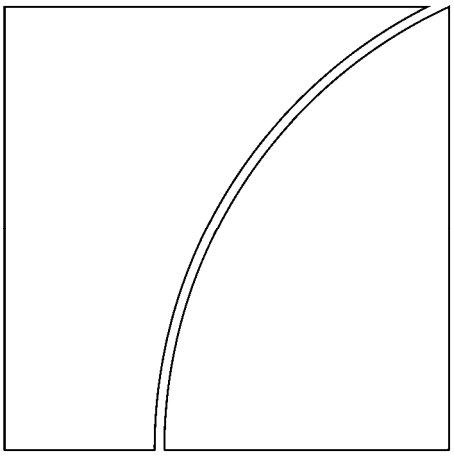
Irving Fisher Committee on Central Bank Statistics

IFC Bulletin

No 34



Initiatives to address data gaps revealed by the financial crisis

Proceedings of the Fifth IFC Conference, Basel, 25–26 August 2010

November 2011

BANK FOR INTERNATIONAL SETTLEMENTS

Papers in this volume were prepared for the IFC Conference held in Basel on 25–26 August 2010. The views expressed are those of the authors and do not necessarily reflect the views of the BIS or the central banks represented at the meeting. Individual papers (or excerpts thereof) may be reproduced or translated with the authorisation of the authors concerned.

This publication is available on the BIS website (www.bis.org/list/ifcbulletins/index.htm)

ISSN 1991-7279 (print)
ISBN 92-9131-883-3 (print)

ISSN 1991-7511 (online)
ISBN 92-9197-883-3 (online)

Contents

Session 3 C: Marrying analytical methods and frameworks with data sources

Session 4 A: The use of surveys to remedy data gaps

Session 4 B: The usefulness of micro data

Session 4 C: Marrying analytical methods and frameworks with data sources

Session 5 A: The use of surveys to remedy data gaps

Session 5 B: Marrying analytical methods and frameworks with data sources

Session 5 C: Improving external statistics

Session 6 A: Improving financial account data

Session 6 B: Improving housing statistics

Session 6 C: Improving data on debt markets and securitisation

Summary of the conference

The financial crisis: what implications for new statistics?

Claudio Borio[1]

Introduction

We live in a world of paradoxes. And the financial crisis has put the spotlight on a new one: in our internet age we are constantly bombarded with data, and yet the information that we would need to answer even the simpler questions we might ask about the health of our financial system is not at our fingertips. Either this information does not exist or, if it does, it is not collected in a way that makes it easily available and digestible.

Can this really be true? Consider just one example. Public reports by banks are growing ever more voluminous. And yet anyone who has been charged with monitoring banks' health knows just how difficult it is to draw on this material and other sources of information. Often, special data gathering exercises must be carried out. And even these are quite laborious. Those who have been involved in efforts to assess the macroeconomic impact of the latest Basel Committee proposals know this all too well. It is simply hard to gather the necessary information: it is hard with respect to current conditions, and even harder with respect to their historical evolution.

Every financial crisis brings in its wake demands for more information. The crises in developing countries in the 1970s and early 1980s gave a big push to improvements in the BIS international banking statistics.[2] The Asian crisis led to refinements in those statistics, resulted in major enhancements in the disclosure of foreign exchange reserves, and spawned the IMF's Special Data Dissemination Standard (SDDS). The current upheaval is no exception. To mention but one of the many efforts, the G20 have identified a large set of data gaps that are now being addressed (FSB-IMF (2009)).

Crises open windows of opportunity that must not be missed. In deceptively tranquil times, it is simply too difficult to achieve the consensus necessary to improve data availability. The sense of urgency is absent. Why fix what, seemingly, ain't broken? The cost/benefit analysis calculus is heavily biased towards inaction.

To take advantage of these narrow windows of opportunity, we need to have the right expectations and set the right priorities. Even in the Internet age, and contrary to what finance textbooks often assume, the costs of gathering information are not negligible. Beyond technical factors, disagreements over the value of the information stand in the way, as do concerns about confidentiality, both within and across countries.

In what follows, I will address three questions. First, what can we realistically expect in terms of better statistics for financial stability? Second, what are the priorities regarding what

---

[1] Bank for International Settlements, Basel.

I would like to thank Dietrich Domanski, Ingo Fender, Bob McCauley, Pat McGuire and Paul van den Bergh for helpful comments and suggestions. The views expressed are my own and do not necessarily reflect those of the Bank for International Settlements.

[2] For accounts of these efforts, and the obstacles they faced, see Borio and Toniolo (2008), Lamfalussy (2000) and Maes (2009).

information to collect and how to collect it? Third, what role can the BIS play in this endeavour?

Let me highlight the main takeaways. First, there is no holy grail. Better statistics can no doubt be a big help in safeguarding financial stability; improvements are badly needed. That said, the main reason crises occur is not lack of statistics, but the failure to interpret them correctly and to take remedial action. Second, we should walk before we run. Concerning the "what", out of the myriad new statistics being put forward I would highlight two sets, one for prices, of which there is otherwise an abundance, and one for quantities, on which information is much more limited. What we urgently need here is internationally comparable sets of property prices, and, above all, consistent and timely bank balance sheet information on a consolidated and global basis – the cornerstone of any more encompassing, sophisticated and granular reporting system. Concerning the "how", the collection process should be supported by sound governance arrangements that are flexible and cost-efficient. Finally, the BIS stands ready to help. To do so, it can leverage its comparative strengths: a long track record; the presence of key players (central banks, supervisory authorities and you – the Irving Fisher Committee (IFC)); and a specific infrastructure on which to build – the international banking statistics.

1. Expectations: there is no holy grail

Could better statistics *by themselves* have allowed policymakers to anticipate the recent catastrophic financial crisis? I very much doubt it.

To be sure, there *were* big statistical gaps. For instance, aside from some aggregate figures, notably those compiled by the BIS, we had hardly any information on credit derivatives. Gross and net volumes in CDS markets by underlying name became available via DTCC only a long way into the crisis, and even then the identity of the counterparties has remained beyond reach for a broader audience, although supervisors can now obtain such data from the DTCC. Similarly, the extraordinarily large US dollar funding needs of European banks – a puzzling factor at the core of the unfolding strains – were on no one's radar screens. Only after the crisis broke out did work at the BIS, drawing on its international banking statistics, provide tentative ranges of magnitude (McGuire and von Peter (2009)).

But the failure to anticipate this crisis, and those preceding it, did not stem from faulty *statistics*, as it turned out. Rather, it resulted from the faulty *lens* through which those statistics were examined. Ultimately, we see what we want to see.[3] What is a sustainable credit boom for some raises alarm bells for others. What some view as a healthy redistribution of risk in the financial system others see as fuelling dangerous risk-taking. Policies that some regard as prudent others consider reckless. Historically, time and again, adjudicating between these fundamentally different perspectives by drawing solely on data has not proved feasible. Add to this the human tendency to take credit for successes and to disown failures – so that "booms have a thousand fathers, busts are orphans" – and the enormous difficulties in the way of anticipating the crisis, let alone taking action to prevent it, become apparent.

And yet, signs of the gathering storm were there. True, they could not be detected through the popular macro-stress tests. Indeed, all those run *before* the crisis failed to identify vulnerabilities. As argued in detail elsewhere, given *current* technology, regardless of data availability, these tests risk lulling policymakers into a false sense of security (Borio and

[3] Psychologists have a specific term for this well known phenomenon: "cognitive dissonance".

Drehmann (2009a), Alfaro and Drehmann (2010)). But they could be spotted through simple real-time leading indicators of financial distress, such as those based on the *joint* deviation of the credit-to-GDP ratio and asset prices, notably property prices, from historical trends (Borio and Drehmann (2009b)). Indeed, such indicators have also performed well out of sample. The secret of their comparative success is simple: they focus on the most systematic and general signs of the build-up of risks across policy regimes and historical periods – they focus, that is, on what is common to the various episodes, rather than on how they differ.

At the same time, it would be a serious mistake to infer from all of this that more and better data are not necessary. Far from it! First, even those simple indicators could greatly benefit from better data, given the major limitations of available property price series and the inability of available credit series to fully capture cross-border exposures – points to which I will return later. Second, by their very nature, those indicators have a *very* limited function. Their source of strength is also their source of weakness. Given their generality, as a prevention tool they can at most act as a starting point for a fuller analysis based on much more granular information.[4] They raise a flag, which has to be followed by a drill-down exercise. They are silent about the more specific nature of the vulnerabilities and, hence, about the possible dynamics of financial distress. Moreover – by design – they cannot help us understand unfolding events during a crisis and in its aftermath. Barometers are helpful, but so are thermometers! Third, and looking further ahead, better statistics are indispensable to improve our understanding of the mechanisms that underlie the build-up of financial risks and their crystallisation in financial crises. They are essential to develop and test analytical hypotheses from which eventually to refine or develop concrete policies.

To sum up, any set of statistics, no matter how sophisticated and reliable, inevitably has limitations. However, it is important that policymakers, market participants and scholars have the best possible set of statistics at their disposal, subject to a proper cost/benefit test. And awareness of what statistics can and cannot do is the best way of limiting the risk of putting too much faith in their power.

2. Priorities: walk before you run

The crisis has provided one of those rare opportunities to implement a welcome and much needed step-enhancement in available statistics. But gathering statistics is costly. Priorities have to be set regarding what to collect and how to collect it. Consider each of these issues in turn.

What to collect

As for the "what", I would highlight two gaps: the first, quite specific, concerns price series; the second, potentially much more extensive, concerns quantities.

The proliferation of price series is, without a doubt, extraordinary. In particular, financial innovation and deepening have spawned an unprecedented expansion of financial contracts. Risk has been spliced and diced, reduced to its atomistic components and recombined in various ways. The corresponding financial contracts trade at a price. Those prices have generally become publicly available, in some cases even at intra-day frequencies.

[4] For a conceptual framework on how such a two-step approach might be set up, see Eichner et al (2010) and Cecchetti et al (2010).

If anything, I would argue that there is an *overabundance* of such information. All too often observers, policymakers and market participants are glued to their screens, their attention riveted on the latest blip. It is hard to distinguish true information from noise. And there is a risk of misreading that information. This is especially the case when assessing potential vulnerabilities in the financial system. Time and again, financial market prices have proved to act more like *contemporaneous* indicators of financial distress rather than true *leading* indicators – that is, more like *thermometers* than *barometers* (Borio and Drehmann (2008)). Volatilities, spreads and risk premia tend to be unusually low precisely when risk is building up, and to spike only when it materialises. What looks like low risk is, in fact, a sign of high risk-taking. The build-up of risk is akin to the slow shift in tectonic plates: high-frequency information distracts our attention, it obscures the bigger picture.

One critical exception to this wealth of data is *property prices*, for both residential and commercial property (and corresponding information about rents). This is puzzling, since throughout history property prices have been at the heart of some of the most serious and damaging financial crises with major macroeconomic costs (eg Hoyt (1933)). The reasons are not hard to find: property prices are subject to major boom and bust cycles, especially commercial property prices; property represents a major fraction of an economy's perceived "wealth"; it is extensively used as collateral; and its purchase is largely financed with debt. Not surprisingly, property prices also play an important role in the above-mentioned leading indicators of banking crises. And yet, available statistics are extremely poor. The series are generally limited in coverage and granularity, their extension back in time is gravely inadequate, and consistency across countries is a serious problem.

At the BIS, we started to collect information on property prices in the early 1990s, drawing on a mix of official and private sources. Judging from external requests, this has proved to be one of the most successful sets of ad hoc statistics we have ever put together. Over time, interest in property price data in official statistical circles has grown, as recently reconfirmed by specific recommendations made in recent G20 reports (FSB-IMF (2009)). And I am glad to see that an informal survey of IFC members ahead of this conference indicates that many countries have assigned a high priority to collecting this data. That said, while improvements have been made concerning residential property prices, statistics for commercial property are lagging badly behind. So I would very much hope that these efforts will be intensified and coordinated internationally, to ensure greater consistency. Maybe this is an area in which the IFC could play a more active role.

But the more pervasive gaps relate to *quantities*, not prices, and especially to balance sheet information. It is rather extraordinary that, even today, we still lack readily available statistics for comprehensive consolidated balance sheet data on banks' global operations. The publicly available data that do exist are incomplete or sparse. And, with few exceptions, the BIS international banking statistics being one of them, they are generally unreliable, untimely, inconsistent across firms and borders, user-unfriendly and hard to aggregate meaningfully. At the BIS, we regard addressing this problem as *the* top priority going forward (eg Cecchetti et al (2010)).

The consolidated principle is critical. Residency-based data – the data that underlie national account statistics – are the right ones if we are interested in knowing *where* output is produced and financial claims held. But they do not tell us *who* makes the underlying economic decisions. In a world in which firms increasingly operate across borders, consolidated data provide a better approximation to the actual decision-making units. It is these units that decide where to operate, what goods and services to produce and at what prices, and how risks should be managed. Importantly, it is these units that ultimately survive or fail.

Such a set of statistics, covering *both* assets *and* liabilities (on- and off-balance sheet) comprehensively, and complemented with the income statement, would be a solid basis on which to build further. It would provide the basic building blocks for the assessment of

exposures to various risks – credit, market and liquidity (funding) risks.[5] And, over time, it could be refined in terms of granularity and be extended beyond the banking sector. The banking sector is no doubt the right place to start. Financial crises have repeatedly shown that, one way or the other, problems elsewhere in the non-financial and broader financial sector ultimately end up back with the banks, as strains become acute and more damaging.

What about the usefulness of information on bilateral exposures in all of this? This has become quite popular following the financial crisis and the development of analytical approaches to the modelling of systemic risk that trace the knock-on effects from one institution to the next. Such an approach views the financial system as a network of connections linking institutions. One of the working groups under the aegis of the G20 is actively considering the collection of this type of information.

My sense is that this type of information falls under the category "nice to have", but is not a priority on a par with the core balance sheet information just discussed. True, interlinkages are necessary to estimate meaningful balance sheet measures of sectoral or aggregate leverage: the capital available to absorb losses in any given sector can easily be overstated unless interlinkages within the sector are taken into account (eg the well known "double leverage" phenomenon). But detailed counterparty exposure information would have very limited value unless it was grafted onto reliable, basic information about each institution's balance sheet. Moreover, there is a risk of putting too much emphasis on interlinkages as a factor driving contagion. Common (similar) exposures of institutions, on both their asset and liability sides, together with undiscriminating responses by investors and counterparties, are the main drivers of the dynamics of financial distress. A financial crisis is more like a tsunami that sweeps away all that gets in its way than a force knocking down one domino after the other along a specific path.[6] Even so, granular, up-to-date information about interlinkages can be helpful in managing a crisis – making it particularly relevant for exchanges of information among supervisors.

Of all the international reporting systems available, the one that comes closest to providing the core balance sheet information identified here as a priority is the BIS international banking statistics. The set combines consolidated balance sheet information with residency-based (locational) information, providing a bridge between national account statistics and those needed to understand the behaviour of individual decision units.[7] The statistics are collected on a consistent basis internationally. Their timeliness has improved over time, with a current reporting lag of roughly one quarter. The coverage is quite extensive, including internationally active banks from some 40 jurisdictions, and accounting for about 95% of all international claims. Their reliability is constantly checked and improved.

At the same time, these statistics have a number of limitations. In particular, they cover only the *international* operations of the reporting banks. And the granularity of the information could be enhanced significantly. Not least of the problems is that for historical reasons the consolidated statistics have focused primarily on the *asset* side of banks' balance sheets. While combining them with the residency-based statistics that identify the nationality of the bank can help to overcome some of these limitations, the scope for improvements is substantial (Cecchetti et al (2010), and Fender and McGuire (2010)). In particular, the

---

[5] For a systematic analysis of the type of possible risk information at the level of individual institutions and the system as a whole, see Borio and Tsatsaronis (2005). For individual institutions, see also BCBS, CGFS, IAIS and IOSCO (2001).

[6] See Elsinger et al (2006) for empirical evidence on this point; see Upper (2007) for a critical survey of contagion analysis based on networks.

[7] For an illustration of how rich the analysis based on the combination of consolidated and residency-based data can be, see Fender and McGuire (2010), who explore funding risk in the global banking system.

improvements would be necessary to get a better handle of the banks' funding risks that have been so prominent in the current crisis, including those resulting from maturity transformation**.**

How to collect it

Priorities have to be set not only for what to collect but also for how to collect it. The process is important. A number of principles suggest themselves (see also Tarullo (2010)).

First, governance matters. For one, to ensure consistency, the process should be guided internationally. Purely domestic efforts risk resulting in inconsistent data sets. If the data sets are consistent, the total is more than just the sum of the parts. Given the global nature of the operations of many reporting firms, international coordination should also facilitate the collection of the data. In addition, those responsible should have the necessary legal powers to collect the information. In some cases, data may need to be gathered on a voluntary basis. International peer pressure could contribute to catalysing the necessary efforts. Finally, and critically, the process should ensure the confidentiality of the data, whenever necessary. This is especially important when supervisory information is involved.

Second, flexibility is critical. The *specifics* of the next crisis will be different from those of the recent one. The financial system will continue to evolve rapidly and, rest assured, it will do so especially in the shadows, away from the reach of regulation (Eichner et al (2010)). Any collection system should be flexible and agile enough to keep up with these changes. The chain from the identification of the necessary data to its collection should be short and efficient. This should apply to both permanent revisions to the reporting frameworks and to more ad hoc, one-off collection of statistics to address specific issues.

Third, costs matter. In order to reduce collection costs and barriers to the gathering of new information, it would make sense to build as far as possible on available infrastructure, whenever it is up to the task.

3. What the BIS can do

Throughout its history, the BIS has been instrumental in developing consistent sets of global financial statistics. This has been a core task in the performance of its overall mission. Since the 1970s alone, in addition to the international banking statistics, there have been other examples, including the statistics on derivatives instruments, those on activity in foreign exchange markets and the securities statistics. The Committee on the Global Financial System (CGFS) – formerly known as Eurocurrency Standing Committee – and the Markets Committee – formerly known as the Committee on Gold and Foreign Exchange – have played a lead role in this area. More recently, the establishment of the IFC provides yet another channel that could help catalyse improvements in available statistics. And the Basel Committee, too, could play a key role in future.

Currently, the BIS is closely involved in several efforts to enhance available statistics. It is participating, in various capacities, in the work on 11 out of 20 of the recommendations that are being pursued under the aegis of the G20, alongside the Financial Stability Board and other international financial institutions. In addition, the CGFS is seeking further enhancements to the international banking statistics, in terms of both instrument and country coverage, and to the derivatives statistics, notably to get a better handle of credit risk transfers; it is also exploring the collection of data on the evolution of credit terms in wholesale lending and derivatives markets.

Looking forward, the BIS stands ready to support further statistical efforts that can leverage its comparative advantages. One such strength is its long track record of using economic

expertise to identify and subsequently analyse and disseminate the relevant data. Another is the technical expertise to set up and run the necessary infrastructure. And, crucially, the BIS houses the relevant authorities for statistical governance, notably the committees that include not just central banks but also supervisory authorities.

Conclusion

To conclude, let me just recall some of the key points of my presentation. Better statistics will not prevent the next crisis, but will definitely help policymakers and market participants to identify vulnerabilities, monitor financial health and better manage financial strains once they emerge. Above all, they will remove an easy excuse to disown responsibility: "if only I had known…". The recent financial crisis offers a window of opportunity to address serious gaps in available statistics; that opportunity cannot be missed. Since collecting information is costly, priorities have to be set. I have highlighted two such priorities: better property price data and comprehensive balance sheets that illuminate banks' global operations on a consolidated basis. The process for collecting the information should be guided internationally, not least to ensure its consistency and overcome confidentiality restrictions; it should retain the necessary flexibility to respond to changing demands; and it should limit costs, building as far as possible on existing reporting infrastructures. The BIS strongly welcomes these efforts and it stands ready to support them by leveraging its comparative strengths, notably its extensive track record in this core aspect of its mission.

References

Alfaro, R and M Drehmann (2009): "Macro stress tests and crises: what can we learn?", *BIS Quarterly Review*, December, pp 29–41.

BCBS, CGFS, IAIS and IOSCO (2001): Final report of the Multidisciplinary Working Group on Enhanced Disclosure, Basel, April.

Borio, C and M Drehmann (2009a): "Towards an operational framework for financial stability: 'fuzzy' measurement and its consequences", in Central Bank of Chile (ed), *Financial stability, monetary policy and central banking;* also available as *BIS Working Papers,* no 284.

——— (2009b): "Assessing the risk of banking crises – revisited", *BIS Quarterly Review*, March, pp 29–46.

Borio, C and K Tsatsaronis (2005): "Accounting, prudential regulation and financial stability: elements of a synthesis", *BIS Working Papers*, no 180, September.

Borio, C and G Toniolo (2008): "One hundred and thirty years of central bank cooperation: a BIS perspective", in C Borio, P Clement and G Toniolo (eds), *Past and Future of Central Bank Cooperation*, Cambridge University Press. Also available as *BIS Working Papers*, no 197, 2006, February.

Cecchetti, S, I Fender and P McGuire (2010): "Toward a global risk map", *BIS Working Papers*, no 309, May.

Eichner, M, D Kohn and M Palumbo (2010): "Financial statistics for the United States and the crisis: what did they get right, what did they miss, and how should they change?", *Finance and Economics Discussion Series*, no 2010–20, Washington DC.

Elsinger, H, A Lehar and M Summer (2006): "Risk assessment for banking systems", *Management Science*, vol 52, no 9, pp 1301–14.

Fender, I and P McGuire (2010): “Bank structure, funding risk and international shock transmission: concepts and measurement”, *BIS Quarterly Review*, September, forthcoming.

FSB and IMF (2009): *The financial crisis and information gaps*, Basel/Washington DC, October.

Hoyt, H (1933): *One hundred years of land values in Chicago*, The University of Chicago Press, Chicago, Illinois.

Lamfalussy, A (2000): Financial Crises in Emerging Markets: An Essay on Financial Globalisation and Fragility, Yale University Press.

Maes, I (2009): “On the origins of the BIS macro-prudential approach to financial stability: Alexandre Lamfalussy and financial fragility”, *Working Paper Research*, no 176, National Bank of Belgium, October.

McGuire, P and G von Peter (2009): “The US dollar shortage in global banking and the international policy response”, *BIS Working Papers*, no 291, October.

Tarullo, D (2010): “Equipping financial regulators with the tools necessary to monitor systemic risk”, testimony before the Subcommittee on Security and International Trade and Finance, US Senate Committee on Banking, Housing, and Urban Affairs, February.

Upper, C (2007): “Using counterfactual simulations to assess the danger of contagion in interbank markets”, *BIS Working Papers*, no 234, August.

Session 1

An overview of international and national initiatives to address data gaps revealed by the financial crisis

Chair: Aurel Schubert, European Central Bank

Papers:

Enhancing information on financial stability
Adelheid Burgi-Schmelz, Alfredo Leone, Robert Heath and Andrew Kitili, International Monetary Fund

Enhancements to ECB statistics for financial stability analysis
Anna Maria Agresti, Stefano Borgioli and Paolo Poloni, European Central Bank

Data gaps in the UK financial sector: some lessons learned from the recent crisis
Gareth Murphy and Robert Westwood, Bank of England

Enhancing information on financial stability

Adelheid Burgi-Schmelz, Alfredo Leone, Robert Heath and Andrew Kitili[1]

I. Background

1. The recent financial crisis revealed a deepened integration of economies and markets, and a strengthening of interlinkages across financial institutions, that data systems failed to comprehensively capture. There is overwhelming evidence that, leading up to the crisis, credit risks were worsened by extensive use of leverage coupled with a high degree of maturity transformation, a large part of which took place outside of traditional depository corporations through the use of commercial paper, repurchase agreements, and other similar instruments. It is estimated that the over-the-counter derivatives market exploded from $91 trillion in 1998 to about $600 trillion in 2008 in notional value terms. At the height of the crisis, concerns about the ability of companies to make good on these contracts, and the lack of transparency about what risks existed, caused credit markets to freeze. As Bear Stearns, American International Group, and Lehman Brothers failed, investors became wary of trading as new transactions could expose them to more risks. Liquidity-constrained institutions were compelled to offload assets at distressed prices, which amplified margin calls for leveraged actors and exacerbated mark-to-market losses for all asset holders.

2. A key feature of the crisis was the high dependence on short-term finance to purchase long-term assets, leading to a mismatch between the maturity structure of the corporations' assets and liabilities. Such maturity transformation exposes financial institutions and entire markets to vulnerabilities of market runs. However, owing to a lack of data, regulators, supervisors and market participants could not fully measure the degree of maturity transformation or the extent to which financial institutions and markets were interconnected: "It was the collapse in funding markets which made the crisis global, and yet we cannot really see funding patterns in the available data" (Hannoun, 2010).[2]

3. One key lesson learned is that supervisors, policymakers, and investors should have sufficient data and information to promptly evaluate the potential effects, for instance, of the possible failure of a large bank on other large banks through counterparty credit channels, settlement arrangements, and reliance on common sources of short-term funding. The need for comprehensive, high-frequency, and timely data to monitor systemic risks associated with operations of the global systemically important financial institutions (G-SIFIs) was underscored by the IMF Managing Director, Dominique Strauss-Kahn, who observed in an interview: "We need more data, including from a rather small number of the large financial systemic institutions." "The mandate of the Fund is to have surveillance of countries, but today you have institutions as big, maybe bigger, than many countries. How can we have global surveillance without having data on what happens with those large financial institutions?" This observation was echoed in a number of forums.

4. Recognizing the existence of data gaps, the G-20 Working Group on Reinforcing International Co-operation and Promoting Integrity in Financial Markets asked the IMF and the Financial Stability Board (FSB) to explore the gaps and provide appropriate proposals for

---

[1] The views expressed in this paper are those of the authors and do not necessary reflect the view of the International Monetary Fund, its Executive Board, or its management. The paper draws from the recent May 2010 progress report to the G-20 prepared by IMF staff and the FSB Secretariat.

[2] Opening remarks to the high-level conference in April 2010 by Hervé Hannoun (Deputy General Manager, BIS) (http://www.bis.org/speeches/sp100419.htm).

strengthening data. This call was endorsed by the IMF's International Monetary and Financial Committee at its Spring Meetings in 2009 and 2010.[3]

II. What Are the Data Gaps That Must Be Closed to Ensure Financial Stability?

5. In response, staff of the IMF and the FSB Secretariat, in consultation with official users of economic and financial data in G-20 economies and key international organizations, identified 20 recommendations that need to be addressed. These include:

- The need to strengthen the data essential for effectively capturing and monitoring the build-up of risk in the financial sector. This calls for the enhancement of data availability, both in identifying the build-up of risk in the banking sector and in improving coverage in those segments of the financial sector where the reporting of data is not well established, such as the nonbank financial corporations.
- The need to improve the data on international financial network connections**.** This calls for enhanced information on the financial linkages of global systemically important financial institutions (G-SIFIs), as well as the strengthening of data-gathering initiatives on cross-border banking flows, investment positions, and exposures, in particular to identify activities of nonbank financial institutions.
- The need to strengthen the data needed to monitor the vulnerability of domestic economies to shocks. This calls for measures to strengthen the sectoral coverage of national balance sheet and flow of funds data, including timely and cross-country standardized and comparable government finance statistics and data on real estate prices. On the latter, country practice in compiling these data is uneven, yet the impact of house prices on household net worth is highly relevant to the current crisis.
- The need to promote the effective communication of official statistics to enhance awareness of the available data for policy purposes.

6. These recommendations were endorsed by the G20 finance ministers and central bank governors at their meeting in Scotland in November 2009 (http://www.imf.org/external/np/g20/pdf/102909.pdf).

III. What Is the Progress Made So Far?

7. Considerable progress has been made in a very short period, particularly on those recommendations for which conceptual/statistical frameworks exist (Figure 1). In June 2010, the progress made to date was reported to the G-20 ministers of finance and central bank governors (http://www.imf.org/external/np/g20/pdf/053110.pdf) at their meeting in Busan, Korea. A visible example of the accomplishments of this initiative is the Principal Global Indicators (PGI) website.

8. In April 2009 the PGI website was launched, providing timely data available at participating international agencies covering financial, governmental, external, and real sector data, with links to data on websites of international and national agencies. The website—a collaborative effort of the Inter-Agency Group on Economic and Financial

[3] An initial description of the initiative was published in the March 2009 edition of *Finance & Development*. More information can be found in the lower part of http://www.imf.org/external/data.htm.

Statistics (IAG), involving the Bank for International Settlements (BIS), the European Central Bank (ECB), Eurostat, the International Monetary Fund (IMF) (Chair), the Organisation for Economic Co-operation and Development (OECD), the United Nations, and the World Bank—is available at (http://www.principalglobalindicators.org/default.aspx).

9. In developing the PGI website, the IAG recognized the importance of going beyond traditional statistical production processes, in more innovative ways, to obtain a set of timely and higher-frequency economic and financial indicators, at least for systemically important countries. In particular, because of the global nature of the recent crisis, data users demand more internationally comparable, timely, and frequent data. The benefits of this inter-agency approach are that it mobilizes existing resources, builds on the comparative advantages of each agency, and supports data sharing in a coordinated manner. The international agencies have access to selected country datasets that they present in a manner broadly comparable across countries. The website has already been enhanced several times. Now efforts are under way to expand the country coverage on the website beyond the G-20 economies. These concerted efforts are being carried out in tandem with other ongoing data initiatives at the IMF and collaborating agencies (see below).

10. The G-20 Report of November 2009 provided significant impetus for action. For several of the 20 recommendations, international bodies have already taken a number of actions that support their implementation, including the IMF with regard to Financial Soundness Indicators (FSIs) (#2), the International Investment Position (IIP) (#12), and Government Finance Statistics (#17), and the BIS (via the Committee on the Global Financial System (CGFS)) with regard to credit default swaps (CDS) (#5). For other significant recommendations, progress has been made in international working groups and task forces (securities (#7), public sector debt (#18), real estate prices (#19), and the PGI website (#20).

11. In March 2010, the IMF Executive Board took a number of decisions related to recommendations #2 and #12. In particular, the IMF Executive Board decided to enhance the Special Data Dissemination Standard (SDDS) by:[4]

- including seven FSIs in the SDDS on an "encouraged" basis (that is, not legally "prescribed" under the SDDS)—in order to strengthen information about the financial sector and better detect system risks (Recommendation #2); and
- moving to quarterly reporting (from annual) of the IIP data, with a maximum lag of one quarter (quarterly timeliness), on a "prescribed" basis after a four-year transition period—in order to better understand cross-border linkages (Recommendation #12).[5]

12. Also in March 2010, the IMF Executive Board approved a phased migration strategy for implementing the *Government Finance Statistics Manual 2001* as the standard for IMF fiscal data (Recommendation #17).[6] This will contribute to better and more comparable fiscal data, including on government assets and liabilities.

13. In June 2009, the CGFS approved changes to credit risk transfer statistics (Recommendation #5) that include improved information on counterparty risk and exposure to various reference entities, and expanding the reporting to collect details on instruments such as index CDS contracts (http://www.bis.org/publ/cgfs35.htm). Subsequently, agreements have been reached by the BIS with the reporting central banks to report these new datasets, with implementation phased in two steps, for June 2010 and June 2011 data.

---

4 IMF Public Information Notice (PIN) 10/41 of March 23, 2010.

5 It was also decided to add a simplified table on countries' external debt by remaining maturity (on an "encouraged" basis) to better monitor the vulnerability of domestic economies to shocks.

6 See http://www.imf.org/external/pp/longres.aspx?id=4431.

14. Progress has also been made in enhancing securities statistics (Recommendation #7), both conceptually through the BIS-ECB-IMF *Handbook on Securities Statistics* and through the collection of data by the BIS. Moreover, the BIS has solicited authorization from a wider range of central banks to report residential property price indices for dissemination on the BIS website (Recommendation #19).

15. The World Bank's public sector debt database (Recommendation #18), which is being developed under the auspices of the Task Force on Finance Statistics (TFFS),[7] is due to be launched by end-2010, providing quarterly public sector debt data from developing and emerging market countries. The global financial crisis reinforced the importance of integrated economic data, both stocks and flows, so that the impact of developments in one sector of the economy on other sectors, and flows such as valuation changes, can be reliably analyzed. Strengthening sectoral information is reflected in Recommendation #15. The IMF is currently creating an inventory of existing practices with the intent of conducting an expert group meeting in early 2011, to share experiences, discuss the gaps, and identify common templates to take this work forward.

16. Two recommendations deserve particular attention because of their importance in helping to understand cross-border financial networks (recommendations #10 and #11). These recommendations build on the existing initiatives of the quarterly BIS International Banking Statistics (IBS) and the annual IMF Coordinated Portfolio Investment Survey (CPIS), which provide data on cross-border banking transactions and portfolio debt and equity positions, respectively.[8]

17. These datasets help track financial transactions and/or positions on a bilateral basis. In addition to enhancements regarding country coverage, the CGFS and the IMF Committee on Balance of Payments Statistics have created working groups to study other enhancements, such as the separate identification of nonbank financial institutions in the consolidated banking data, as well as the information required to better track funding patterns and maturity mismatches in the international financial system in the case of the BIS (also relevant for Recommendation #4), and the enhancement of the frequency and timeliness of the CPIS data and the identification of the institutional sector of the foreign debtor in the case of the IMF. These working groups are expected to give careful consideration to the benefits and the costs of enhancements and to report to their parent committees in the second half of 2010.

18. The involvement of all the G-20 economies in these two long-standing collections is fundamental given their relevance for understanding cross-border financial flows and positions. In particular, there are positive externalities that flow to other economies through mirror data that can be compiled from the counterpart information supplied. In this regard, the IMF and the BIS continue to work to increase country participation in the CPIS and the IBS, respectively.

IV. What Are the Major Challenges?

19. While progress is being made in closing data gaps in areas where the conceptual framework is already established, it has become evident that closing the gaps where the statistical framework is still not fully developed poses significant challenges. Some of the

---

[7] The TFFS consists of representatives of the BIS, the Commonwealth Secretariat, the ECB, Eurostat, the IMF (Chair), the OECD, the Paris Club, UNCTAD, and the World Bank.

[8] The IMF has also conducted a Coordinated Direct Investment Survey with a reference date of end-2009. First results are expected towards the end of calendar 2010.

most challenging areas are also among the most important for improving financial stability analysis and macropolicy decision-making more broadly.

A. Build-up of Risk in the Financial Sector

20. The build-up of leverage and maturity mismatches within the financial system is one area where conceptual frameworks need to be developed before ascertaining specific data collection demands. This is further complicated by the fact that the measurement of leverage and maturity mismatches is not necessarily conceptually uniform across sectors, institutions, or markets, and therefore it may prove difficult (or in fact misleading) to devise aggregate measures across sectors. Given the importance of monitoring leverage and maturity mismatches to prevent future crises, addressing these gaps is a high priority. The IMF and the BIS staff are working closely on addressing these gaps. The BIS has made significant recent advances in the analysis of maturity mismatches ("funding gaps") for the banking sector on the basis of its IBS data.[9] But pursuing this work further is likely to involve longer-term projects, as the analytical and data challenges involved remain significant.

B. Developing a Template to Capture Data on G-SIFIs

21. It is imperative that data collection efforts, particularly on global financial networks, take cognizance of international dimensions and seek appropriate participation from regulators and supervisors worldwide, especially in jurisdictions with significant financial centers. For instance, the international nature of financial markets hampers the extent to which one economy, acting single-handedly, can organize data on financial markets globally. However, moving from identification of data gaps to efficient systems of data collection and reporting on G-SIFIs is challenging, and requires prioritization of activities, effective coordination and cooperation among international agencies and national authorities, adequate resources, and an appropriate legislative framework to improve the ability of regulatory/supervisory and statistical agencies to collect the necessary data. Indeed, senior officials at a conference held in Basel in April 2010 on data gaps (http://www.imf.org/external/np/seminars/eng/2010/infogaps/index.htm) observed that "closing all the gaps will take time and resources, and will require coordination at the international level and across disciplines, as well as strong high-level support. In this context, cooperation across disciplines—financial stability, supervisory, statistical, and coordination with standard setters, notably the Basel Committee on Banking Supervision, as well as high-level support are needed to deliver a successful outcome. As noted above, there may also be some need for strengthening legal frameworks for data collection in some economies. Differences in accounting standards across countries would also need to be considered."

22. While the priorities have been identified through the G-20 data gaps initiative, there are many complex and sensitive issues and questions that need to be addressed with regard to G-SIFIs. Pertinent questions include:

Who should collect the data?

23. The crisis demonstrated both the difficulty of capturing, and the importance of, sound indicators of the degree and location of leverage or excessive risk-taking within the system, particularly as regards unregulated or lightly regulated institutions and instruments (the "shadow banking system") but also liquidity, credit, and tail risks within the regulated sector. Related is the issue of a better understanding of where risks actually lie across institutions and markets given the growth of risk transfer instruments. Given this, national regulatory and supervisory agencies have a great role to play—the data should be

[9] For details, see McGuire, P. and G. von Peter (2009), "The US dollar shortage in global banking and the international policy response", BIS Working Papers, no 291, October.

sufficiently timely and have sufficient coverage of systemically important financial institutions (SIFI) (bank and nonbank) and nonfinancial corporations. Some countries are in the process of enacting legislation to monitor risks relating to SIFIs. The US financial reform bill creates a new Office of Financial Research within the Treasury that will collect and analyze data to identify and monitor emerging risks to the US economy and make this information public in periodic reports and testimony to Congress every year.

How should the data be organized and reported?

24. Standardization of data reporting allows efficient aggregation of information for effective monitoring and analysis. It is therefore important to promote the use of common reporting systems across countries, institutions, markets, and investors to enhance efficiency and transparency. Standardized reporting allows the assemblage of industry-wide data on counterparty credit risk or common exposures, thus making it possible for stakeholders to construct basic measures of common risks across firms and countries.

Who should have access to the data?

25. The enhanced data collection by regulatory and/or supervisory agencies must be accompanied by a process for making data available to key stakeholders as well as the public at large. This is consistent with the "public good" nature of data, while safeguarding the confidentiality concerns of both the home and host regulators and supervisors. Differences in accounting standards across countries would also need to be addressed through the legislative framework.

26. It was in recognition of these factors that the FSB Secretariat, in close collaboration with the IMF Statistics Department and with support from the IMF Monetary and Capital Markets Department, adopted a consultative international approach to developing a common reporting template for G-SIFIs as required in recommendations #8 and #9 of the G-20 Report. This work is making progress and involves financial stability experts, supervisors, and statisticians from the FSB membership. When completed, the reporting template could play an important role in standardizing information and facilitating the process of sharing data on common exposures and linkages between G-SIFIs.

C. Vulnerability of Domestic Economies to Shocks

27. The lack of information on how income, consumption, and wealth are distributed within sectors, particularly households (as reflected in Recommendation #16) hampered the identification of vulnerabilities developing in the domestic economy. The OECD and Eurostat are leading the work to rectify this gap, and are looking to define common international methodology and implementing pilot studies.

V. Conclusions and the Way Forward

28. Recent years have seen significant progress in the availability and comparability of economic and financial data. However, the present crisis has thrown up new challenges that call for going beyond traditional statistical production approaches to obtain a set of timely and higher-frequency economic and financial indicators, and for enhanced cooperation among international agencies in addressing data needs. As noted, one area in which better information is critical for financial stability is the web of connections among G-SIFIs through channels such as interbank lending, securities lending, repurchase agreements, and derivatives contracts, and with national markets. While data in these areas are the most important for financial stability, key challenges must be addressed, including legal barriers, regulatory issues, and resource availability, especially in national statistical agencies. Organizational issues also need to be tackled, especially in developing common and

standardized datasets on exposures of G-SIFIs. We are looking forward to the outcomes of the ongoing work in developing the common template.

Figure 1

Overview of the 20 Recommendations

	Conceptual/statistical framework needs development	**Conceptual/statistical frameworks exist and ongoing collection needs enhancement**
Build-up of risk in the financial sector	#3 (Tail risk in the financial system and variations in distributions of, and concentrations in, activity) #4 (Aggregate leverage and maturity mismatches) #6 (Structured products)	#2 (Financial Soundness Indicators (FSIs)) #5 (Credit default swaps) #7 (Securities data)
Cross-border financial linkages	#8 and #9 (Global network connections and systemically important global financial institutions) #13 and #14 (Financial and nonfinancial corporations' cross-border exposures)	#10 and #11 (International Banking Statistics (IBS) and the Coordinated Portfolio Investment Survey (CPIS)) #12 (International Investment Position (IIP))
Vulnerability of domestic economies to shocks	#16 (Distributional information)	#15 (Sectoral accounts) #17 (Government finance statistics) #18 (public sector debt) #19 (Real estate prices)
Improving communication of official statistics		#20 (Principal global indicators)

Enhancements to ECB statistics for financial stability analysis

Anna Maria Agresti,[1] Stefano Borgioli[2] and Paolo Poloni[3]

Section 1: Motivation[4]

The strengthening of the framework for macro-prudential supervision within Europe has been a key priority in response to the ongoing financial crisis. Taking up the recommendations of the De Larosière report,[5] one of the main initiatives is the creation of the European Systemic Risk Board (ESRB), which will have responsibility for identifying, monitoring, assessing and responding to potential threats and risks to financial stability in the EU. Subject to the endorsement of the underlying legal acts, this new body will receive analytical, statistical, administrative and logistical support from the ECB. The establishment of the ESRB consequently has relevant implications for the statistical work of the ECB and the ESCB. The aim of this paper is to describe two key work streams that are being undertaken in order to prepare for the ESRB. These workstreams concern the enhancement of the Consolidated Banking Data (CBD)[6] and the development of a statistical definition of Large Banking and Insurance Groups (LBIGs).

The statistical requirements for macro-prudential analysis to be potentially carried out by ESRB entail the following demanding aspects: i) an EU wide geographical scope (moving beyond the euro area focus applied to the ECB's own financial stability analysis); ii) including country developments in the risk monitoring; iii) focusing on risks of a systemic nature arising not only from banks but also from other financial institutions, markets or infrastructures, such as common or correlated exposures of financial intermediaries and bilateral positions (which in turn requires harmonised and granular *from-whom-to-whom* statistics).

The banking sector has always been in the focus of the risk analysis of the ECB, and will remain an important component also for ESRB purposes. Detailed, frequent and timely information on the EU banking system is therefore necessary. In this respect, work has started to enhance the current data, in particular from supervisory sources (used in the CBD), as described in Section 2. At the same time, a considerably more detailed and granular analysis is needed for LBIGs, as they might be a possible endogenous source of system risk. This requires, in a first step, identifying such groups and agreeing on a common statistical definition for the reference population. Work in this area is described in Section 3.

---

[1] European Central Bank, Directorate General Statistics, Kaiserstrasse 29, 60598 Frankfurt, Germany, E-mail: anna_maria.agresti@ecb.int.

[2] European Central Bank, Directorate General Statistics, Kaiserstrasse 29, 60598 Frankfurt, Germany, E-mail: stefano.borgioli@ecb.int

[3] European Central Bank, Directorate General Statistics, Kaiserstrasse 29, 60598 Frankfurt, Germany, E-mail: paolo.poloni@ecb.int.

The views expressed in this paper are those of the authors and not necessarily those of the ECB.

[4] We would like to thank Caroline Willeke, Jean Marc Israel, Patrick Sandars, Bjoern Fischer, Natalja Benkovska and Marco Burroni for their useful comments.

[5] See http://ec.europa.eu/internal_market/finances/docs/de_larosiere_report_en.pdf

[6] For the publication of CBD, see www.ecb.de/pub/pdf/other/eubankingsectorstability2009en.pdf

Finally, Section 4 describes the challenges ahead in further developing consolidated statistics for the banking sector and for large financial institutions.

Section 2: Consolidated Banking Data – short-term approach

The macro-prudential analysis conducted by the Banking Supervision Committee (BSC)[7] is based on aggregated information on the banking systems of all EU Member States. The key set of data for this analysis is the CBD, which is provided by the member organisations of the BSC.

These data include detailed information on bank profitability, balance sheets, asset quality and solvency broken down by size classes of banks.

The current CBD framework was implemented in 2009 by all the EU-27 countries for their provision of banking data to the ECB. The main data sources are the supervisory information collected according to Financial Reporting (FINREP)[8] and Common Reporting (COREP)[9] templates and guidelines, as developed by the Committee of European Banking Supervisors (CEBS).

The data cover nearly 100% of the EU banking sector and are fully consolidated on a cross-border and cross-sector basis; cross-border means that data on branches and subsidiaries located outside the domestic market are included in the data reported by the parent institution and cross-sector means that branches and subsidiaries of banks that can be classified as financial institutions other than banks are also included; however, insurance corporations are not included.

Foreign banks are defined as subsidiaries and branches that are controlled by either an EU or a non-EU parent that is "foreign" from the reporting country's point of view. The data for these institutions are excluded from the definition of the domestic banking sector, and are aggregated under the heading "foreign banks". A separate analysis of the data on foreign banks is justified by their large share of the domestic banking sector in some EU countries.

The data on EU banks are divided into three size classes (small, medium-sized and large banks), which are determined by their percentage share of the total assets of the whole EU banking system. This breakdown by size allows the analysis of different national banking systems, as concentration in these markets varies substantially among countries, and assessment of the potential implication for systemic risks.[10]

The CBD dataset is the backbone of the analysis of the stability of the banking sector in the EU carried out at the ECB/ESCB. It forms the basis for the annual BSC report on EU Banking Stability and is used for other analytical purposes as well. The CBD allows the calculation of different banking system strength indicators on a consolidated level for domestic banking sectors as well as for foreign-controlled banks.[11]

---

7 The Banking Supervision Committee assists in the fulfilment of the ESCB's statutory tasks in the field of prudential supervision of credit institutions and the stability of the financial system, as laid down in the Treaty (Article 105 (5)) and the ESCB Statute.

8 See http://www.c-ebs.org/documents/Publications/Standards---Guidelines/2009/FINREPrev2/FINREPrev2-instructions.aspx

9 See http://www.c-ebs.org/Publications/Consultation-Papers/All-consultations/CP01-CP10/CP04-Revised-2.aspx

10 For a complete list of the indicators, see www.ecb.de/pub/pdf/other/eubankingsectorstability2009en.pdf

11 For a comparison between the ECB and IMF indicators for the macro-prudential analysis of the banking sector, see http://www.ecb.europa.eu/pub/pdf/scpops/ecbocp99.pdf

Some short-term developments are now planned in order to expand the possible scope of the CBD, also in the light of the establishment of the ESRB. These enhancements of CBD are likely to be facilitated by the implementation of new versions of the FINREP and COREP which are now being introduced by CEBS.

Indeed, a revised version of the FINREP framework (so called rev. 2) will enter into force on 1 January 2012, while a revised COREP (so called rev. 2) will be applicable by 31 December 2010. FINREP rev. 2 provides a common standard reporting framework for banks, with the goal of increasing the comparability of the financial information reported by banks to their national supervisory authorities. COREP rev. 2 provides for an updated version of the information requirements arising from the CRD (Directives 2009/27/EC and 2009/83/EC) as well as CRD II amendments (Directive 2009/111/EC).

Specifically, two main short-term enhancements to the current CBD framework are under consideration. The first aims at increasing the data collection frequency to a semi-annual basis, for a specific and limited subset of CBD series currently published in the annual ECB report on Banking Sector Stability. The second concerns the possible inclusion of further breakdowns in the annual CBD collection. Efforts are also ongoing to improve the data timeliness of CBD series.

Increased frequency/timeliness and additional breakdowns would also provide an improved benchmark against which ad-hoc data collection exercises initiated by the decision making bodies of the ECB (or possibly the ESRB in the future) can be evaluated, or could even reduce the need for such resource intensive ad-hoc exercises.

The semi-annual CBD sub dataset will encompass profitability and efficiency indicators, balance sheet indicators relating to banks' funding sources, loan portfolio and non-performing loan developments as well as solvency indicators. The first semi-annual CBD data collection is scheduled to take place in the second half of 2010.

Referring to the second short-term enhancement, a fact finding exercise took place with National Central Banks and National Supervisory Authorities on the feasibility of incorporating additional breakdowns within the annual CBD dataset. The envisaged more granular breakdowns included counterparty sector breakdowns for balance sheet items and non-performing loans, counterparty geographical breakdowns, maturity breakdowns and derivative exposures. The results of the stock-taking exercise were not homogeneous, as some envisaged areas of improvement appear to be more promising than others. It also emerged that several of the additional breakdowns will become available as of 1 January 2012, subject to national adoption of the revised FINREP (such as counterparty sector breakdowns of loans and receivables). Also taking this into consideration, no firm timeline has yet been established for the final implementation of this enhancement. In order to satisfy user needs, this and further enhancements to the CBD are necessary (see Section 4).

In particular, as explained in the section below, the enhancement of the frequency and granularity of the CBD should be accompanied by further statistical work on LBIGs.[12]

Moreover, the CBD may soon need to be amended again, as COREP rev. 2. is likely to be replaced by an enhanced version (rev. 3) which is currently subject to a public consultation. COREP rev.3 will be mandatory in all EU countries from end-2012.

Conversely, the application of the FINREP framework may remain non-mandatory. However, the CEBS highly recommends its use, in order to achieve its twin goals of harmonisation and reduction of the reporting burden. The FINREP framework is made up of a set of tables or "templates", divided into two sections which contain "core" and "non-core" quantitative

[12] See also Box 2.2 in the IMF Global Financial Stability Review (April 2010) www.imf.org/external/pubs/ft/gfsr/2010/01/pdf

financial information respectively. National authorities that decide to apply the FINREP framework must, at the minimum, require institutions to report all the core information, which comprises the consolidated balance sheet and the consolidated income statement. Non-core information includes additional data such as the geographical distribution of assets and liabilities and the sectoral breakdown of assets.

Section 3: Definition of Large Banking and Insurance Groups

Whereas the provision within the CBD of core data on the overall banking sector broken down by size is an important backbone of macro-prudential analysis, a considerably more granular dataset is needed to analyse systemically relevant institutions and their interlinkages. In particular, data on large financial institutions on a (consolidated) group basis are a key input to financial stability analysis, not least to assess the transmission of systemic risks within the financial system, including possibly via stress tests.

Systemic risk analysis for the LBIGs entails the use of detailed data to develop measures of leverage, portfolio liquidity and risk concentrations among financial institutions, correlation among asset holdings, interconnectedness of institutions among each other, large exposures to other financial institutions and sectors (including via off-balance sheet vehicles, credit lines and other contingent liabilities) as well as relevant positions in derivatives markets, large FX transactions and open FX positions.

Information on the portfolio holdings of institutions in the financial sector is key.[13] Focusing on the banking sector, detailed credit exposure data (e.g. exposures to non-financial corporations broken down by country and sector) are needed to assess how negative developments in a specific sector or country can spread to financial institutions. Information on interconnectedness is another challenge due to confidentiality issues and a borderline with micro-prudential supervision.

Also regarding common exposures among financial institutions, there is a growing consensus on the need for institution-specific granular data in order to conduct systemic risk analysis. Only in this way is it possible to identify dislocations and growing imbalances that are the key sources of risks and vulnerabilities at the systemic level and arrive at meaningful policy conclusions, as for example the definition of groups of connected clients for refinancing-related risks.

Quantitative evidence for large financial institutions is potentially already available from their public data disclosure, and from the derived commercial data sources. Public data disclosure in recent years (in particular in response to the current financial crisis) has improved and the harmonisation of accounting standards has enhanced the comparability of data across institutions. Nevertheless, data from public disclosures are not straight-forward to collect and are often not fully comparable across institutions. In addition, public disclosures lack sufficient details about, for example, liquidity and solvency positions, and they do not contain sufficient information about institutions' different exposures to form a complete assessment.

All in all, in order to overcome the current data drawbacks, reliance on public disclosure is no longer sufficient and, thus, accurate and timely information may need to be reported by large financial institutions.

[13] Detailed securities holding statistics (as envisaged by the ECB) would contribute to assessing correlations in financial intermediaries' portfolios, common exposures to specific asset classes, as well as liquidity-related aspects.

Hence, given the users' needs and the drawbacks of the available data sources, there is a need for a more formal approach in order to develop and compile harmonised datasets for large financial institutions. Such datasets will be required, among others, to analyse financial interlinkages and potential risk spillovers at the EU level and beyond.

An important prerequisite for the development of such statistics is a definition of the reporting population of large financial groups. This definition of LBIGs is needed in order to work towards a detailed register of banking and insurance groups in the euro area, which would form the basis for developing, for example, detailed securities holdings and securities issuance statistics.

Systemically important financial institutions are important for financial stability not simply because they are large, but because the nature of their business is such that their failure and inability to operate would most likely have adverse implications for financial intermediation, the smooth functioning of financial markets or other financial institutions operating within the system, and indirectly on the real economy.

Various definitions of systemically relevant institutions are actually possible.[14] Size, interconnectedness and substitutability are usually the three main dimensions according to which systemic relevance is measured.[15]

As a matter of priority, the ECB is currently focusing on LBIGs, while statistical definitions of other types of financial institutions (such as pension funds) would only be developed if and when users express a need for corresponding data.

For defining "banking groups" and "insurance groups" in the euro area, the following criteria might be followed:

- The definition of a "banking group" for statistical purposes should be based on the Capital Requirements Directive, in particular Directive 2006/48 on the taking-up and pursuit of the business of credit institutions. In broad terms, a "***banking group***" *shall mean a [euro area] resident parent credit institution and all its subsidiaries and branches or a [euro area] resident parent financial holding company and all its subsidiaries and branches provided that in both cases the parent is a head of the banking group*.
- The definition of an "***insurance group***" for statistical purposes should be based on the regulatory legislation for insurance undertakings, namely on Directive 98/78/EC (as amended), which is in force until 1 November 2012, and subsequently on Directive 2009/138/EC of the European Parliament and of the Council on the taking-up and pursuit of the business of Insurance and Reinsurance ("Solvency II") which shall be implemented by the Member States by 31 October 2012. The structure of the definition based on these Directives resembles the definition of the banking group to the extent possible. In broad terms, an "***insurance group***" *would mean a [euro area] resident parent insurance (or reinsurance, or holding, or captive (re)insurance undertaking) and all its subsidiaries and branches, provided that the parent is not a subsidiary undertaking of another [euro area] resident parent insurance (or reinsurance/holding/captive) undertaking.*
- For the purposes of the above statistical definitions of banking groups and insurance groups, an entity without any subsidiary would be deemed by convention to constitute a group in its own right, provided that the entity is not a subsidiary itself.

---

[14] See for example www.financialstabilityboard.org/publications/r_091107d.pdf

[15] On the specific issue of moral hazard posed by systemically relevant institutions, see: http://www.financialstabilityboard.org/publications/r_100627b.pdf

- Moreover, so-called "*truncated groups*" (i.e. groups whose parent is resident outside the EU) are excluded from the scope of the above definitions. The amended EU Council Regulation 2533/98 allows the ECB to impose reporting obligations on heads of the banking/insurance groups resident in the euro area, where the head could be either a credit institution or an insurance company or a financial holding company (as defined in the Capital Requirements Directive). However, reporting requirements cannot be addressed to banking and insurance groups headquartered outside the euro area. The ESRB legal acts should allow the collection of data from groups headquartered in the EU. However, groups headquartered outside the EU, but with significant business in the EU, are excluded from the scope of the above definitions. Relevant data for such groups would need to be collected from other sources.

Once having defined banking and insurance groups, a total asset threshold value might be tentatively used for defining "large" banking groups and "large" insurance groups. The thresholds should aim to provide a good balance between minimising the reporting burden and at the same time limiting the risk of excluding relevant groups from the sample. A smaller sample of insurers than banks can be selected due to the overall smaller size, different business nature and higher concentration in the insurance sector. Tentatively, the objective might be to identify a reference population of around 100 banks and 50 insurers headquartered in the euro area. Such a reference population would cover around 71% of the total euro area banking sector consolidated assets and around 90% of the total euro area insurance sector consolidated assets. A full impact assessment and cost/benefit analysis need to be undertaken in order to fine-tune these thresholds.

Indicators of complexity and interconnectedness are tentatively excluded from the above definitions. This is mainly because creating a list of large and complex banking and insurance groups that would be made public raises the risk that the institutions on such lists would be interpreted as the institutions that the ECB considers to be "systemically important" and "too-big-to-fail". This, in turn, could give rise to moral hazard issues as the institutions themselves or investors might assume that these institutions would receive support from governments and/or the ECB and National Central Banks if they were to face difficulties. Moreover, since size is anyway a good proxy for complexity, setting the thresholds at a relatively low level ensures that most "complex" groups are also covered. Identifying large banks and insurers based on a simple threshold value is also more transparent since it makes it easier for institutions to identify themselves as "large" and the data are readily available.

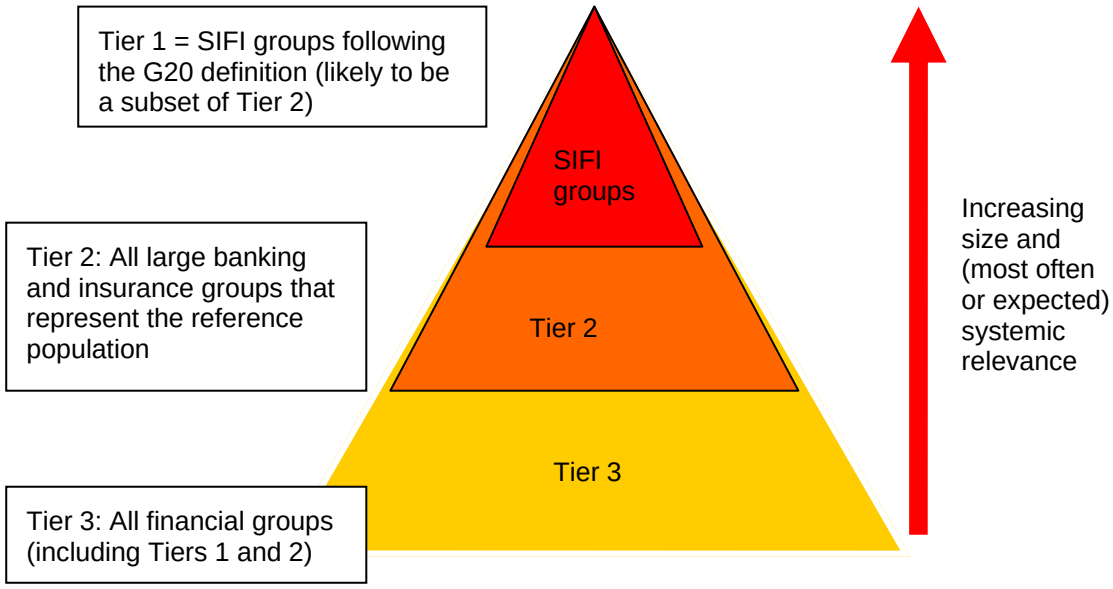
The different sets of banking and insurance groups might then be split into a three-tier ranking of importance (see Figure 1 below).

Tier 3 covers all banking and insurance groups, including Tiers 1 and 2. Tier 2 represents the population of large banking groups and insurance groups that would represent the reference reporting population for financial stability analysis. Tier 1, comprising "systemically important financial institutions" (SIFIs) which adopt the terminology used by the G20,[16] is likely to be a subset of Tier 2. SIFI groups would be identified internally by users. While the list of around 100 large banking groups and 50 large insurance groups (Tier 2) would obviously be known for reporting purposes, the list of SIFI groups would not, due to moral hazard issues.

[16] http://www.financialstabilityboard.org/publications/r_091107c.pdf

Figure 1

Three-tier approach for data on banking and insurance groups



Section 4: Current and future challenges

Ideally a satisfactory statistical basis for macro-prudential policy should comprise the evolution of both the aggregate risk of the consolidated financial system over time and the network risk operating across and between institutions at any point in time.

The focus of this paper has been on improving, in the short term, the consolidated data for the banking sector and on how to adequately define LBIGs in order to construct granular statistics for those institutions.

In the longer term, a number of further aspects will need to be taken into account. This concerns first the need to develop a more detailed and harmonised reporting scheme to serve financial stability analysis.

As already mentioned, an important step in this direction will be the introduction of the new common supervisory information framework in the EU as foreseen to be available in late 2012. The revised FINREP and COREP (and for the latter its mandatory application in the EU) already represent a good opportunity to expand and enhance these datasets, and the possibly additional data from FINREP and COREP items might be useful to increase the coverage of information for the list of indicators in the CBD and also for additional information for the LBIGs. For instance, the more granular geographical and sectoral breakdowns of exposures presented in the non-core tables of FINREP could provide the statistical basis for

a more detailed and in-depth analysis of the challenges posed to stability by different kinds of risks.[17]

Another challenge is the collection of data under a harmonised consolidation approach. While data collected under the FINREP/COREP framework will follow the CRD consolidation approach, which excludes insurance companies, it will be important to collect additional information under the broader IFRS scope of consolidation (which includes insurance companies). Reconciliation between the CRD and IFRS scope of consolidation would be useful, in particular when banking groups hold significant participation in insurance companies or, vice versa, when insurance groups hold significant participation in banking groups.

A further challenge concerning in particular FINREP data is that many of the envisaged granular breakdowns of assets may not be available (since the application of FINREP at national level is not mandatory and the CEBS reporting schemes are designed to serve mainly micro supervisory requirements). The missing data might be proxied at least in the short run by using alternative sources, keeping in mind methodological differences. Country and currency breakdowns of assets may be derived from ESCB MFI Balance Sheet Statistics (as set up for monetary policy purposes)[18] or from the BIS International Banking Statistics (both on a locational and consolidated basis).[19] The latter allow a breakdown of banks' exposures (on both the asset and liability side) by original and residual maturity to monitor banks' liquidity situation and potential maturity mismatches. In the longer run, however, and depending on the quality of these proxies, data for large financial groups might need to be collected directly.

Finally, in view of further needs for systemic risk analysis and for a complete coverage of the financial system, financial intermediation (on- and off-balance sheet) taking place outside the traditional banking system (so called shadow banking system) needs to be covered as well. It could become pressing to have information on the non-bank financial sector including insurance corporations, hedge funds, investment funds, SIVs, securitisation vehicles, private equity funds and securities dealers. In this respect, however, existing statistical and supervisory data in the euro area might already give a relatively good and reliable picture of non-bank financial intermediaries' activity, at both euro area and EU level. For instance, forthcoming ECB statistics on Financial Vehicle Corporations as well as COREP securitisation data may shed some light on the shadow banking system. Before considering the creation of a new data collection, a detailed stock-taking to identify which datasets are available and which aspects of systemic risks they might cover might be necessary.

In addition, in a global world, financial intermediation is taking place worldwide and non-bank financial intermediaries are often placed outside the euro area, increasing the need for a global harmonised approach.

In conclusion, the two frameworks FINREP and COREP developed by the CEBS would represent a key framework to structure the requested information for macro-prudential analysis regarding the banking sector. In particular, the uniform and mandatory application of COREP (hopefully to be extended to FINREP) in the European Union will contribute to improving the assessment of profitability, capital requirements for the risks faced by the

---

[17] The ECB and the CEBS, via the so called Joint Expert Group on Reconciliation of credit institutions' statistical and supervisory reporting requirements (JEGR), are working to harmonise the definitions in statistical and supervisory data requirements for banks. This work aims at reducing the reporting burden, improving data consistency and identifying additional uses of the data. See http://www.ecb.europa.eu/press/pr/date/2010/html/pr100217.en.html

[18] See www.ecb.europa.eu/stats/money/aggregates/aggr/html/index.en.html

[19] See www.bis.org/statistics/consstats.htm

European banking system. Moreover, the definition of LBIGs will serve as reference to formulate further data requirements for institutions which are potentially systemically relevant. Still, several challenges need to be addressed in order to develop a robust and harmonised data collection system capable of satisfying the information needs of users.

References

Agresti A., Baudino P., and Poloni P. (2008) "The ECB and IMF indicators of financial stability for the financial sector: a comparison of the two approaches", ECB Occasional Paper n. 99 http://www.ecb.europa.eu/pub/pdf/scpops/ecbocp99.pdf

Bier W. (2009), "Data Requirement and Improvements necessary for assessing the health of systemically important financial institutions", IMF-FSB Users conference, held in Washington DC on 8 and 9 July 2009.
http://www.imf.org/external/np/seminars/eng/2009/usersconf/pdf/Bier.pdf

Committee of European Banking Supervisors (2009), "Guidelines for implementation of the consolidated Financial Reporting framework (FINREP or "the framework") for supervisory purposes"
http://www.c-ebs.org/documents/Publications/Standards---Guidelines/2009/FINREPrev2/FINREPrev2-instructions.aspx

Committee of European Banking Supervisors (2010), "CEBS consultation on its proposed amendments to the Guidelines on Common Reporting (COREP)", June 2010
http://www.c-ebs.org/Publications/Consultation-Papers/All-consultations/CP01-CP10/CP04-Revised-2.aspx

De Larosière Group (2009), "The High Level Group on Financial Supervision in the EU – Report", http://ec.europa.eu/internal_market/finances/docs/de_larosiere_report_en.pdf

European Central Bank (2005a) "Measuring challenges in assessing financial stability", *Financial Stability Review*, December

European Central Bank (2005b) *Large EU banks' exposure to hedge funds*, November

European Central Bank (2005c) "Assessing financial stability: conceptual boundaries and challenges", *Financial Stability Review*, June

European Central Bank (2006) "Identifying large and complex banking groups for financial system stability assessment", *Financial Stability Review*, December

European Central Bank (2009): EU banking sector stability report, August 2009
www.ecb.de/pub/pdf/other/eubankingsectorstability2009en.pdf

European Central Bank (2010), "New classification system between the reporting frameworks of the ECB and CEBS", February 2010
http://www.ecb.int/press/pr/date/2010/html/pr100217.en.html

Financial Stability Board (2009) "The Financial Crisis and Information Gap", Report to the G-20 Finance Ministers and Central Banks Governors.
http://www.financialstabilityboard.org/publications/r_091107e.pdf

Financial Stability Board (2010a) "Reducing the moral hazard posed by systemically important financial institutions"
http://www.financialstabilityboard.org/publications/r_100627b.pdf

Financial Stability Board (2010b) "The Financial Crisis and Information Gap – Progress report – Action plan and timetables", Report to the G-20 Finance Ministers and Central Banks Governors. http://www.financialstabilityboard.org/publications/r_100510.pdf

International Monetary Fund (2006): *Financial soundness indicators. Compilation Guide*

International Monetary Fund (2010): Global Financial Stability Review (April 2010) www.imf.org/external/pubs/ft/gfsr/2010/01/pdf

Mörttinen L., Poloni P., Sandars P. and Vesala J. (2005) "Analysing banking sector conditions. How to use Macro-prudential indicators", ECB Occasional Paper no. 26

Poloni, P. and Sandars, P. (2005) "A comparison of the main features of accounting and statistical standards and review of the latest developments in the field of accounting standards", Irving Fischer Committee Bulletin no. 22, September

Data gaps in the UK financial sector: some lessons learned from the recent crisis

Gareth Murphy and Robert Westwood[1]

Introduction

The financial crisis has changed the relationship between national authorities (be they finance ministries, central banks or supervisors) and the financial system. Around the world, various financial reforms are being considered. In the UK, the Bank of England ("the Bank") has set out in detail its views on financial reform, which include (a) capital adequacy, (b) powers of resolution and (c) the structure of the financial system.[2] Central to these endeavours is a process of monitoring the financial system, measuring its progress and steering its direction. Informed by the recent financial crisis, this paper looks not only at the many data gaps identified but also at deficiencies in the framework for collecting data.

The Bank has considerable responsibility for safeguarding the UK financial system. In particular, the Bank is the lender of last resort to banks which are solvent but in need of liquidity, and it monitors possible risks to the UK financial system, producing half-yearly *Financial Stability Reports*. The Banking Act 2009 gave the Bank powers to "resolve" distressed deposit-takers, and responsibility for oversight of the payments systems. Over the course of the last decade, its powers of data collection have not been commensurate with all of these responsibilities.

The Bank of England Act 1998 gave the Bank the power to set the official interest rate to deliver inflation close to the target set by the government. Crucially, given the purpose of this paper, it empowered the Bank to collect data – but only for monetary policy purposes. Recent announcements[3] have paved the way for the Bank also to exercise macroprudential control over the UK financial system, and will make the Bank responsible for microprudential regulation through its new subsidiary, the Prudential Regulation Authority.[4] The precise data set that will inform macroprudential decisions has yet to be fully scoped.[5] The government is

---

[1] Not for publication without express permission. We would like to acknowledge the assistance of Niki Anderson, Dave England, Glenn Hoggarth, Mark Manning, Mark Robson, Stephen Sabine, Sally Srinivasan and Nicola Worrow in the preparation of this paper. All errors and omissions are the sole responsibility of the authors. The opinions expressed in this paper are those of the authors and do not necessarily represent those of the Bank of England or its Monetary Policy Committee.

[2] See, for example, "Too important to fail – too important to ignore", House of Commons Treasury Committee, *Ninth Report of Session 2009-10*, Volume II, Question 94, available at: http://www.publications.parliament.uk/pa/cm200910/cmselect/cmtreasy/261/261ii.pdf.

[3] See the Mansion House speech of the Rt Hon. George Osborne MP, UK Chancellor of the Exchequer, at: http://www.hm-treasury.gov.uk/press_12_10.htm.

[4] This is the temporary name for those functions of the UK Financial Services Authority that are being transferred to the Bank.

[5] Though a recent Bank discussion paper identifies some of the data required. See tables 4.1 and 5.1 of "The role of macroprudential policy: A discussion paper". Available at: http://www.bankofengland.co.uk/publications/other/financialstability/roleofmacroprudentialpolicy091121.pdf.

currently consulting on the precise nature of the institutional arrangements for financial regulation in the UK, and the outcome of this will affect the collection of financial data.[6]

1. Principles underlying data collection

Oversight of the UK financial system must be informed by analysis that is underpinned by reliable data gathered within a coherent statistical framework. Tarullo (2010) enunciates some principles for financial sector data collection.[7] These can be summarised as follows:

1. Data must meet the needs of the regulatory or supervisory function. In particular, this means timely, precise and comprehensive data.
2. Data collection must be user-driven. To be effective, this must mean that statistics collection and financial system oversight must fall under the same governance structure. This will ensure a strong two-way dialogue between users and producers where costs and benefits are evaluated under the same roof.
3. There must be greater standardisation of data. Again, this must be driven through an intense dialogue between the users who understand conceptually what they are trying to measure and the producers who are charged with interrogating the suppliers of the data and validating the returns.
4. Fourth, the data collected and the associated reporting standards and protocols should enable better risk management by the institutions themselves and foster greater market discipline by investors.
5. Fifth, data collection must be nimble, flexible, and statistically coherent so as to adapt to the rapid pace of financial innovation.
6. Sixth, there must be a framework and powers to transmit the data to other supervisory agencies. This is not trivial: it involves inter-agency co-ordination and legislation defining what can (and cannot) be transmitted, in what form and to whom.
7. Finally, any data collection and analysis effort must be attentive to its international dimensions. We discuss these and related issues in more detail in section 3.

On reflection, these principles are suggestive of an organisational framework for data collection and data usage. In particular, Tarullo's second principle puts the statistics function under the same roof as the regulators and supervisors. He summarises it thus: "The most desirable feature of collection and analysis under the existing setup is that it satisfies the principle that data collection and analysis should serve the end users, the regulatory agencies." And for good reason: the collection of statistics is a resource-intensive activity. Equally, the consequences of gathering incomplete, inaccurate or unreliable data can be disastrous as they can stymie decisive policy action in a crisis. This is not a trivial issue, as in many jurisdictions data collection and supervisory usage of the data are currently undertaken by different agencies, sometimes pursuing different objectives.

As section 3 makes clear, there may also be an additional set of parameters circumscribing the collection of financial data. At the national level, there is likely to be a National Accounts

---

[6] See "A new approach to financial regulation: judgement, focus and stability", HM Treasury, 26 July 2010, at: http://www.hm-treasury.gov.uk/consult_financial_regulation.htm.

[7] See Tarullo, D, "Equipping financial regulators with the tools necessary to monitor systemic risk", testimony before the US Senate Subcommittee on Security and International Trade and Finance, Committee on Banking, Housing, and Urban Affairs, February 2010.

framework of which financial data are a subset and which would be the basis, for example, for building a national flow of funds model. At the international level, bodies like the Bank for International Settlements and Eurostat gather and publish data that must be comparable across countries.

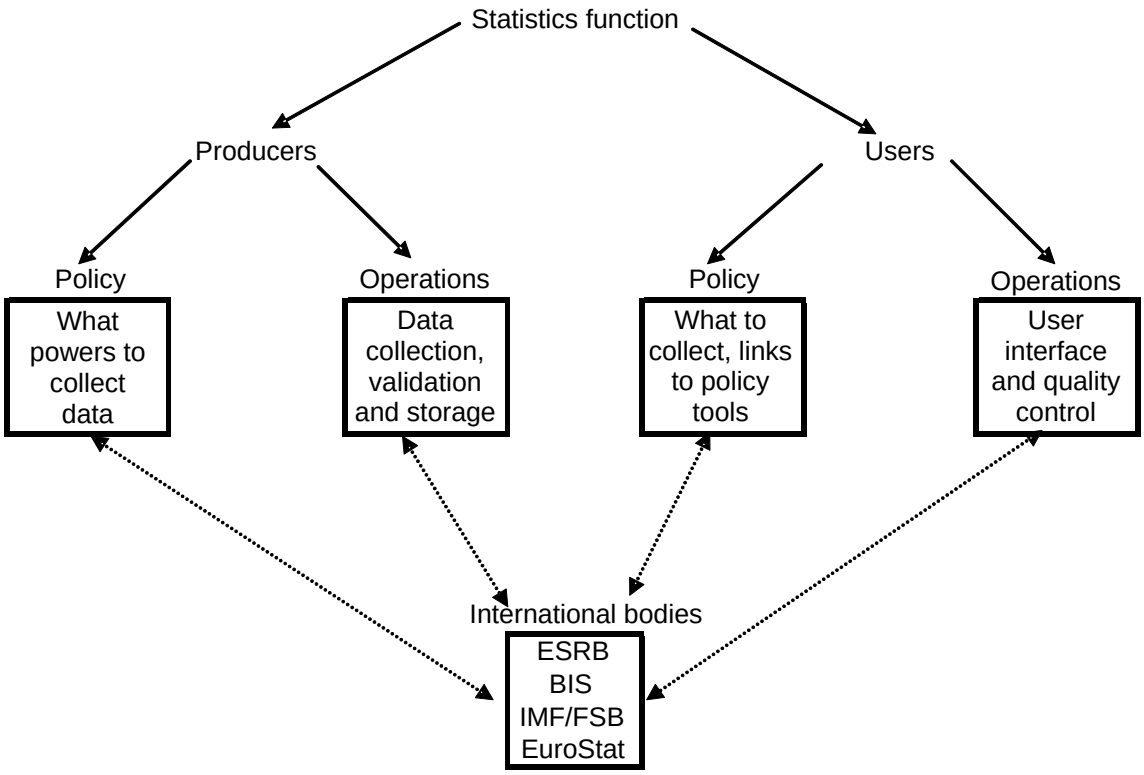
Organising data collection

In thinking about the task of gathering data for financial stability purposes, it is helpful to think in terms of an organisational framework like that depicted in Chart 1. This approach could be applied to any statistical function which gathers economic data.

Statistics collection must meet the interests of both *users* (those who will use the data) and *producers* (those who collect the data). The activity of each of these groups can be split into two sets of issues: *operational* and *policy*. Operational issues refer to how data are collected, stored, transmitted, formatted and accessed. Policy issues refer to what precisely needs to be collected, whether the cost of collection can be justified, from whom and to whom it can be transmitted. It may also ensure that the data produced conform to a system of data collection used by other collectors – section 3 discusses the role of the United Nations (UN) System of National Accounts (SNA). In addition, the international backdrop will dictate a parallel agenda that will bring its own benefits and burdens.

Chart 1

An organisational framework for data collection



The logic of this framework will become apparent during the course of this paper as we ask the key questions: (i) what ("analysis"), (ii) how ("powers"), (iii) where ("source") and (iv) to whom ("destination")?

In section 2, we motivate the question of data collection from a *user* perspective by looking at some of the questions that challenged UK policymakers during the crisis and the data gaps

that were exposed. In section 3, we explore the process of *producing* data. It is apparent from sections 2 and 3 that there are different mindsets between producers and users, which must be married under a common purpose. This should help emphasise the value of proper governance to ensure that there is an alignment of interest between all stakeholders. We have deliberately written this paper from two viewpoints – reflecting our respective backgrounds – so as to emphasise the difference between producers and users in the arena of financial statistics. Section 4 draws these two aspects together in the context of the emerging domestic and international financial stability agendas.

2. What were the main questions and data gaps that arose during the crisis?

As a starting point, policymakers and supervisors are users of data. A simple way to motivate the discussion of what gaps were uncovered during the crisis is to track a timeline of the crisis events and identify the key questions that arose at each point in time. It should be stressed that this is a device to motivate the issue of what data gaps might be relevant and when. In reality, many different questions were being tackled during the course of the crisis.

The crisis has been attributed to global macroeconomic imbalances, loose monetary policy and excessive credit provision to the real economy supported by rampant and sometimes reckless financial innovation. The years preceding 2006 were characterised by a build-up of financial imbalances. The subsequent period can be split into six phases (see chart 2):

1. ***US sub-prime crisis:*** US house prices started to decline in 2006 Q3, and many sub-prime borrowers fell into arrears on their mortgages after the expiry of teaser rates led to a dramatic rise in arrears and delinquencies.

2. ***Loss of market confidence:*** The crisis intensified during the middle of 2007 (Q2 and Q3) as hedge funds and various structured investment vehicles started to encounter problems in valuing assets and funding their balance sheets. Key events in this phase were the failure of two Bear Stearns hedge funds invested in sub-prime assets, the suspension of redemptions of investment funds run by BNP Paribas, and the bailouts of Sachsen Bank in Germany and Northern Rock in the UK.

3. ***Crisis develops:*** From 2007 Q4 to 2008 Q2, there was a steady stream of announcements declaring sub-prime lenders bankrupt, and financial institutions started to suffer substantial write-downs on their securitisation holdings. Concerns were being raised over the solvency of certain banks and funding in unsecured money markets shortened. The key event in this phase was the bailout of Bear Stearns. More importantly, the flow of credit to the real economy started to slow down, creating an adverse feedback loop between the financial sector and the real economy.

4. ***Panic of autumn 2008:*** The crisis peaked during 2008 Q3-Q4 with the conservatorship of the US Government-Sponsored Entities (GSEs),[8] the bankruptcy of Lehman Brothers and the bailout of American International Group (AIG). In the following weeks, governments around the world announced a range of measures to support certain financial markets and financial institutions. Policy rates were cut dramatically.

[8] Federal National Mortgage Association ("Fannie Mae") and Federal Home Loan Mortgage Corporation ("Freddie Mac").

5. ***Global recession:*** Global growth declined dramatically during 2008 Q4 and remained in negative territory for most G20 countries until 2009 Q1.

6. ***Focus shifts to public sector balance sheets:*** From early 2009, the markets started to focus on the fiscal consequences of the financial crisis and global recession. Sovereign credit default swap (CDS) spreads widened. This culminated in April 2010 in the creation of International Monetary Fund (IMF)/eurozone facilities.

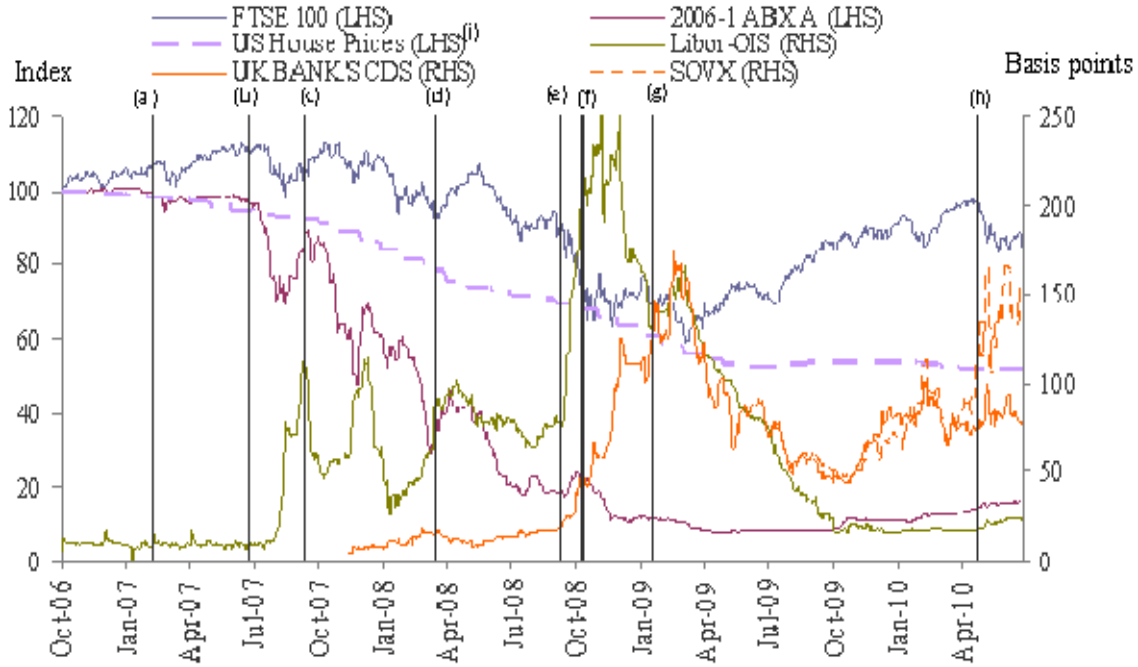
Box 1 identifies a series of data-related questions that arose with each phase of the crisis. The complexity of the task undertaken by the Bank and by other financial authorities is evident. This task is formidable for three reasons: (1) supervision, regulation and resolution are largely local in nature, but many systemic financial institutions are complex multinational groups; (2) the financial sector comprises many institutions with dynamic and/or opaque business models, evolving faster than authorities can adapt – in particular, the shadow banking system has extended the landscape that supervisors may need to cover; and (3) imbalances in different parts of the global economy have ramifications far and wide.

Box 1

A chronology of analytical questions

Chart 2

Timeline of the crisis



Key events on the timeline:

(a) HSBC announces substantial provisions due to expected losses on households.

(b) Bear Sterns bails out two hedge funds.

(c) Northern Rock bailed out

(d) JPMorgan buys Bear Stearns.

(e) GSEs put into conservatorship, Lehman fails and AIG bailed out

(f) 1st bank bailout packages

(g) 2nd bank bailout packages

(h) 1st Greek bailout package

(i) This index is based on the worst-performing states mentioned in Michael Lewis' "The Big Short" chronicle of the US sub-prime crisis.

Sources: Bloomberg, Datastream, Bank of England calculations.

Table 1

Financial crisis: key stages, questions and data gaps

Event	Question
1. US sub-prime crisis	• What is the importance of the sell-off in US house prices?
2. Loss of market confidence	• Does the US sub-prime mortgage market matter?
	• Who is affected by the breakdown in securitisation markets?
3. Crisis develops	• Who is lending to the banks?
	• Are there other banks like Northern Rock around and how do we spot them?
	• Does Bear Stearns matter? Are there other banks like Bear Stearns around?
	• How big are banks' exposures to sub-prime and other securitisations?
	• How good are banks' household and commercial property loan assets?
	• How do we stress test these?
4. Panic of autumn 2008	• Why are Libor-OIS spreads so wide and do they matter?
	• Does the widening in UK sovereign CDS spreads matter?
	• Why are capital markets shut?
	• Do the GSEs matter?
	• Does Lehman Brothers matter?
	• How much capital do banks need?
5. Global recession	• How much is needed in loan guarantees?
	• How much asset insurance is needed?
	• What should the banking system look like?
	• How do we implement macroprudential policies?
	• Can we improve microprudential supervision?
6. Focus shifts to public sector balance sheets	• How to interpret the widening of sovereign CDS spreads of Greece, Portugal, Ireland and Spain?

Lastly, the role of contagion in the financial crisis greatly expands the range of data that might be relevant to assessing the implications of various events which took place during the financial crisis.[9] Contagion is partly the result of uncertainty due to a lack of information or the lack of a framework to process information, or – to paraphrase a former US Defence Secretary – known unknowns and unknown unknowns. As an example, the price falls on collateralised debt obligations (CDOs) of sub-prime mortgages issued originally with a AAA rating raised investors' concerns as to whether other AAA-rated structured finance securities – including prime residential mortgage-backed securities (RMBS) and even banks' covered

[9] See "Rethinking the Financial Network", Andrew Haldane, Executive Director for Financial Stability (2009), available at: http://www.bankofengland.co.uk/publications/speeches/2009/speech386.pdf.

bonds – were likely to suffer credit losses. Some of the questions raised were: How do CDOs work? To what extent are structured finance ratings specific to the structure? Are the ratings of different ratings agencies different because of the models they use? Is there "read-across" to other structured finance securities?

Underlying the high-level policy issues is a series of questions underpinning analysis of the potential answers:

- What data exist?
- Who has the data?
- Can the Bank be given the data?[10]
- Is the data set complete and well defined or does it require further manipulation?
- What assumptions underlie further manipulation of the data?
- Are the data reliable?
- Can the Bank publish the data in their current form or in some other (possibly aggregated) form?
- Can the Bank pass the data on to other agencies both within the UK and abroad?

These are the same recurring questions that have formed part of the Bank's internal stocktaking of data gaps in financial stability. This exercise has sought to learn from the crisis and set out an agenda for the future. In particular, it has highlighted the need to take advantage of institutions that naturally collect data, such as payment systems, clearing houses, futures and options exchanges and trade repositories. Implementation of the new regulatory arrangements in the UK presents a potentially unique opportunity to align the interests of data producers and data users and to ensure that the authorities can collect the relevant data.

Monitoring the broader financial system

The crisis started in the US sub-prime market and progressively infected the mainstream banking sector and the global real economy. It highlighted that focus on one part of the financial sector – such as regulated banks – runs the risk of missing the implications of the activities of other parts of the system. As Paul Tucker, the Bank's Deputy Governor for Financial Stability, observed at the beginning of 2010:[11] "The lesson … is to look at the economic substance, not the legal form" and "we need to think through how to avoid the problems of the past few years replicating themselves beyond the perimeter of the regulated banking sector". In making this remark, the "bank-like" functions of non-bank financial firms are highlighted. These economic functions include deposit-taking, provision of credit and maturity transformation: borrowing short to lend long. And some of these "non-bank" firms provide these banking functions using non-traditional technologies, such as securitisation of loan cash flows, structured investment products, and money market mutual funds, to name but a few. These technologies in turn rely on a host of other supporting markets such as repo

[10] During the crisis, the Bank was reliant on data collected by the Office for National Statistics (ONS), the Bank itself, the Financial Services Authority (FSA) and other international agencies. In these cases, the data were acquired pursuant to legal powers, such as the Bank of England Act 1998 and FSMA 2000. However, at certain junctures, individual institutions voluntarily provided particular information in order to facilitate the authorities' decision-making.

[11] "Shadow Banking, Financing Markets and Financial Stability", Paul Tucker, Deputy Governor, Financial Stability, January 2010. See http://www.bankofengland.co.uk/publications/speeches/2010/speech420.pdf.

markets, listed options and futures exchanges, OTC swaps and options … the list is potentially endless.

An *atlas* of financial risk

The challenge for regulatory authorities is to understand the flow of risk in the financial system. Pozsar et al (2010)[12] show how complex such a map can be for a national financial system. This is not just an exercise in constructing a single map of the financial system – would that it were so easy. In fact, we need an *atlas* comprised of maps containing the same regions, but whose interdependencies correspond to different types of risk, for example, term unsecured credit risk, term secured credit risk, currency risk and interest rate risk. Imagine that each page of the atlas might show the regions connected by a different mode of transport (or risk category: interest rate risk, credit risk, volatility risk, etc). And some pages of the atlas might show certain regions in greater detail (sub-sectors) or lying on tectonic plates (vulnerable institutions). Piecing all the countries together and representing multinational financial institutions (which operate across borders as branches and/or subsidiaries under one corporate umbrella) poses yet another challenge. Regulators and supervisors are conscious of the complications arising from the international dimension; indeed, Cecchetti et al (2010) assert that "global risk maps are the holy grail of systemic risk monitoring".[13]

This atlas is ever evolving. Unlike natural atlases, the pace of evolution is rapid and reflects genuine innovation in finance, but also firms' efforts to arbitrage regulatory and tax regimes. Firm-level data could be supplemented through the monitoring of transaction flows from exchanges, clearing systems and trade repositories.

3. A central bank statistician's perspective on the practicalities of implementing a new data collection

Between the identification of data gaps and the filling of those gaps, a significant endeavour must be undertaken. The necessary steps are outlined in broadly the order in which they need to be taken, although in reality many of them would be implemented concurrently.

Understanding what users want, and from whom

Once the user has determined the concept to be measured, the typical starting point for the discussion with the statistics compiler will be to establish in general terms the quality of the statistics required. This will include discussion of the various dimensions of quality, including:

- accuracy: how close do the statistics need to be to the (unobservable) true values – eg how much, if any, sampling error can be tolerated;
- coherence: how reliably can they be combined with related statistics to produce useful products, ratios, etc;
- reliability: how close do the initial estimates need to be to later or "settled" estimates of the data; timeliness: what is the optimal length of time between the availability of the statistic and the end of the period in which the activity measured took place; and

[12] See Pozsar, Z, Adrian, T, Ashcraft, A, and Boesky, H (2010), "Shadow Banking", *FRBNY Staff Report No. 458, 2010*.

[13] See Cecchetti, S, Fender, I, and Mcguire, P (2010), "Toward a global risk map", *BIS Working Papers, No. 309*.

- at what frequency do the statistics need to be available?

Other key considerations include identifying the universe (the sampling frame) of potential reporters, and making an initial assessment of the likelihood that the reporters' financial reporting systems will capture the data required to meet the quality requirements.

Under what powers can the data be collected and shared?

Typically, statistics compilers' powers to gather and disseminate data will be legally defined. For the Bank they are set out in the Bank of England Act 1998 and supplemented by the Banking Act 2009.[14] The current position is that these powers permit the Bank to collect data for monetary policy purposes, to fulfil its own regulatory responsibilities, and to disclose to certain institutions information it thinks relevant to the financial stability of individual financial institutions, or one or more aspects of the financial systems of the UK.

Is there an overarching framework of concepts and classifications within which the new data will sit?

A key question when introducing a new data collection is whether it is intended that the new collection will sit within – or articulate with – an overarching framework of concepts and classifications. If this is the case, the natural starting point when viewed through the lens of the Bank's monetary and financial statistics division, whose Code of Practice commits it to compile statistics in accordance with internationally recognised standards,[15] would be those set out in the UN System of National Accounts[16] and the associated international statistical Standards and Manuals.[17] The advantage of this approach is that the statistics compiled would then have a number of desirable characteristics for any user attempting to tackle the types of questions discussed in Section 2, including:

- international compatibility;
- consistency of concepts across different parts of the framework (eg stocks, flows and associated income) to allow combinations that produce analytically useful ratios; and
- concepts that are well established/fixed for long periods to allow the production of time series of sufficient length to permit analysis.

But it may be that for this particular exercise the data do not readily lend themselves to collection/compilation that is fully consistent with those concepts and classifications in the SNA and the associated Manuals and Standards. In these circumstances, there is a mechanism for the examination of areas of economic interest not covered in the central National Accounts but which retains key elements of the framework, through the use of satellite accounts. Satellite accounts are linked to, but distinct from, the central National

---

[14] See Appendix 2 of the Bank's Statistical *Code of Practice*, which contains extracts from legislation relevant to information powers and obligations (pp 43–50), available at the following link: http://www.bankofengland.co.uk/statistics/about/code.pdf.

[15] See Section 3.1 in the Bank of England's Statistical Code of Practice, available at: http://www.bankofengland.co.uk/statistics/about/code.pdf.

[16] Available at: http://unstats.un.org/unsd/nationalaccount/SNA2008.pdf.

[17] For example, the European System of Accounts 1995 and the Monetary and Financial Statistics Manual of the IMF, available at http://circa.europa.eu/irc/dsis/nfaccount/info/data/esa95/en/esa95en.htm and http://www.imf.org/external/pubs/ft/mfs/manual/index.htm, respectively.

Accounts. They therefore provide a framework for analysis that is linked to the central National Accounts framework that is itself the basis for much economic analysis.

Satellite accounts have been developed to address a variety of user needs; examples include health, tourism and unpaid household production. But it is perhaps the environmental satellite accounts in which this technique is most fully developed.[18] And to the extent that environmental satellite accounts aim to capture externalities, it has parallels with some of the discussion there has been of the financial crisis.[19]

Determining the reporting panel

Identifying potential reporters is key to any new data collection. The starting point will typically be to identify the sector/sub-sector of the economy from which the data are required and then to translate this into a group of specific institutional units using a business register. A business register is a list of businesses, usually populated using a combination of tax and other administrative data. It will typically contain information on each business in a given geographical location, covering dimensions such as Industrial Classification,[20] number of employees, turnover, legal status and country of ownership. The business register provides the basis for assembling the sampling frame, the universe from which the reporting panel will be drawn. For example, if the focus of the new data collection is an aspect of the activity of hedge funds, the register will provide a list of all hedge funds operating in the geographical location of interest together with information on each firm such as that outlined above.

Once the sampling frame has been assembled, the next step is to determine the reporting panel. In broad terms, the options run from a census approach, under which all of the members of the sampling frame report data, through top slicing and stratified sampling down to a simple random sample. The decision as to which of these approaches is taken will depend on a range of factors – some of which are discussed in more detail in Box 2 – and is ultimately likely to be determined through some form of cost-benefit exercise.

Applying cost-benefit principles

The quality – using this term in its broadest sense, to include most of the aspects of collecting and compiling statistics – of the new data collection is likely to be determined using some form of cost-benefit approach. The Bank has developed a framework for applying cost-benefit analysis to its monetary and financial statistics.[21] This framework provides the starting point for assessing new data requests (although it is likely that this framework will be reviewed in the light of the Bank's new micro/macroprudential responsibilities, the overarching principles could be expected to be retained). While this is not the place for a long

---

[18] The interim Integrated Environmental and Economic Accounts was published in 1993 and an updated version released in 2003: see http://unstats.un.org/unsd/envaccounting/seea.asp. Work is currently under way to revise this further with a view to publication in 2012.

[19] For example, see: "The $100 billion question", Andrew Haldane, Executive Director for Financial Stability, March 2010. Available at: http://www.bankofengland.co.uk/publications/speeches/2010/speech433.pdf.

[20] A number of different classifications are used throughout the world. In the UK there is the Standard Industrial Classification (SIC). The Nomenclature statistique des activités économiques dans la Communauté européenne (NACE) is the European standard. There is also the North American Industry Classification System (NAICS) and the International Standard Industrial Classification of All Economic Activities (ISIC), set by the UN.

[21] See "Cost-benefit analysis of monetary and financial statistics – a practical guide", available at: http://www.bankofengland.co.uk/statistics/about/cba.pdf.

description of the process, it might be helpful to draw out a few of the key components, for example:

- Estimating set-up and ongoing costs to reporters for various options for meeting users' needs, eg different levels of granularity for instrument/counterparty splits; or, if flows are required, are these gross flows or are the net flows derived from balance sheet levels acceptable?
- Estimating set-up and ongoing costs to the compiler.
- Estimating benefits to the user requesting the new collection, and to the wider user community.
- Combining estimated costs and benefits to inform the decision whether or not to go ahead with the new data request, and if the decision is to go ahead, to determine which option offers the largest net benefit.
- Establishing mechanisms for prompt response to ad hoc data requests.

In practice, specifying the costs and benefits of statistical collections in monetary terms has proved challenging. An alternative has been to focus on estimating *relative* costs and benefits, an exercise which has been completed for the Bank's existing statistical collection. A new data request would be placed into this context, the rationale being that if the proposed collection was shown to have relatively high benefits and low costs it would go ahead immediately, while if the exercise showed the proposed collection to have relatively low benefits and high costs it would be challenged and potentially revised – or, in the extreme, it may not go ahead at all.

Quality assurance in the early periods of a new data collection and in steady state

There are a number of challenges when attempting to ensure that the data reported and compiled in the early periods of any new collection are fit for their purpose, and some approaches for mitigating the associated risk. The key challenges include: (a) that reporters have not fully understood the reporting requirements, (b) that reporters' systems do not enable them to fully capture the dimensions of the data required (eg insufficient granularity[22] on counterpart or instrument), and (c) that the compiler does not have enough information reliably to assess the plausibility of reported data. Challenges (a) and (b) are best mitigated through good communications between compiler and reporter in the period leading up to the introduction of the new collection. For (c), an attempt can be made to use any associated data that are already reported in order to assess plausibility.

Once a new data collection has settled and the back-run and available vintages are sufficient, full data quality assurance can take place. The Bank has set out its approach to doing so in its *Data Quality Framework.*[23] This framework is designed to enable users of the monetary and financial statistics currently produced by the Bank to be better informed about the various dimensions of the quality of these data and could be expected to be applicable to data collected for macroprudential purposes. It discusses a range of data quality dimensions, including accuracy, coherence, frequency, reliability and timeliness.

---

[22] Increasing granularity raises issues of disclosure for statisticians, which may imply a review of publication policy and a reassessment of the boundary between "information" and "statistics."

[23] Available at: http://www.bankofengland.co.uk/statistics/about/dqf.pdf.

Australia – an example of a centralised data collector

Once data gaps have been identified and broad approaches to filling them have been agreed on, it is likely to be helpful when considering the detailed practicalities of collecting and compiling the data to consider examples of current good practice in the collection of financial sector data. One such example is Australia's adoption of a single data collection for statistical and regulatory purposes from the bulk of its financial corporations sector.[24] In 1997 the Wallis Committee of Inquiry into Australia's financial system recommended wide-ranging reforms. The Australian Federal Government accepted the Wallis Committee's proposals and by mid-1999 the necessary legislation had been put in place. One result that flowed from these changes was the development of an integrated framework for the collection of information. Prior to the introduction of the new framework, information for regulatory and statistical purposes was collected by a number of disparate agencies.[25]

After the introduction of the integrated framework a newly established agency – the Australian Prudential Regulation Authority (APRA) – assumed responsibility for collecting information from the bulk of the agencies mentioned above. However, the ABS maintained collections for entities not subject to APRA's prudential supervision. A key element in the project to develop the integrated framework was to review, harmonise and modernise the existing information collections from the agencies listed above. Central to this task was the establishment of the Tripartite Data Committee (TDC) – formed from representatives of the ABS, the APRA and the Reserve Bank of Australia (RBA) – which was responsible for reaching agreement on the single set of data items to be reported by each entity, and the underlying definitions applying to these data items. Determining the single set of data items and associated definitions required a number of steps to be followed. These are summarised below:

1. Deciding on the suite of returns required and the frequency at which each should be reported.
2. Settling on the individual data items to be collected on each return – as part of this process, an inventory was compiled of data items currently being collected; those that were duplicates or were collected but not used were discarded.
3. The quality of data currently reported was assessed.
4. For each data item collected, a single definition was agreed on.

---

[24] This single collection covers institutions holding more than 85% of the financial assets held by residents. The bulk of the residual is held by mutual funds and securitisation trusts and data from these is collected outside the single collection.

[25] These are summarised below:

- The Reserve Bank of Australia (RBA) and the Australian Bureau of Statistics (ABS) collected information from banks;
- The RBA and the states and territories collected data from other authorised deposit-taking institutions;
- The ABS collected information from mutual funds;
- The ABS collected information from institutions carrying out securitisations;
- The ABS and the Insurance and Superannuation Commission collected information from life offices;
- The Insurance and Superannuation Commission collected information from general insurers;
- Information from superannuation funds was collected quarterly by the ABS and annually by the Insurance and Superannuation Commission; and the ABS collected foreign investment from all types of financial institutions.

While some parts of this exercise were straightforward, others were found to be complex and time-consuming – in particular agreeing on some of the definitions – and involved extensive liaison with stakeholders from the reporting institutions.

Australia's integrated framework for the collection of information has now been in place for almost a decade and a number of benefits have been identified, including: consistency of standards and definitions has reduced asymmetries between financial corporation sub-sectors, as well as improving data quality more generally; data collected primarily to serve microprudential purposes can be reliably combined to produce aggregates that can be used at a macro level; benchmark data can be produced from defined peer groups, which can then be fed back to reporters to assist them with their own internal prudential analysis; and duplicate (or multiple) reporting of the same data items is prevented, therefore reducing the compliance burden on reporters. The data collection arrangements have been formalised in a Memorandum of Understanding which outlines the respective roles and responsibilities of the participants.

Tapping existing data sources

Good practice with regard to the use of existing data sources is also likely to repay study. Some examples of potential data sources are:

- trade repositories
- credit registers
- cheque and securities clearing systems
- stock, futures and options exchanges

For example, credit registers are databases that contain information on a number of different characteristics relating to both new lending and amounts of lending outstanding. Typically, these will include: amount drawn/undrawn on a facility, currency of denomination, maturity, type of instrument, whether the loan has a guarantee, and whether the loan is in arrears. They also contain information relating to borrowers, including: residency, address, National Accounts sector and, if applicable, SIC. Apart from Luxembourg, all of the EU countries have credit registers: there are 14 public credit registers and 22 private credit registers.[26]

While credit registers are potentially a rich source of information, a number of practical considerations need to be considered regarding their usefulness in the context of data gaps facing a macroprudential regime, including:

- The contents of credit registers can differ markedly between countries regarding the level of detail they contain about individual loans/borrowers, as well as thresholds for inclusion in the register.
- Some registers are set up on a loan-by-loan basis, whereas others are organised by borrower.
- The main purpose of credit registers is to facilitate the sharing of credit information within the financial system, especially among banks.
- The data in credit registers may be privately owned and therefore not automatically accessible to regulatory authorities without legislation.

[26] Based on Jentzch, N (2007), "Financial privacy: An international comparison of Credit Reporting Systems", Springer.

Box 2

Why are financial sector data different from other economic data?

The type of data we wish to gather, post-crisis, has greater scope and depth than what has been collected before. An exercise in constructing a financial risk atlas involves gathering data in at least four dimensions: which firms do we cover, who are they exposed to, what risk factors link the firms[27] and what are the maturities of the financial transactions? Owing to the dynamic nature of financial firms, the data must be gathered at a frequency which allows for an adequate understanding of the firm's business model. As firms are constituted as financial groups comprised of multiple entities in different countries, it can be a challenge getting aggregate or consolidated data at the firm/group level.

Tail risk

In financial risk assessment, the distribution of the data matters, especially the tail part of it. One aspect of systemic risk involves an assessment of the risk of contagion arising from the failure of a small firm. Simply sampling the population of firms may miss developments in the tail of the distribution. The crisis has taught that contagion effects can start with the failure of institutions on the periphery of a sector but it may not end there. So in many cases, assessing systemic and/or firm-specific risk will involve an almost census-like data collection effort. Collecting data from a near census is generally feasible for those sectors/sub-sectors of the economy where the sampling frame is relatively small – for example, in the UK, the MFI sampling frame currently consists of fewer than four hundred reporting entities. But for other sectors/sub-sectors with much larger sampling frames, census/near-census data collection is likely to be a very substantial task, particularly if the data are required at anything other than a low frequency.

Frequency of data

In times of financial stress, financial data are often required at a weekly or even daily frequency. Protocols should exist so that even if the data are not produced on this basis in a benign steady state, high-frequency data provision occurs at short notice in times of heightened supervision.

Dimensions of risk

Developments in modern finance mean that raw notional amounts are no longer sufficient to represent the various risks of financial products. Each financial instrument may be described by an array of risks which in turn may change with the market environment.

Understanding network risk and contagion risk

As is clear in Box 1, understanding the implications of a firm's failure (like Lehman Brothers) involves a detailed understanding of its interaction with other firms across a range of asset classes and risk categories. Drawing on examples from medicine and physical science, Haldane (2009) explains that this is a substantial undertaking.[28] The "atlas" analogy used earlier is useful here: each page of the atlas may depict the global network defined by a certain financial relationship, eg secured borrowing lines, unsecured borrowing lines, credit exposures governed by credit support annexes (CSAs), etc. The mechanism by which a shock (like the failure of a firm) is transmitted throughout the network may depend on how that firm is linked to the rest of the financial network and what are the dynamics of these contracts (network links) in times of stress. For example, in the case of AIG, the effect of CSAs was to create a cliff-edge effect whereby it had to post vast amounts of liquidity once its credit rating had been sufficiently downgraded.

---

[27] Developments in financial markets mean that there is an extensive list of risk factors. For example, many derivative contracts are sensitive to interest rates, implied volatility, dividends, borrowing costs and the underlying assets determining the payoff.

[28] See "Rethinking the financial network", Andrew Haldane, Executive Director for Financial Stability, speech delivered at the Financial Student Association, Amsterdam, April 2009, available at: http://www.bankofengland.co.uk/publications/speeches/2009/speech386.pdf.

4. Financial data in the future – UK and international agendas

The agenda for collecting financial sector data will be driven by: (i) the design of the regulatory/supervisory architecture, (ii) the framework for supervision and risk assessment, (iii) a willingness (or otherwise) to impose costs on the financial sector, (iv) the level of resourcing of data collection function, and (v) the standards and requirements set by international bodies and peers.

FSB/IMF "List of 20" Data Gaps

Efforts to identify data gaps and to work up proposals for how they might best be filled are moving forward at the international level. In their report to the G20 in October 2009 the FSB/IMF made 20 Recommendations for data improvements. [29] At a conference hosted by the FSB/IMF in April 2010, officials from G20 central banks and finance ministries provided updates on progress, and on the basis of feedback received the FSB/IMF provided an updated Report for the June 2010 G20 meeting.[30] Among the areas identified as candidates for data improvements, perhaps the two that stand out are those that address the linkages between financial institutions, both within countries and across borders.[31]

ECB/ESRB

Within Europe, there is a programme of work under way coordinated by the European Central Bank (ECB) to provide support for the European Systemic Risk Board (ESRB).[32] As at August 2010, the relevant draft legislation on the role and powers of the three European Supervisory Authorities that will act in conjunction with the ESRB is still subject to co-decision between the European Parliament and the European Council.[33] What now does seem to be clear is that while the Parliament remains willing to negotiate on the detail, it has taken a strong view that the European authorities need to be equipped with sufficient powers to act to prevent future crises, and to strengthen the single market.

Against this backdrop, the ECB Banking Supervision and Statistics Committees have been attempting to anticipate what the information needs of the ESRB are likely to be, to ensure that the Board is properly briefed from its inception. Once the legislative issues are resolved, the ESRB is expected to be required to be operational quickly. The ECB aims to make available as much data relevant to financial stability as is possible from existing sources or from enhancements currently in hand. These will be supplemented by new data collections and infrastructure in due course, with key areas on which attention will focus including the following:

---

29 Available at: http://www.imf.org/external/np/g20/pdf/102909.pdf.

30 Available at: http://www.imf.org/external/np/sec/pr/2010/pr10155.htm.

31 These are described in Recommendations 8, 9 and 11 of the October 2009 G20 report. Recommendations 8 and 9 focus on the interlinkages between, and systemic importance of, financial institutions. Recommendation 11 covers improvements in international banking data and, in particular, increased granularity in the sectoral breakdown available in the data: for example, separating out "non-bank" into "non-bank financial institutions" and "non-bank non-financial institutions".

32 See "Proposal for a regulation of the European Parliament and of the Council on Community macro prudential oversight of the financial system and establishing a European Systemic Risk Board" , COM(2009) 499 final, available at: http://ec.europa.eu/internal_market/finances/docs/committees/supervision/20090923/com2009_499_en.pdf.

33 See http://www.europarl.europa.eu/news/expert/infopress_page/042-77910-186-07-28-907-20100706IPR77909-05-07-2010-2010-false/default_en.htm.

- Analysing systemic risk within the European banking sector: a key objective identified under this heading is the production of quarterly consolidated bank balance sheet data within three months of the reference period end.
- Securities holding statistics: the focus is high-quality granular data (for example, including a full sectoral breakdown of the holders, and an extensive instrument, maturity and currency breakdown of the securities held) that is based on security-by-security information.
- Fully integrated financial and non-financial sectoral accounts for the EU, with a timeliness of 90 days. The challenge of improved timeliness is amplified by the likely requirement that the level of detail required will be greater than is generally available in current sectoral accounts, and of combining data for the euro area and non-euro area Member States.
- Improved quality of data on insurance companies and life/pension funds.

Senior Supervisors Group

There are interesting lessons from the approach of the Senior Supervisors Group (SSG), comprising supervisors from seven countries with large financial centres.[34] During the crisis in the autumn of 2008, supervisors in the SSG decided to collect counterparty exposure data from systemically important banks. The initial data collection effort consisted of 13 firms. The reporting group has since been expanded to 16, and will ultimately include approximately 25 firms. The SSG continues to collect the data, which consist of reporting banks' largest exposures to individual counterparties by type of credit instrument and type of counterparty. The results of analyses of these data are currently shared among the supervisors in the SSG under strict protocols, such as aggregate exposures without counterparty details, and with some degree of anonymity in the shared information. In the future, the sharing of counterparty exposure data among supervisors in the SSG will ultimately be governed by a memorandum of understanding that would allow exposures among reporting firms to be identified by name.

A flow of funds model for the UK

In the UK, much work needs to be done to fill the data gaps identified from the financial crisis. One issue is the development of a flow of funds model for the UK. A flow of funds model tracks financial activity across the whole economy – not just the financial economy. In the words of Godley and Lavoie,[35] all money "comes from somewhere and goes to somewhere". As such, it is potentially an invaluable tool for spotting macroeconomic imbalances. At present, the data which are available are not sufficiently granular nor of sufficiently high quality to support policymakers in a timely fashion. Progress on this issue is likely to require close cooperation with the UK's Office for National Statistics.

All of this is a great and important challenge. In relation to the task that lies ahead, one might quote Churchill: "This is not the end; it is not even the beginning of the end, but it is, perhaps, the end of the beginning."

---

[34] UK, US, France, Germany, Switzerland, Canada and Japan.

[35] Godley, W and Lavoie, M, (2007), "Monetary Economics", Palgrave.

References

Bank of England (2006), "Cost-benefit analysis of monetary and financial statistics – a practical guide"
http://www.bankofengland.co.uk/statistics/about/cba.pdf.

Bank of England (2009), "The role of macroprudential policy: A discussion paper" http://www.bankofengland.co.uk/publications/other/financialstability/roleofmacroprudentialpolicy091121.pdf.

Bank of England (2010), "Statistical Code of Practice June 2010"
http://www.bankofengland.co.uk/statistics/about/code.pdf.

Cechetti, S, Fender I and McGuire P (2010), "Toward a global risk map", *BIS Working Papers, No. 309.*

European Commission (1995), "European System of Accounts 1995"
http://circa.europa.eu/irc/dsis/nfaccount/info/data/esa95/en/esa95en.htm.

European Communities, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations and World Bank (2008), "System of National Accounts 2008" http://unstats.un.org/unsd/nationalaccount/SNA2008.pdf.

Godley, W and Lavoie, M, (2007), "Monetary Economics", Palgrave.

Haldane, A (2009), "Rethinking the Financial Network"
http://www.bankofengland.co.uk/publications/speeches/2009/speech386.pdf.

Haldane, A (2010), *"The $100 billion question"*
http://www.bankofengland.co.uk/publications/speeches/2010/speech433.pdf.

HM Treasury (2010), "A new approach to financial regulation: judgement, focus and stability", *Consultation Document, 26 July 2010*
http://www.hm-treasury.gov.uk/consult_financial_regulation.htm.

House of Commons Treasury Committee (2009), "Too important to fail – too important to ignore", *Ninth Report of Session 2009–10, Volume II*
http://www.publications.parliament.uk/pa/cm200910/cmselect/cmtreasy/261/261ii.pdf.

International Monetary Fund (2000), "Monetary and Financial Statistics Manual"
http://www.imf.org/external/pubs/ft/mfs/manual/index.htm.

Jentzch N (2007), "Financial privacy: An international comparison of Credit Reporting Systems", Springer.

Pozsar, Z, Adrian, T, Ashcraft, A, and Boesky, H (2010), "Shadow Banking", *FRBNY Staff Report No. 458.*

Tarullo, D (2010), "Equipping financial regulators with the tools necessary to monitor systemic risk", *Testimony before the US Senate Subcommittee on Security and International Trade and Finance, Committee on Banking, Housing, and Urban Affairs, February 2010.*

Tucker, P (2010), "Shadow Banking, Financing Markets and Financial Stability"
http://www.bankofengland.co.uk/publications/speeches/2010/speech420.pdf.

United Nations Statistics Division (2003), "Integrated Environmental and Economic Accounting 2003 (SEEA 2003)"
http://unstats.un.org/unsd/envaccounting/seea.asp

Session 2

Improving data compilations on/from banks

Chair: Guido Boller, Swiss National Bank

Papers:

Banking system soundness during the financial crisis
Sally M Davies, Federal Reserve System

Improving the quality and flexibility of data collection from financial institutions
Milan Nejman, Otakar Cejnar, Czech National Bank, and Patrick Slovik, Organisation for Economic Co-operation and Development

Implementation of International Financial Reporting Standards for nonfinancial companies and their impact on financial stability monitoring at the Central Bank of Chile
Isabel Scheuch and Mariela Iturriaga, Central Bank of Chile

A new approach to MFI interest rate statistics in Croatia
Ivana Usorac, Croatian National Bank, and Igor Jemrić, Croatian National Bank

Banking system soundness during the financial crisis

Sally M Davies

1. Introduction

Message: With the onset of the financial crisis in the summer of 2007 and with its intensification in September and October of 2008, interest in banking system soundness increased substantially. This paper documents efforts to find data on banking system soundness from publicly available sources. Although quite a lot of information (much, but not all of which is timely) is available for large, publicly traded financial institutions via services such as Bloomberg and Bankscope or directly from company reports, it is much harder to find the same amount of aggregate balance sheet and performance statistics covering the entire banking systems for major countries.

As concerns about U.S. subprime lending increased in the summer of 2007, market indicators of U.S. and European bank health – CDS premiums and stock price indices – began to show signs that investors were increasingly concerned about the health of at least some banks. In addition, some banks had difficulty obtaining U.S. dollar funding, and the spread between interbank funding rates and overnight index swap rates increased significantly. As the performance of U.S. subprime mortgages continued to decline, these concerns and funding difficulties increased.

In light of these developments, there was increased interest in the health of countries' banking systems. Banking system soundness matters because it gives some indication of how likely it is that financial problems would be transmitted to the real economy (by, for example, a reduction in the supply of loans).

Market measures of the health of individual banks – stock price movements and CDS premiums – were readily available for publicly traded banks and for larger banks, which are more likely to have regularly quoted CDS premiums. In addition, for the larger banks, information services such as Bloomberg and Bankscope provided information taken from banks' public disclosures (quarterly and annual reports). Aggregate information for the entire banking systems of major countries, however, was less readily available. This paper discusses the types of information I looked for and what I was able to find.

2. So why look for data on the entire banking system? Why not just concentrate on the largest banks?

Message: It is very useful to have aggregate data on the largest banks, as this informs us about systemic risks, since the largest banks are likely to be the only systemically important institutions. However, when considering the transmission of financial shocks to the real economy, small institutions can also play a significant role, in the aggregate (depending on their share of the banking system). In addition, certain sectors of the real economy – such as small and medium-sized enterprises (SMEs) – are likely to be disproportionately reliant on smaller financial institutions. Finally, if many smaller banking systems are in weak condition, banking system stability can be affected, as illustrated by recent concerns about the cajas in Spain.

3. Overall measures of banking system condition

Message: First, I looked for some basic measures of the overall current health of major banking systems. A number of these measures are core measures in the IMF's Financial Soundness Indicators (FSIs).

- Capitalization: Capital is a bank's cushion against losses, so capital measures are very important for assessing banking system health.
  - Tier 1 capital/risk-weighted assets (RWA). How much of a capital cushion does the banking system have?
  - Tangible common equity/RWA. Tier 1 can contain some debt-like capital instruments (e.g., preferred shares, which have fixed dividends) as well as intangible assets, such as goodwill, which may prove less useful than tangible common equity in absorbing losses.
  - Tier 1 capital. What is the level (in dollars, euros, pounds, etc.) of Tier 1 capital? On the face of it, this might seem like a strange measure, since it is not scaled by anything, such as risk-weighted assets, total assets, or total loans. However, this measure is important because it can be used to scale the size of potential risk exposures, helping us judge whether certain exposures are "large" or "small" (discussed further below).
  - Tangible common equity (TCE). What is the level of TCE? Like the level of Tier 1 capital, this can be used to scale potential risk exposures.
- Profitability: Return on assets (ROA) = Net income/Total assets. Because earnings also help to offset credit losses, it's useful to know a banking system's annual earnings, and perhaps also some breakdowns, such as fee income and net interest income. (Because net income can also be used to absorb future losses, the level of net income may also be a useful measure to have, along with capital levels.)
- Asset quality: Nonperforming loans (NPLs)/Total loans. How healthy is the current loan portfolio?

4. Measures of banking system risk exposures (specific to this crisis)

Message: Next, I looked for measures of the risk exposures of major banking systems that had relevance to this particular crisis, including exposure to real estate, to U.S. borrowers, and liquidity risks.

- Claims on the U.S. nonbank private sector, scaled by Tier 1 capital or TCE. (Ideally, one would like exposure to U.S. real estate or U.S. mortgage lending, but I knew that this would not be available.)
- Claims on own real estate sector, scaled by Tier 1 capital or TCE. This would be especially useful for countries that had their own real estate bubble, e.g., the U.K., Spain, and Ireland.
- Short-term funding needs: Short-term debt securities outstanding or short-term liabilities. Given that funding issues arose early in this crisis, short-term funding needs of a banking system (excluding demand deposits) would indicate vulnerability to a crisis of confidence.

- Currency-maturity mismatch. BIS staff have written at length about the need for better data about the combination of currency and maturity mismatches, so I won't discuss that here.

5. Data sources: the IMF's Financial Soundness Indicators (FSIs) (and the CEBS)

Message: The IMF's FSIs, found at http://fsi.imf.org/, included some of the measures I was looking for – Tier 1 ratio, NPLs, ROA – and short-term funding needs (i.e., short-term liabilities/total assets) could be calculated from two FSIs (liquid assets/total assets and liquid assets/short-term liabilities). Unfortunately, although the IMF recommends that countries disclose the aggregate amount of Tier 1 capital, I could not find it in the FSIs. In addition, the FSI data were not particularly timely.[1]

Timeliness of IMF's FSIs as of August 20, 2010

	France	Germany	United Kingdom	United States
Tier 1 capital/RWA	Dec. 2008[1]	Mar. 2010	Jun. 2009[1]	Dec. 2009
Return on assets	Dec. 2008	Dec. 2008	Jun. 2009	Dec. 2009
NPLs/total loans	Dec. 2008	Dec. 2008	Jun. 2009	Dec. 2009
Short-term liabilities/total assets	Dec. 2008	Mar. 2010	Jun. 2009	Dec. 2009

[1] Disclosure of total capital/RWA and Tier 1 capital as a percentage of total capital (which can be used to derive Tier 1 capital/RWA) is mandated by the Committee of European Banking Supervisors (CEBS). The Banque de France and the U.K. Financial Services Authority publish these data as of Dec. 2009.[2]

6. Data sources (continued): the BIS consolidated banking statistics

Message: The BIS consolidated banking statistics, found at bis.org/statistics/consstats.htm, give information on banking system exposure to foreign residents. For each reporting country, one can obtain total consolidated exposure to all U.S. residents on an ultimate risk basis, which provides an upper bound for what I was trying to get – exposure to the U.S. nonbank private sector. However, for many countries, data on the sectoral breakdowns by country (which would enable us to get exposure to the U.S. nonbank private sector) are not

[1] On a minor note, the FSI link for "latest available data" showed German asset and liability data as of end-2009, rather than as of end-March 2010. However, the Bundesbank also posted Germany's FSIs, at http://www.bundesbank.de/statistik/statistik_iwf_fsibasisdaten.en.php, and showed end-March 2010 FSI data for the capital and liquidity measures.

[2] On a minor note, the CEBS table on national banking sectors (see http://www.c-ebs.org/Supervisory-Disclosure/Statistical-Data.aspx) for 2009 does not show data for France or Germany, although the Banque de France (http://www.banque-france.fr/gb/supervi/disclosure/statistical/statistical.htm) and the Bundesbank (http://www.bundesbank.de/sdtf/index4.htm) publish their 2009 tables. Also, there may be a problem with the U.K. data: the "total capital adequacy ratio" for U.K. banks is listed as 185%.

publicly available. In some cases (e.g., Germany), these data are confidential to the BIS, while in other cases (e.g., France), they are confidential to central banks that contribute to the consolidated statistics. The United States publishes its consolidated country exposure statistics at http://www.ffiec.gov/E16.htm, although these data do not provide data on exposure to U.S. residents. That must be obtained from the U.S. call reports.

7. Data sources (continued): ECB data for national aggregated balance sheets

Message: The European Central Bank (ECB) data for national aggregated balance sheets, found at http://www.ecb.int/stats/money/aggregates/bsheets/html/index.en.html, had country aggregates of bank balance sheet data for E.U. countries. These data were very timely (by August 9, the data were as of end-June 2010), and had several pieces of what I was looking for: "lending for house purchase" (but not commercial real estate lending). But they didn't have all that I was searching for, such as Tier 1 capital (instead, they had capital and reserves). Also, they had short-term debt securities issues that were held by euro area (for euro countries) or domestic (for non-euro countries) residents. Short-term debt securities issued that were held by foreign residents were not broken out from other external liabilities.

8. Data sources (continued): national sources (central banks and bank supervisors)

Message: I looked at national data sources, particularly central banks and financial supervisors. I also had a look at financial stability reports, although these tended to use data on only large banks (presumably so that data could be comparable across countries).

- Bank of England (BoE) data on monetary and financial institutions' balance sheets, income and expenditure statistics, found at: http://www.bankofengland.co.uk/statistics/bankstats/current/index.htm#2, has timely balance sheet and income data for banks, including income and breakdowns, home mortgage lending, construction and real estate lending, sterling liabilities, including short-term and repos, and write-offs. (The BoE's Financial Stability Report presents data for "major UK banks," – i.e., large and complex financial institutions.)
- Banque de France data (http://www.banque-france.fr/gb/statistiques/telechar/activite/france-tableaux-bilan-aifm.pdf) have debt securities with maturities of less than 2 years and capital + reserves, the same data found in the ECB statistics.
- Bundesbank statistics (http://www.bundesbank.de/statistik/statistik_iwf_fsibasisdaten.en.php) had data on the sectoral distribution of loans for end-2009 that included construction and real estate as sectors. FSIs on capital ratios (total and Tier 1) and liquidity were also as of end-2009. Regional distribution of loans includes only all advanced economies lumped together. Underlying data on capital ratios and liquidity, such as total Tier 1 capital and short-term liabilities, were "compiled for supervisory purposes only". As with the ECB statistics, the data showed short-term debt securities issued that were held by euro area residents. Short-term debt securities issued that were held by foreign residents were not broken out from other external liabilities.

- The U.S. Federal Deposit Insurance Corporation (FDIC) publishes large amounts of aggregate statistics on the U.S. banking system at: http://www2.fdic.gov/SDI/SOB and http://www2.fdic.gov/qbp/qbpSelect.asp?menuItem=QBP. The U.S. data include the level of Tier 1 capital, as well as capital ratios, and data that can be used to calculate most of the ratios in which I was interested.

9. Conclusion

Message: Summary of what was missing from the measures I hoped to find, and my own priorities (aggregate level of Tier 1 capital!).

Improving the quality and flexibility of data collection from financial institutions

Milan Nejman[1], Otakar Cejnar[1] and Patrick Slovik[2]

1. Introduction

The study focuses on possible interactions between financial market supervision architecture and securities data collection systems. While numerous studies have focused on these two areas separately, this study has its unique scope in exploring possible synergies between them. The conduct of financial market supervision, as well as the compilation of statistics, requires a collection system for high-quality securities data. Although the two areas cangreatly differ in the use of the required market data, they both require similar or the same market data from similar or the same reporting agents. The main challenge and opportunity for the public authorities is, therefore, to integrate these different aspects into a system that will bring about a higher quality of securities data, a lower reporting burden on the reporting agents, and a saving of public resources. Based on the sample of Organisation for Economic Co-operation and Development (OECD) countries, this study explores the implications of different types of financial supervision architecture and different types of securities data collection systems. It describes the experience, synergies, and challenges of a joint securities data collection system – shared between financial market supervision and statistics – based on the experience of a successful implementation of such a data collection system in the Czech Republic.

2. Statistics and the Financial System Supervision Architecture

The standard role of a statistical department of a central bank is to prepare various statistics (e.g., financial market, external and financial accounts statistics) for a broad group of users, comprising internal users at the central bank itself and other domestic users in the private and public sectors, as well as a contribution to the international statistics by providing national data to international organizations. The standard roles of a financial system supervisor that require a substantial use of high-quality data (and often high-frequency data) are in particular microprudential supervision, macroprudential supervision, and the supervision of proper market conduct of the financial market participants. The different functions of statistical department and financial market supervisor often require similar or the same data from similar or the same reporting agents; however, these data requirements are often at different levels of aggregation and different data collection frequency. The main challenge and opportunity for the public authorities is, therefore, to integrate these different data needs into a system that will bring about a higher quality of data, a lower reporting burden on the reporting agents, and a saving of public resources.

---

[1] Monetary and Statistics Department, Czech National Bank. The views expressed in this paper are those of the authors and do not necessarily represent those of the CNB. Corresponding author: milan.nejman@cnb.cz.

[2] Macroeconomic Policy Division, OECD. The views expressed in this paper are those of the author and do not necessarily represent those of the OECD.

A profound change in the supervisory architecture in the Czech Republic, which occurred in 2006, integrated all supervisory functions under a single organization that conducts supervision of the entire national financial system encompassing credit institutions, capital market, insurance companies, and pension funds. The activities of several independent entities in charge of financial market supervision – the Czech Securities Commission, the Office for Supervision of Credit Unions, and the Office of State Supervision of Insurance Companies and Private Pension Schemes – were integrated into the Czech National Bank (CNB).[3]

The integration of supervisory functions reflects the endeavor of public authorities to address contemporary developments in financial markets, in particular rising financial market interconnectedness, changes in financial intermediation channels, and an increase in financial conglomeration. The integration of financial market supervision under a single entity is characteristic of several countries. However, the integration of all supervisory functions under the responsibility of the central bank is specific only for a much smaller group of countries, as shown in Figure 1.

The rationales for unified or separate supervisory functions have been thoroughly addressed in numerous studies.[4] It is not within the scope of this paper to discuss all the arguments for or against a specific supervisory architecture. The main scope of this paper is to focus specifically on the merits and challenges arising from the coexistence of financial market supervision and various statistics under the responsibility of a central bank. The main merits of such a structure are as follows:

- Joint statistical-supervisory data collection initiatives, which can lead to considerable synergies and significantly lower the burden on the reporting agents;
- Easier access to local and international data and reporting sources with implications for higher data reliability and timeliness;
- A better flow of data and metadata within a single unified institution than between separate entities;
- Accelerated transfer of knowledge and a better understanding of complex financial and statistical issues stemming from improved interactions between experts in statistics and financial market supervision;
- Substantial improvement in the conceptual and technical capabilities of national authorities to address financial market data gaps that arise from the conduct of supervision and monetary policy.

---

[3] The incorporation of supervision into the CNB is laid down in Article 1(1) of Act No. 6/1993 Coll. on the Czech National Bank, as amended. The respective provision states that "The Czech National Bank shall be the central bank of the Czech Republic and the authority performing financial market supervision." Further, see Article 2(2d) of Act No. 6/1993 Coll. on the Czech National Bank, as amended: "In accordance with its primary objective, the Czech National Bank shall: … supervise the activities of entities operating on the financial market, analyze the evolution of the financial system, see to the sound operation and development of the financial market in the Czech Republic, and contribute to the stability of its financial system as a whole."

[4] See, for example, Herring and Carmassi (2008), De Luna Martinez and Rose (2003), Lumpkin (2002), Briault (2002), and Abrams and Taylor (2000).

Figure 1

Financial System Supervisory Architecture in OECD Countries (2010)

	Unified Supervision	Unified Financial System Supervisor	Date of Implementation
Australia	No	-	-
Austria	No	-	-
Belgium	Yes	Supervisory Authority	2004
Canada	No	-	-
Chile	No	-	-
Czech Republic	Yes	Central Bank	2006
Denmark	Yes	Supervisory Authority	1990
Estonia	Yes	Supervisory Authority	2002
Finland	Yes	Supervisory Authority	2009
France	No	-	-
Germany	No	-	-
Greece	No	-	-
Hungary	Yes	Supervisory Authority	2000
Iceland	Yes	Supervisory Authority	1998
Ireland	Yes	Supervisory Authority	2003
Israel	No	-	-
Italy	No	-	-
Japan	Yes	Supervisory Authority	2000
South Korea	Yes	Supervisory Authority	1998
Luxembourg	No	-	-
Mexico	No	-	-
Netherlands	No	-	-
New Zealand	No	-	-
Norway	Yes	Supervisory Authority	1986
Poland	Yes	Supervisory Authority	2008
Portugal	No	-	-
Slovakia	Yes	Central Bank	2006
Slovenia	No	-	-
Spain	No	-	-
Sweden	Yes	Supervisory Authority	1991
Switzerland	Yes	Supervisory Authority	2007
Turkey	No	-	-
United Kingdom	Yes	Supervisory Authority	1997
United States	No	-	-

Source: Various sources (e.g., websites of national supervisors and central banks).

3. Securities Data Collection Systems

Data collection systems vary by data collection channel and level of aggregation of the collected data. The main data collection channels are a data collection based on the settlement system, a data collection based on reports from individual investors, and an indirect data collection channel based on reports from financial intermediaries (custodians). The securities data collection systems in the European Union, including the Czech Republic, are predominantly based on the indirect data collection channel from financial intermediaries who report on behalf of their customers. Based on the level of aggregation, securities data collection systems can be subdivided into three categories: (i) aggregated securities data

collection systems, (ii) partially disaggregated securities data collection systems, and (iii) fully disaggregated securities data collection systems.

Aggregated Securities Data Collection Systems

The role of the compiler of statistics is to prepare national aggregates of financial data for use by public authorities in charge of economic policy and market participants who can base their decisions on the analysis of these aggregates. Because the deliverables of the compilation process are in an aggregated form, the securities data collection systems did not historically put a strong emphasis on data disaggregation. In the simplest form, the statistical data are collected from the reporting agents in an aggregated form, i.e., each reporting agent, such as a bank, aggregates all financial securities in its custody and reports the aggregated figures to the compiler of national statistics, e.g., the national central bank. These aggregates are usually broken down by the reporting agents, for instance, into geographical regions. The role of the compiler is, then, to combine these aggregated data into statistics describing the national economy.

Although an aggregated securities data collection system is conceptually relatively straightforward (for the compilers and the reporting agents), it is connected with several disadvantages. For example, it is very cumbersome in its ability to address new data gaps flexibly. Since the reporting agents already report the data in aggregated form, the system is not flexible in the compilation of statistics in other than already predefined breakdowns; it might take several months or years to address new data gaps. An aggregated data collection system also does not allow in-depth quality checks of the securities data, because the data received by the compiler are already aggregated. For this reason, several countries, predominantly in the European Union, have moved to partially disaggregated data collection systems.

Partially Disaggregated Securities Data Collection System

A partially disaggregated data collection system is based on collection of disaggregated data at the level of individual securities. The reporting agents report to the statistical compiler the holdings of concrete individual securities; for this reason, the system is also referred to as a security-by-security data collection system. The statistical compiler, however, does not receive data on individual holders of securities but only on the sector of a holder. Therefore the system is referred to as “partially disaggregated”. The main advantages of a partially disaggregated security-by-security data collection system are as follows:

- More in-depth quality checks at the level of individual securities;
- Improvement of data standardization and consistency due to the possibility of cross-checking the data with a securities reference database (e.g., Reuters, Bloomberg, or CSDB[5]);
- Flexibility to adapt to new requests and address new data gaps;
- Improved flexibility and consistency of regular revisions of statistics.

A partially disaggregated data collection system is much more flexible in addressing new data gaps. The aggregation of the security-by-security data usually falls under the responsibility of the statistical department. The compiler of statistics is, therefore, better

[5] The Centralized Securities Database (CSDB) is a supranational database of securities of the European System of Central Banks (ESCB).

positioned to address new data gaps by aggregating individual security-by-security data subject to specific attributes of the financial securities. These attributes are either collected from reporting agents or, in most of the cases, are sourced from an instrument reference database[6] (e.g., Reuters, Bloomberg, CSDB).

Fully Disaggregated Securities Data Collection System

Although a partially disaggregated data collection system offers obvious advantages for the compilation of statistics, it might not be sufficient for the use of financial market supervisors. In order to oversee proper market conduct of financial market participants, the supervisors might need fully disaggregated securities data. The reporting agents, therefore, might have to report data not only disaggregated at the level of individual securities and the sector of a holder (partially disaggregated / security-by-security), but also disaggregated at the level of individual holders of individual securities (fully disaggregated / holder-by-holder). In practice this often necessitates two different data collection systems: one for the purposes of statistics, and another for the purposes of financial market supervision. The existence of two different data collection systems can create extra reporting burdens on the reporting agents, higher costs for the public authorities, and the risk of inconsistencies between supervisory and statistical outputs. A financial market architecture which integrates financial market supervisory functions under the responsibility of the central bank enables the public authorities to address these disadvantages. The coexistence of both under the responsibility of the national central bank gives an opportunity to create a joint data collection system shared for the purposes of financial market supervision and statistics. Such a data collection architecture can contribute to a lower reporting burden on financial market participants, a more efficient use of public resources, and a higher consistency of data used by supervisors and policymakers. It also offers significant improvement of securities data, because data quality control is conducted by supervisors as well as statisticians at different levels of aggregation and with a focus on different sets of attributes. Figure 2 summarizes the securities data collection systems in the OECD countries for the use of portfolio investment statistics.

[6] A security identification number, such as ISIN, is utilized to link the data from reporting agents with the reference database.

Figure 2

Securities Data Collection Systems in OECD Countries (2010)

	Aggregated Data Collection System	Partially Disaggregated Data Collection System	Fully Disaggregated Data Collection System
Australia	-	Yes	-
Austria	-	Yes	-
Belgium	-	Yes	-
Canada	-	Yes	-
Chile	-	Yes	-
Czech Republic	-	-	Yes
Denmark	-	-	Yes
Estonia	-	Yes	-
Finland	-	Yes	-
France	-	Yes	-
Germany	-	Yes	-
Greece	-	Yes	-
Hungary	-	Yes	-
Iceland	-	Yes	-
Ireland	-	Yes	-
Israel	Yes	-	-
Italy	-	Yes	-
Japan	Yes	-	-
South Korea	Yes	-	-
Luxembourg	-	Yes	-
Mexico	-	-	Yes
Netherlands	-	Yes	-
New Zealand	-	Yes	-
Norway	-	Yes	-
Poland	-	Yes	-
Portugal	-	Yes	-
Slovakia	-	Yes	-
Slovenia	-	Yes	-
Spain	-	Yes	-
Sweden	Yes	-	-
Switzerland	Yes	-	-
Turkey	-	Yes	-
United Kingdom	Yes	-	-
United States	-	Yes	-

Source: Various sources (e.g., websites of national supervisors and central banks).

4. Implementation of a Fully Disaggregated Data Collection System in the Czech Republic

The integration of financial market supervision under the responsibility of the Czech National Bank, which occurred in 2006, created a new opportunity to explore any possible synergies between different areas of the central bank. Shortly after the integration, the Czech National Bank decided to investigate the possibility of creating a new data collection system for

securities held in custody by banks that would jointly serve for use by financial market supervision and statistics. To identify synergies, and to avoid any duplication in the requirements of reporting agents, a working group comprising experts from all the concerned areas in the Czech National Bank was set up.

The main objective of the working group was to evaluate the benefits and risks associated with the change to a new data collection system. The working group – which comprised representatives of financial market supervision, statistics, and specialists on data processing – also engaged in regular consultations with the concerned reporting institutions represented by the Czech Banking Association. The working group based its efforts on the clear principle that all requests raised by different data users within the central bank should be reflected in the new securities data collection system. The integration of all reporting requirements of the central bank into a single report was also one of the main requests of the Czech Banking Association.

The representatives of statistics agreed that, to ensure a high quality of compiled statistics, it would be necessary and at the same time sufficient to collect data based on a partially disaggregated security-by-security data collection model.[7] The representatives of financial market supervision welcomed a security-by-security data collection model, but in addition required fully disaggregated data that would include detailed information on the individual holders of securities. These data on individual holders were necessary for the supervision of proper market conduct by market participants. The working group therefore recommended implementing a fully disaggregated data collection system which included details on individual financial market securities and individual holders of these securities.[8] The Czech National Bank successfully implemented the fully disaggregated data collection system on securities held by banks on behalf of its clients as of January 2009, about 2 years after the working group had been set up.[9]

5. Conclusions

The existence of various types of institutional frameworks in the areas of statistics and financial market supervision across countries sets grounds for different approaches to securities data collection systems. Given the architecture of national institutional frameworks, the main objective of the public authorities is to optimize data collection systems in ways that maximize the quality of the data, minimize the reporting burden on reporting agents, and maximize the saving of public resources. This study shares the experience of the optimization process of the securities data collection system in the Czech Republic that resulted from a new financial market supervisory architecture. The new securities data collection system implemented by the Czech National Bank represents a substantial improvement in the quality of financial market data for the purposes of financial market supervision as well as for the purposes of statistics. Other synergies resulting from the joint data collection system described in the paper comprise a lower reporting burden, a more cost-efficient use of public resources, and a higher capacity of national authorities to flexibly address new data gaps in a timely manner.

---

7 A subset of the data would be needed for statistics, since data needs regarding some holders are accommodated by direct reporting from individual investors.

8 An obvious challenge for this kind of data collection system is the huge amount of data to be processed, as it covers each individual financial market security as well as each individual holder of the security. In the case of a partially disaggregated data collection system, the amount of data to be processed and stored is much lower, owing to the aggregation of holders into sectors.

9 As of January 2011, the obligation to report the fully disaggregated securities data will be extended to all investment firms (banks and nonbanks).

References

Abrams, R.K., and Taylor, M.W. (2000). Issues in the Unification of Financial Sector Supervision, IMF Working Paper no. 213, December 2000.

Bank for International Settlements (2009), Issues in the Governance of Central Banks, May, Basel.

Briault, C. (2002). Revisiting the rationale for a single national financial services regulator, FSA Occasional Paper Series No. 16, London.

De Luna Martinez, J., Rose, T.A. (2003). International Survey of Integrated Financial Sector. Supervision. World Bank working paper No. 3096.

European Central Bank (2007). European Union Balance of Payments/International Investment Position Statistical Methods. Frankfurt am Main.

European Central Bank (2002). Task Force on Portfolio Investment Collection Systems, Final report. Frankfurt am Main.

European Central Bank (2010). The “Centralised Securities Database” in Brief. Frankfurt am Main.

European Central Bank (2006). Recent developments in supervisory structures in EU and acceding countries. Frankfurt am Main.

Herring, R. J., and Carmassi, J., (2008). The Structure of Cross-Sector Financial Supervision. Financial Markets, Institutions & Instruments, Vol. 17, No. 1. New York University Salomon Center.

International Monetary Fund (2007). The Special Data Dissemination System: Guide for subscribers and users. Washington, D.C.

Lumpkin, S., (2002). Supervision of Financial Services in the OECD Area. OECD, Paris.

Masciandaro, D., 2004, “Unification in financial sector supervision: The trade off between central bank and single authority,” Journal of Financial Regulation and Compliance, Vol. 12, No. 2, 2004, pp. 151–169.

Masciandaro, D., and Quintyn, M., 2009, Regulating the regulators: The changing face of financial supervision architectures before and after the crisis.

Implementation of International Financial Reporting Standards for nonfinancial companies and their impact on financial stability monitoring at the Central Bank of Chile

Isabel Scheuch and Mariela Iturriaga[1]

Introduction

For a country like Chile, the adoption of IFRS is an important step in the process of adhering to international standards and good practices in general. These accounting standards facilitate comparison across global issuers, as they provide a common language basis, a fact that is widely recognized in the countries that have already adopted IFRS. In addition, they improve and increase information available to investors, including more elements related to economic and financial behavior and risk assessment of the firms. In theory, all this should increase market efficiency and reduce capital costs[2].

In the case of nonfinancial companies, and despite all their advantages, IFRS may not be as beneficial for the work undertaken by systemic risk regulators – in particular, by the Central Bank of Chile – as they are for investors, for whom they were originally designed. Among the difficulties that IFRS pose are the fact that they allow free reporting (making aggregate analysis and systemic risk assessment more difficult, and increasing compilation costs)[3], that a relevant portion of new information available is reported on qualitative and not quantitative terms, and that they apply to consolidated financial statements (as opposed to solo basis or individual statements), all of which – in our opinion – somehow offsets part of the benefits mentioned earlier.

Some of the issues just mentioned are particularly important in the Chilean case, especially since the Chilean regulator, the Superintendency of Securities and Insurance (SVS), decided to fully adhere to these international standards. This also implied that some standardized information that the SVS formerly demanded from the firms would be lost, including relevant information on currency exposure and details on indebtedness, both of which are key to the monitoring task of the financial stability unit. Although initial discussions between the Bank and the SVS began before the subprime crisis, they developed together with the crisis, confirming the importance of such information for the Central Bank.

---

1 Central Bank of Chile, Statistics Division and Financial Policy Division, respectively.

2 Although proponents of IFRS suggest that accounting standards determine accounting quality – which in turn affects the cost of capital – the opposing argument is that the preparer's incentives and the institutional context affect the quality of financial reporting more than accounting standards. For a review of the literature, see Epstein (2009).

3 Risk rating agencies have also expressed some concerns on this issue. See Standard & Poor's (2007a, 2007b and 2007c.)

1. The Central Bank's specific concerns

The relevance of statistics gathered by the SVS

The reliance on information gathered by the securities regulator is a central issue for understanding the challenges faced by the Chilean Central Bank. Unlike central banks in other countries, the Central Bank of Chile uses as a key information source for the financial position of the corporate sector information on the firms registered under the SVS. Although these firms account for approximately 35% of aggregate debt (Annex 1)[4], the main reason for using their information is the lack of another robust statistical body containing complete financial information available on a quarterly basis and with a reasonable delay (two to three months)[5]. Other sources of information used by the Central Bank include the Internal Revenue Service's reports – which use very different definitions for some key concepts of the financial statements – and, for financial stability analysis, some general information on the firms from the Superintendency of Banks and Financial Institutions (SBIF) surveys, which are available with considerable delay. On the other hand, the national accounts department complements SVS information with data received from the Central Securities Depository.

While in this paper we examine the impact of IFRS on the work of the Central Bank only from the standpoint of financial stability monitoring, the truth is that two other important activities conducted by the Bank were jeopardized by the decisions taken by the SVS: financial stability research and national accounts compilation. These two activities use information on individual financial statements. In particular, the bank's Statistics Division calculates national accounts, a task that in other countries is performed outside the Central Bank. From the System of National Accounts' (SNA) perspective, the relevant information is that of the individual company (the solo basis financial statement). Thus, the change from Chilean accounting standards to IFRS, which is based on consolidated financial statements, could potentially cause major damage to the quality of some of the statistics[6].

This created an additional complexity for the information requests, as these had to be oriented not only to prevent the loss of information but also to produce individual or solo basis financial statements under IFRS.

Main impacts on financial stability monitoring

During the work conducted by the Central Bank to assess the potential impact of IFRS on the statistics compiled or used for its financial stability monitoring, two issues arose as priorities: currency risk and indebtedness. Based on the analyses of the corresponding norms, on selected financial statements of global firms already reporting under IFRS, on "ideal company reports" issued by audit firms and on the information model proposals submitted by the SVS, the Bank concluded that the information requested under the new accounting standards regarding these specific issues did not guarantee the availability of all relevant information.

Currency risk. We believe that the European origin of IFRS could explain the lack of adequate information on some relevant issues for the Chilean market and, ultimately, financial stability monitoring by the Central Bank. Although, net-net, the quantity of

---

[4] Companies registered at the SVS hold 100% of local bonds, a relevant share of external debt but a low share of local banking debt.

[5] When only Chilean accounting principles were used, the delay was even shorter (one to two months).

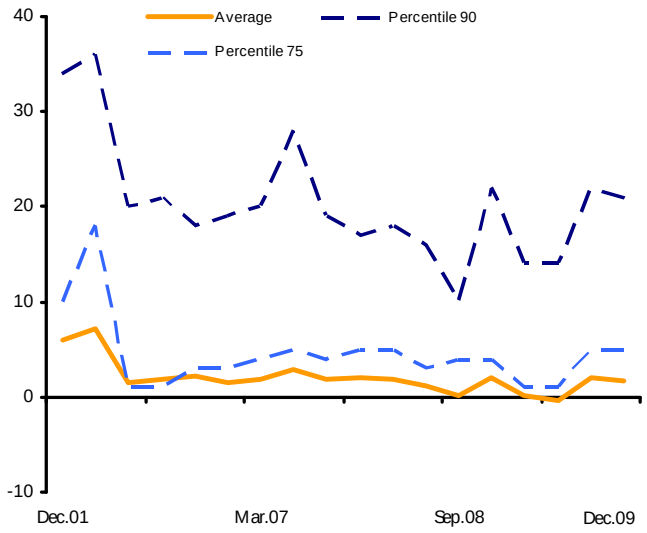
[6] This was not the case in many of the countries adopting IFRS, which, especially in Europe, maintained information systems based on the individual company.

information that firms now disclose is larger, these new standards also exclude valuable information for the analysis of some of the risks to which Chilean companies are exposed. This is the case of the balance sheet's breakdown by currency, which is necessary to calculate currency exposure[7]. As Chile is a small open economy, many of its firms rely on external financing, which represents approximately 31% of the sector's total indebtedness. As such, currency mismatches can be an issue for financial stability and should be closely monitored (Graph 1). This is also true for many Latin American firms, and it has been important during past and recent economic and financial crises[8].

Graph 1

Currency mismatches of Chilean firms

percent of total assets



(1) USD liabilities minus USD assets, net of derivatives.

(2) Companies reporting under IFRS are included since September 2009.

Source: Central Bank of Chile based on SVS data.

As mentioned earlier, the decision made by the SVS to fully adhere to IFRS implied the elimination of the standardized information that the Superintendency had previously requested on balance sheet composition by currency.

IFRS addresses exchange risk in both a direct and an indirect way. The first way is through IFRS 7, which addresses credit, liquidity and market risks facing financial instruments, and

[7] The analysis of this exposure also uses information about derivatives, which is available at the Bank. This information is collected under a direct reporting system, transaction by transaction. Under IFRS, we should have these data revealed in more detail in comparison to Chilean accounting standards (IFRS 7: "Financial instruments: Disclosures" and IAS 39: "Financial instruments: Recognition and measurement").

[8] Bleakley and Cowan (2009).

the second through information released under International Accounting Standard (IAS) 21 and IAS 39, which together would shed light on currency exposures[9, 10, 11].

However, this information has some disadvantages:

- IFRS 7 is essentially qualitative and relies on the companies' judgment, not allowing independent calculations to be made. In practice, companies' statements on exchange risk exposure may vary substantially, especially regarding numerical support[12]. The one aspect that seems to be superior compared to previous accounting standards is the information on hedging and derivatives (IFRS 7 and IAS 39).
- IAS 21 is a general accounting norm that does not account for exchange risk by itself.

Bank debt, bonds and transactions with related parties. Along the same lines as currency risk, information on banking debt, bonds and similar securities used to be available in a standardized format. However, long before IFRS implementation, the Central Bank had come to the conclusion that this information should be improved to meet the needs of financial stability monitoring. As a result, the challenge for the Bank was not only to recover information potentially at risk but also to make sure that it would be upgraded.

Once again the free reporting allowed under IFRS constitutes a disadvantage for aggregation and compilation and does not guarantee that all debts and their details will be disclosed. This is because the norm lets each company decide which information is relevant[13]. From the Bank's perspective, all information is relevant as long as it ends up in aggregated figures for the sector, which are used to assess systemic risks.

Information on debt should follow the guidelines of IAS 39 and IFRS 7. In addition to the concern about the noncomprehensive and nonstandardized nature of the information disclosed following this norm, a review of existing financial statements highlighted that some aspects would not necessarily be included in the reporting or would be excluded altogether. In the first group we find issuance spreads and amortization schedules, and in the second, the name of the company bearing the debt (as information is consolidated) and the issuing bank (in the case of banking debt). As became evident during the subprime crisis, all information regarding financing is important when evaluating conditions of access to financing, companies' financial health (liquidity, solvency) and, in the case of the subprime crisis – where several international banks faced severe problems – bank debtor concentration.

---

9 IFRS 7 broadly covers different aspects of financial instruments. One of them is the nature and impact of credit, liquidity and market risk. The last one includes currency risk. This note contains mainly qualitative revelations about those risks and the way they are managed.

10 IAS 21 ("Changes in Foreign Exchange Rates") focuses on the concept of functional currency and the effects of converting foreign currency items into the functional currency. It also gives guidelines about how to consolidate foreign subsidiaries that use a different currency.

11 IAS 39 establishes the criteria for recognition and valuation of financial assets and liabilities. It also includes hedge accounting, which labels foreign currency risk hedging under fair value hedging or cash flow hedging.

12 This opinion is based on the review of several companies already reporting under IFRS carried out by the Bank.

13 For instance, IFRS 7, when explaining about risks and the quantitative data to be presented, says that the firm has to show summarized quantitative data about its exposure to this risk, and those data have to reveal information about different kinds of risks, unless that risk is not significant. That materiality principle, part of IAS 1 ("Presentation of Financial Statements"), would finally depend on the company's judgment.

The need to recover and improve the information on transactions with related parties was similar to that of debt, in the sense that one of the main problems was that the information disclosed is noncomprehensive and nonstandardized. To the Bank, the main interest was in transactions of a financial nature. Again, the review showed that not all the transactions and their characteristics (interest rates, spreads or amortization schedules) were always reported.

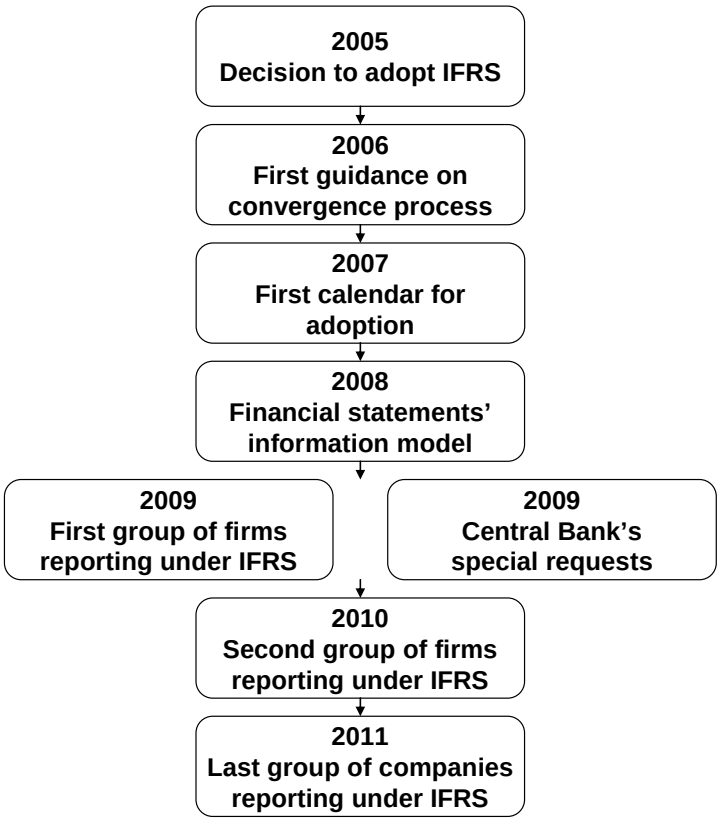
2. Actions taken by the Central Bank

Implementation of IFRS in Chile

The SVS announced at the end of 2005 that it would adopt IFRS as the accounting standard for its supervised companies. Its motivation to do so was to embrace best practices – IFRS was seen as a superior accounting standard – and to make Chilean companies fully comparable in today's globalized capital markets, as many countries are adopting IFRS (Figure 1)[14].

Figure 1

Main steps towards the adoption of IFRS in Chile



Source: Central Bank, based on information from the SVS.

[14] SVS (2008).

A year later, in 2006, the SVS released instructions on the convergence period and in August it published due dates to adopt IFRS for each entity under its supervision (Annex 2). By the end of 2007, initial instructions were updated. In brief, these instructions required the companies to become familiar with IFRS, to stay updated on the guidance from the Chilean Accounting Body and the SVS regarding the subject, and to evaluate how their financial statements reporting would be affected[15].

However, the financial crisis that struck in 2008 caused the SVS to change its original plans, delaying reporting due dates, while at the same time relaxing requirements on submitting comparative financial statements (Annex 3). The decision of the SVS was justified on the grounds of cost reduction in a more adverse macroeconomic environment, together with the belief that the enforcement of IFRS could cause unnecessary noise in an already uncertain scenario[16].

Interaction with the securities authority

The process of discussion and coordination with the SVS took place over two years (2007–2008), during which the Bank made its own evaluation of the impact of IFRS (see the following section). The main difficulties encountered were how to make the objectives of the Bank and those of the SVS compatible and to reach an understanding on from whom and how to request additional information from the supervised companies. The most controversial issue was the Bank's need to request information on individual financial statements, as the SVS argued that this was against the nature of IFRS.

By the end of 2008, an agreement was reached, and the SVS instructed its supervised entities to submit the information requested by the Bank. This agreement stated that i) the SVS would be the intermediary between the Bank and the reporting companies, ii) the information would be used by the Bank only to perform its work, iii) the information would be submitted together with financial statements delivered to the SVS, and with the same periodicity, and iv) the validation process of individual financial statements would be the sole responsibility of the Bank.

The work at the Bank

From the beginning of 2007, but more intensively during 2008, the Bank worked on the analysis of the new accounting principles and their potential impact on the work carried out at the Bank. This process involved the creation of a working group with staff from the financial stability area, the national accounts department and the statistics division. The work included understanding the new norms, the analysis of the guidance and presentation formats provided by the SVS to the companies, a review of the international experience and contacts with international regulators. All this experience formed the basis for the design of standardized formats for gathering information on individual financial statements and the specific notes on currency risk and indebtedness, with their corresponding instructions.

Legal considerations played an important role in determining the options available to the Bank. According to its Constitutional Organic Act, the Central Bank of Chile may require that

---

[15] Official form letter 368 (2006.10.16)

[16] In the end, this delay placed Chile on a path similar to that of the European Union, where four years passed between the announcement of the adoption (2001) and the due date for completion (2005). Nevertheless, the European Union took another five years to study the impact and the potential conflicts between each member's accounting standards and IFRS.

certain foreign exchange operations be reported in writing, using the prescribed forms[17]. In addition, in order to perform the statistical functions contemplated in the said Act, the Bank has the authority to require from any agency or department of the Civil Service Administration, decentralized entities, and the public sector in general any information it may deem necessary that is related to the scope of the regulatory or supervisory functions that such public entities perform.

As a result, the Central Bank requested the SVS to demand the information from the firms. Considering that the SVS has permanent contact with the companies supervised, it was also agreed to channel the Bank's information requests through the SVS.

Information formats and instructions to the private sector

As mentioned before, one of the key concerns regarding the change to IFRS accounting was the lack of standardization derived from free reporting. As the Bank works mostly with aggregate figures for its financial stability analysis – it focuses on systemic risk – the availability of uniform data is crucial in order to manage this volume of information. To accomplish this, the Bank designed predefined formats for its information requests, which were divided into two groups:

- Individual financial statements: These comprise a statement of financial position, a statement of changes in equity, an income statement and statement of comprehensive income, and a statement of cash flows.
- Additional information: This includes notes on currency risk and indebtedness. The goal of these formats is to recover information that was available in the old notes under local accounting standards, asking companies to complete certain fields that are essential for financial stability analysis[18].

3. Compilation and validation of the new information

Before and after IFRS reporting

Before IFRS, the Bank had a very structured system for receiving the information from the SVS, and data quality fulfilled high standards, given that the whole validation process was carried out by that entity. At that time, there was one single body of financial statements accompanied by a set of notes, all under Chilean accounting standards. The data collected was validated at the SVS and received by the Bank on a quarterly basis, with a two- to three-month delay depending on the quarter, almost ready to be used by the different units at the Central Bank.

After eighteen months of operation, the situation with IFRS reporting is quite different. Currently, there are two different standards (local and IFRS) for presenting financial statements, and the number of companies using one or the other is changing each quarter, according to the option chosen for adopting IFRS[19]. Besides, there is a third set of information containing the additional information demanded by the Bank (individual

[17] Also, the Bank is empowered to request, without restriction, all books, accounts, files and documents in matters regarding the accomplishment of foreign exchange regulations issued by the Bank.

[18] Simplified versions of currency risk and indebtedness notes can be found in Annex 4.

[19] This gradual process should end in 2011, when annual financial statements are presented. See Annex 3.

statements and specific notes on currency risk and indebtedness). The first two sets are validated at the SVS while the third is validated at the Bank. All the reporting continues to be made on a quarterly basis for securities issuers but reporting dates have changed and the Bank receives the information with a three- to four-month delay. After that, it takes another month to have the data ready for internal users.

Changes and challenges brought by IFRS

From the standpoint of the statistical process, the Bank's main challenges were: i) to fully understand new accounting standards; ii) to cope with nonstandardized information; and iii) to design and implement a validation process for the additional information requested by the Bank. On another front, the Bank had to strengthen its statistical relationship with the SVS.

Learning process at the Bank

The new accounting principles, the classification of the different concepts in the financial statements, as well as the existence of multiple reporting formats, involved an important learning process at the Bank. This has been true not only in the statistics area, but also in the financial stability and national accounts units.

In addition, IFRS is a very dynamic framework, with constant changes in definitions and interpretations; this raises the need for permanent updates and training of the staff, as year by year the International Accounting Standards Board (IASB) modifies norms and their interpretations. Since 2009, when IFRS started in Chile, the Bank has devoted important resources to this project, including staff training.

Coping with nonstandardized information

IFRS-based financial statements are poorly standardized in terms of the ordering and content of the notes which accompany the consolidated financial statements. In theory, IFRS provides very rich financial information through these notes; however, it was noted that in practice companies do not always submit all of them. Besides, this information is currently available only in PDF format, largely increasing the costs of capturing and processing the information. XBRL (e**X**tensible **B**usiness **R**eporting **L**anguage), a technological tool designed to lower these costs, is not fully implemented as yet and only a few firms are submitting their information through this channel.

Another crucial issue is that notes under IFRS are more qualitative than quantitative in nature in comparison with those under Chilean accounting principles, and even hard to find within the financial statements. Again, this makes the task of aggregation much more difficult.

Validation of additional information required by the Bank

Taking the nonstandardization of the information into account, the Bank prepared a standard form for its specific requirements (individual statements and specific notes for currency risk and indebtedness). However, it turned out that these templates were not always filled in the way the Bank had expected, making the validation process very difficult and affecting the quality of the data.

Before IFRS, all validations were made at the SVS, but with IFRS, the SVS maintained the process only for the information that it requested and not for the information requested in the name of the Bank. To cope with the work load, the Bank created a new area within the

Statistics Division, with seven people dedicated full-time to the validation process. One person is also assisting the SVS to answer the companies' questions about the Central Bank's additional information.

To make the validation process more automatic, many filters and cross-checks were implemented[20]. However, free reporting has also affected what were supposed to be standardized forms, as classifications may vary from one company to the next[21]. This has led to several adjustments in those filters and cross-checks along the way. Table 1 shows statistics on validations made in 2009.

Table 1

Reporting companies and quality of reported information

	Mar. 09	Jun. 09	Sep. 09	Dec. 09
Number of reporting companies	77	80	84	96
Number of filters and cross checks	19	33	47	50
Percentage of companies that had to amend their reports	87	46	94	64

Source: Central Bank of Chile.

Despite all these difficulties, the validation rate had reached 100% in 2009. However, as more companies started reporting under IFRS in 2010, this rate has recently decreased. A return to 100% is expected in the near future.

Relationship with the SVS

Because the SVS is the intermediary between the companies and the Bank, the Bank has also faced the challenge of strengthening its relationship with the SVS. To facilitate interaction, the Bank and the SVS have each appointed a representative who channels all the communications.

Despite initial concerns, the reporting rate has reached 100% since the first reporting period (1Q09). The companies' main difficulties have been in understanding the specific notes, which has led to several adjustments and clarifications concerning the templates and their instructions during the eighteen months of operation, all with the aim of facilitating reporting activity.

The Bank has achieved a very important goal in working with the SVS, namely, that companies must confront only one request for information, without duplications, and establish a relationship with just one entity, which facilitates the task of providing information to other agencies in the public sector (Central Bank).

[20] For instance, between numbers in the same accounts in individual and consolidated statements – when applicable – and between numbers in the currency and debt notes and their respective financial statements. Validations also include graphical analysis to identify outliers.

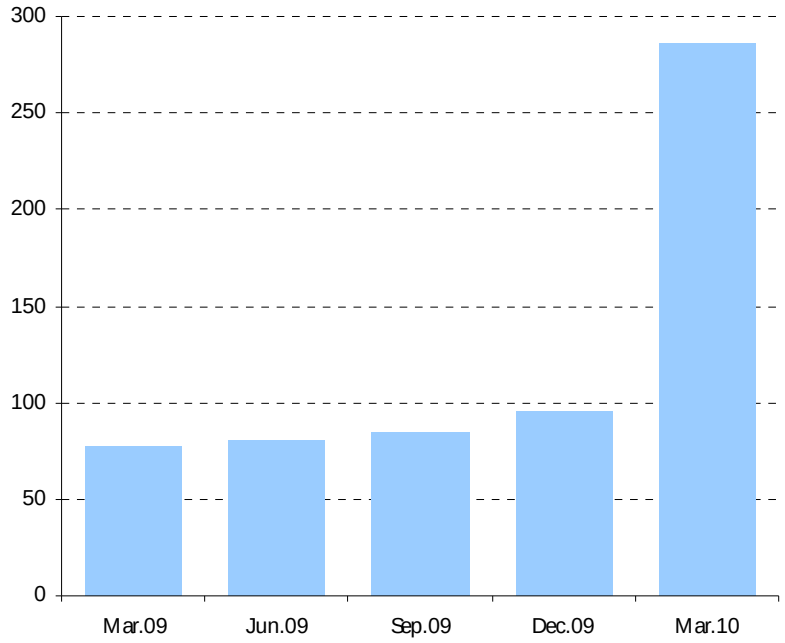
[21] For example, bonds are classified either in "Interest-bearing debt" or in "Other financial liabilities".

Dealing with an increasing number of companies providing information under IFRS

Since the first reporting period in 2009, the number of companies reporting every quarter has increased according to the gradual process of adoption of IFRS in our country (Graph 2 and Annex 3). This has compelled the Bank to adapt its internal operating processes in order to manage an increasing load of information, while at the same time educating the new companies about the Bank's validation criteria.

Graph 2

Number of companies reporting under IFRS



Source: Central Bank of Chile.

Multiple databases

Another issue to be considered is that the Statistics Division has to keep and manage three parallel databases. The first one corresponds to the official consolidated financial statements under IFRS published on the SVS web page. The second one is the database that includes financial statements, both individual and consolidated, of those companies still reporting under Chilean accounting standards. Finally, the third database contains all the information on individual financial statements and the specific notes provided by SVS-listed companies to the Central Bank through the Superintendency.

4. Future challenges

The whole process of compilation and validation of IFRS-based financial statements, individual information and the specific notes requested by the Bank is working fairly well, as several improvements have been made along the way. That notwithstanding, there is still plenty of room for upgrades.

Better technology: XBRL

Given the free report characteristic of IFRS and its changing nature, the current system of compilation of all information coming to the Bank (SVS and the Bank's own requests) is too costly both in terms of the number of people dedicated to the task and the number of days the whole process is taking. As mentioned, XBRL is just starting and is not mandatory yet. In the future, if all the companies send IFRS financial statements using XBRL, individual financial statements and the special notes of the Central Bank will also have to be sent through the same channel. The objective of this is to ensure that reporting companies have just one way of sending the information, thereby facilitating submission.

Despite the cost involved in developing the taxonomies for the individual financial statements and the specific notes, the Bank believes that the benefits should largely outweigh the costs.

Closer coordination with the SVS

Although the Bank has developed a close relationship with the SVS, the good level of coordination between the two entities must be maintained, and improved in those areas where there is room for that. These areas include full adoption of XBRL.

Further changes in accounting policies

Considering the recent financial crisis and the ensuing discussions on a reform of the financial sector in some countries, further changes in accounting policies are expected in the future. Should this be the case, the Bank expects to work in coordination with the SVS, and to follow very closely the international developments in this area.

5. Concluding remarks

After eighteen months of operation, the Central Bank and the SVS have reached a good level of coordination and the companies have proved to be cooperative. However, the compilation and validation work still has room for improvement, and to this end, technology is crucial. This becomes even more essential considering the changing nature of IFRS, which in turn requires a permanent updating of the Bank's information requests.

Two important lessons can be extracted from the process of implementation of IFRS for nonfinancial companies and its impact on financial stability monitoring at the Central Bank of Chile. The first is that free reporting, which is a key part of IFRS, is a major disadvantage for the work of systemic supervisors that need to analyze aggregate data. In the case of the Central Bank of Chile, time has proven that our main concerns in this regard were justified. In particular, with respect to currency risk, a comparison between the disclosure under local standards and under IFRS showed that the gap is wide[22, 23]. In the case of indebtedness, companies are in general showing information similar to that shown in the past. In many cases, data about amortization or currencies exist, but are hard to find, and information about interest rates is often omitted.

---

[22] This exercise was carried out with all the companies reporting under IFRS as of December 2009.

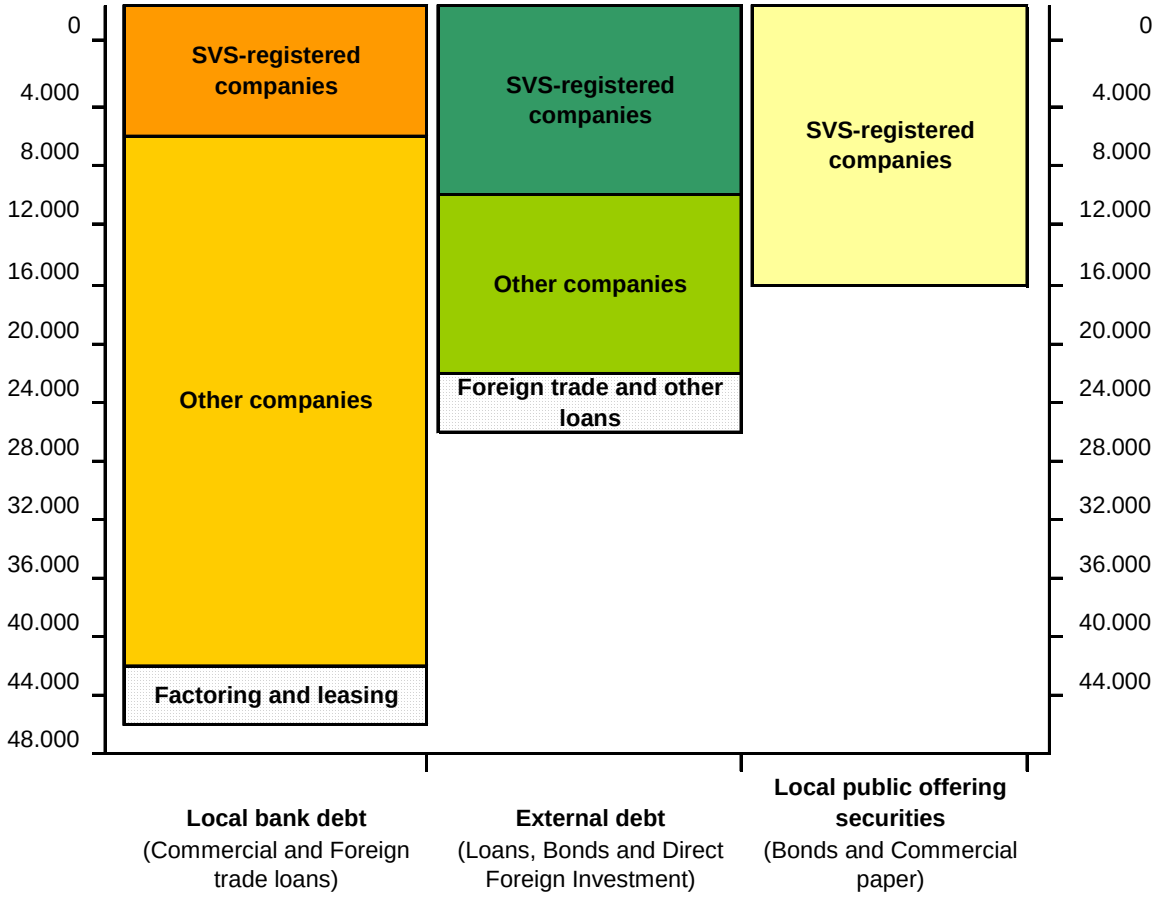
[23] Ernst & Young (2009) made an assessment of the first financial statements under IFRS in Chile and concluded that, in terms of financial risk administration, 10% of the companies did not reveal any information and only 24% of them showed a sensitivity analysis of the results on this note.

A second lesson is that having a body whose mandate is to safeguard financial stability without the power to request necessary information directly from the firms can be problematic. In Chile, this responsibility lies with the Central Bank, while the body that has the authority to request such information is the SVS, whose objectives do not explicitly include financial stability. Though this fact has been mitigated with coordination and communication between the two parties, a direct relationship with reporting companies would make the compilation and validation process much more cost-effective.

Annex 1

SVS-registered companies and the sector's aggregate debt

(billion pesos as of December 2009)



Source: Central bank of Chile, based on information from the SBIF and the SVS.

Annex 2

Entities supervised by the SVS: due dates for adopting IFRS

as of August 2007

Entity	Due date (*)
Corporations (most traded)	January 1, 2009
Other security issuers, stock exchanges, commodity exchanges, securities depository	January 1, 2010
Other companies – non-issuers	January 1, 2011
Securitization companies	January 1, 2011
Mutual funds, investment funds, housing funds and FICEs (foreign capital investment funds)	January 1, 2010
Security agents, stock brokers and commodity exchange brokers	January 1, 2010
Insurance companies, insurance brokers and pension fund administrators	January 1, 2010

(*) Comparative financial statements not requested during the first year of implementation. Companies may adopt IFRS at an earlier date if desired.

Source: SVS website (www.svs.cl).

Annex 3

Nonfinancial companies supervised by the SVS: due dates for adopting IFRS (*)

as of June 2009

Entity	Reporting period	How to report financial statements
Corporations (most traded).	2009	Four options are given: #1 (full IFRS): Quarterly and annual statements for 2009 and a comparable period of 2008 under full IFRS. #2 (pro forma): Quarterly and annual statements for 2009 under local accounting standards. In addition, quarterly and annual statements for 2009 (with no comparisons with 2008) under full IFRS. Starting in 2010, both periods (2010 and 2009) under IFRS will be required. #3 (full IFRS annual basis): First three quarters under local accounting standards and full year under IFRS, with 2009 comparison. Starting in 2010, both periods (2010 and 2009) under IFRS will be required. # 4 (pro forma annual basis): Quarterly and annual statements for 2009 under local accounting standards.
Other corporations	2010	Quarterly and annual statements for 2009 and a comparable period of 2008 under full IFRS

(*) Reporting dates for the rest of the entities supervised by the SVS were also delayed.

Source: SVS website (www.svs.cl).

Annex 4

4.1 Annex on Local and Foreign Currency Assets

	Current period	Previous period
Current assets (1)		
USD		
Euros		
Other currencies		
Chilean pesos		
U.F. (2)		
Non-current assets (3)		
USD		
Euros		
Other currencies		
Chilean pesos		
U.F. (2)		
Total assets		
USD		
Euros		
Other currencies		
Chilean pesos		
U.F.		

(1) Must report separately cash and cash equivalents, other current financial assets, trade and other current receivables and current receivables from related parties.

(2) Inflation-indexed unit.

(3) Must report separately noncurrent receivables and noncurrent receivables from related parties.

4.2 Annex on Local and Foreign Currency Liabilities

	Current Period				Previous Period			
	Up to 90 days		91 days to 1 year		Up to 90 days		91 days to 1 year	
	Amount	Percentage of fixed-rate liabilities	Amount	Percentage of fixed-rate liabilities	Amount	Percentage of fixed-rate liabilities	Amount	Percentage of fixed-rate liabilities
Total current liabilities								
USD								
Euros								
Other currencies								
Chilean pesos								
U.F. (1)								
Total other current financial liabilities (2)								
USD								
Euros								
Other currencies								
Chilean pesos								
U.F. (1)								
Other current liabilities								
USD								
Euros								
Other currencies								
Chilean pesos								
U.F. (1)								
Total non-current liabilities								
USD								
Euros								
Other currencies								
Chilean pesos								
U.F. (1)								
Total other non-current financial liabilities (3)								
USD								
Euros								
Other currencies								
Chilean pesos								
U.F. (1)								
Other non-current liabilities								
USD								
Euros								
Other currencies								
Chilean pesos								
U.F. (1)								

(1) Inflation-indexed unit.

(2) Must report separately banks loans, unsecured obligations, secured obligations, convertible loans, issued capital and shares classified as liabilities, financial leasing, overdrafts and other current financial liabilities.

(3) Must report separately banks loans, unsecured obligations, secured obligations, convertible loans, issued capital and shares classified as liabilities, financial leasing, overdrafts and other non-current financial liabilities.

Current liabilities

Bank ID	Name of the bank	Contractual or residual	Currencies										Total nominal value		Total accounting value	
			USD		Euros		Other currencies		U.F.		Chilean pesos					
			Current period	Previous period	Current period	Previous period	Current period	Previous period	Current period	Previous period	Current period	Previous period	Current period	Previous period	Current period	Previous period
	TOTAL															
	Amount of owed capital															

For loans that represent more than 10% of total bank loans, additional information is required:

Bank ID	Name of the bank	Currency	Maturity date	Contract interest rate	Effective interest rate	Indexation	Amortization type	Total nominal value		Total accounting value	
								Current period	Previous period	Current period	Previous period
TOTAL											

Non-current liabilities

Bank ID	Name of the bank	Currency	Years to maturity			Current period		Previous period
			From 13 month to 5 years (Amount)	From 61 months		Total non-current (Nominal value)	Total non-current (Accounting value)	Total non-current (Accounting value)
				Amount	Maturity date			
TOTAL								

For loans that represent more than 10% of total bank loans, additional information is required:

Bank ID	Name of the bank	Currency	Maturity date	Contract interest rate	Effective interest rate	Indexation	Amortization type	Total Nominal Value		Total accounting value	
								Current period	Previous period	Current period	Previous period
TOTAL											

References

Bleakley, H. and K. Cowan. 2009. "Mishmash on Mismatch? Balance-Sheet Effects and Emerging-Markets Crises. http://home.uchicago.edu\~bleakley\. May.

Epstein, Barry J. 2009. "The Economic Effects of IFRS Adoption". *The CPA Journal*. March.

Ernst & Young. 2009. "IFRS Handbook 2009: Una guía para la implementación de IFRS en Chile". October.

Standard & Poor's. 2007a. "IFRS Figures Require Significant Adjustments to Deduce True Performance of Corporate Issuers". RatingsDirect. January 22.

Standard & Poor's. 2007b. "IFRS After Transition: What's In Store For Standard & Poor's Credit Analysis". RatingsDirect. January 23.

Standard & Poor's. 2007c. "More Clarity Needed in IFRS Accounts of European Corporates". RatingsDirect. January 25.

Superintendencia de Valores y Seguros. 2008. "La cuenta regresiva hacia a IFRS en Chile: desafíos y responsabilidades". Presentation by the Superintendent, Mr. Guillermo Larraín. March.

A new approach to MFI interest rate statistics in Croatia

Ivana Usorac[1] and Igor Jemrić[2]

1. Introduction

The Croatian National Bank (CNB) is responsible for the compilation of monetary financial institution (MFI) interest rate statistics as part of monetary statistics. The current MFI interest rate statistics are based on data collected from reporting institutions by the CNB via a structurally fixed report. The results are published in the CNB bulletin and are also used by CNB researchers for different monetary and financial stability analyses.

As Croatia is in the process of joining the European Union (EU), the CNB is obliged to harmonize its legislation and reporting standards with EU requirements. This was one of the reasons why the CNB started developing a new approach to MFI interest rate statistics.

This paper concentrates on new methodology and especially on the new reporting system for MFI interest rate statistics. After the introduction, the current situation and main reasons for abandoning the old system are explained, followed by an overview of the new methodology and concept of the new reporting system. In the main part, the structure of the new report "KS" (input side of the system) and data warehouse (output side of the system) are introduced. Finally, the text concludes with some remarks on the usability of new data for the CNB analyses.

2. Current situation

Currently, the MFI interest rate statistics in Croatia comprise interest rates applied by reporting institutions on new loans and new deposits vis-à-vis resident households and nonfinancial corporations in the reporting month. The reporting institutions are banks, savings banks and housing savings banks.

Current MFI interest rate statistics are not able to provide all the data needed to fulfill the European Central Bank (ECB) requirements laid down in Regulation ECB/2001/18[3] and its amendments[4]. Below we briefly summarize four major disadvantages of current MFI interest rates statistics that should be resolved in order to harmonize the data with the ECB requirements.

The first one is lack of data on interest rates on outstanding amounts because the current report only provides data on the following: amounts of new loans and new deposits, outstanding amounts of loans and deposits, weighted average nominal interest rates on new

---

1 Statistics department, Croatian National Bank, ivana.usorac@hnb.hr.

2 Statistics department, Croatian National Bank, igor.jemric@hnb.hr.

3 Regulation (EC) No 63/2002 of the ECB of 20 December 2001 concerning statistics on interest rates applied by monetary financial institutions to deposits and loans vis-à-vis households and nonfinancial corporations.

4 Especially the amendment with significant changes: Regulation (EC) No 290/2009 of the ECB of 31 March 2009 amending Regulation (EC) No 63/2002 (ECB/2001/18) concerning statistics on interest rates applied by monetary financial institutions to deposits and loans vis-à-vis households and nonfinancial corporations (ECB/2009/7).

loans and new deposits and weighted average effective interest rates on new loans. Interest rates on outstanding amounts are reported only for instruments where outstanding amounts represent new business.

The second deviation from the standard is the calculation of nominal interest rates. Nominal interest rates are defined as agreed rates individually negotiated between the customer and the reporting institution and do not include any charges. They are quoted in percentages per annum and do not take into account the number of interest payments within the year, as the annualized agreed rate (AAR) does, nor are they calculated in the same way as the narrowly defined interest rate (NDER).

The third problem is related to the definition of new business, especially regarding the amount and the time of reporting. Namely, for new loans, according to the ECB regulation, at the time of agreement the whole amount agreed on should be reported. Instead, in the current system in Croatia, only the amount actually withdrawn is reported as a new loan, and it relates only to the reporting month in which it is recorded in the balance sheet. Also, following the same principle, for loans in tranches, every tranche is reported as a new loan (in the appropriate month). On the deposit side, for time deposits, automatic prolongations with accrued interest are also treated as new business instead of being captured only in outstanding amounts.

The last shortcoming of the current system is related to data breakdowns (by sectors, currency, original maturity and types of loans/deposits); these should be adjusted and some additional criteria added to bring them into line with the ECB requirement. Regarding the sectoral breakdown, the scope of the reporting is in line with ECB/2001/13 as long as Croatia uses the kuna as a national currency. However, once it adopts the euro, the report will need to be expanded on households and nonfinancial corporations resident in the European monetary union. In addition, nonprofit institutions serving households have to be added in the household sector, which should provide separate data on sole proprietors and households as generally understood. Regarding the currency breakdown, data on instruments denominated in euros are only available for time deposits instead of all instruments. Breakdowns by original maturity and types of instruments are not completely usable for the ECB. Some instruments should be separately shown in a report (for example, revolving loans) and some new instruments should be added. Finally, new criteria should be added to enable classification of data by period of notice, period of initial interest rate fixation, amount of a loan and collateral/guarantees.

3. The new methodology

The new methodology of MFI interest rate statistics expands its definition: it will cover interest rates applied by MFIs in Croatia to deposits and loans in all currencies vis-à-vis all resident and nonresident sectors. MFIs are resident credit institutions which consist of banks, savings banks and housing savings banks (the same as today). The CNB will continue to collect the data from the whole reporting population (census).

With regard to business coverage, reporting institutions will continue providing data on the amounts and interest rates (nominal and effective) on new business and start delivering new data on weighted average nominal interest rates on outstanding amounts of loans and deposits.

In order to be in line with the ECB requirements, nominal interest rates are collected as annualized agreed rates (AAR)[5].

The subsidies provided to customers by third parties are treated in terms of reporting institutions. In other words, only those interest rates paid or received by the reporting institution are shown. Favorable rates that reporting agents apply to their employees are included.

Interest rates on loans for restructuring below market conditions (for new loans and outstanding amounts) are not collected for the purposes of MFI interest rate statistics. These loans should be excluded if they are granted with at least a 30% lower interest rate compared to the lowest interest rate published by the reporting institution for this type of loan and its maturity. Interest rates on bad loans for outstanding amounts are also excluded. The CNB defines bad loans as partially recoverable or fully irrecoverable loans for which there is evidence of impairment identified (risk categories B-1, B-2, B-3, C) and fully recoverable loans that have a delay in collection of more than 90 days (risk category A9).

The AAR on outstanding amounts has to cover interest rates on both undue and due stocks (due stocks include only fully recoverable stocks that have a delay in collection of less than 90 days – risk category AA). If they are different, which is usually the case, they need to be treated separately in the calculation of the AAR. To clarify, for each of these types of outstanding amounts, reporting institutions are required to prepare the appropriate AAR and then calculate their weighted average AAR for that instrument. The intercalary interest rate[6] is not included in the calculation of the AAR for new business, but it has to be shown in the AAR on outstanding amounts.

Effective interest rates (regulated separately from MFI interest rate statistics) cover both interest rates and fees that are directly related to the loan. Effective interest rates are defined in the same way as the annual percentage rate of charge (APRC), so there is no need for harmonization[7]. Effective interest rates are shown for all new types of loans granted to customers. This enables the CNB to ensure the data for the ECB (only 2 indicators – consumer credit and loans for house purchases) and to maintain the existing time series (data on all types of loans).

The definition of new business in the new MFI interest rate statistics is harmonized with the ECB regulation and covers any new or redefined agreement between the client and the

---

[5] The AAR is defined as the interest rate individually agreed on between a reporting institution and its customer, converted to an annual basis, taking into account the frequency of interest payments, and quoted in percentages per annum. The formula for calculating the AAR is:

$$AAR = \left(1 + \frac{r}{n}\right)^{n} - 1$$

where for new businesses “r” is the nominal interest rate on an annual basis agreed on between the reporting units and the client; for outstanding amounts, “r” is the nominal interest rate on an annual basis applied to that reporting month; “n” is the number of interest capitalization periods for the deposit and (re)payment periods for the loan in a particular year (the frequency of principal payments is not taken into account when calculating the AAR).

Exceptionally, for new business where a number of different, predetermined interest rates is agreed on, the interest rate on new business is computed as a geometric average of the factors 1+AAR per year for each interest rate.

[6] The intercalary interest rate is an interest rate which a client pays before repayments of a loan starts. Usually, it equals the nominal interest rate, but may also differ from it.

[7] The effective interest rate is an end-of-period interest rate, reported at the annual level by applying the compound interest calculation method, by means of which discounted cash inflows are balanced against discounted cash outflows, i.e. a discounted series of net cash flows equals zero.

reporting institutions. It comprises all financial contracts that specify the interest rates for deposits or loans for the first time and any new negotiations of existing deposits and loans. In negotiations of new terms for existing contracts, it is important that a client is actively involved, because automatic prolongations of existing contracts by the reporting institutions are not considered new business. For loans, the total amount of the agreed loan must be reported as new business at the time it is agreed on. New business in terms of time deposits usually relates to the first amount of the deposit placed in the reporting period. If there is a possibility of additional payments for this deposit, they are not considered new business. An exception is related to agreements for which a reporting institution is ex ante certain that it will receive all the amounts agreed on. In that case, the same rules as for new loans are used.

Outstanding amounts are defined as the stock of all deposits placed by all sectors with reporting institutions and the stock of all loans granted by reporting institutions to different sectors at the end of the reporting period.

In MFI interest rate statistics there is a specific group of instruments for which outstanding amounts and new business coincide by convention. According to the new methodology these are the following instruments: overnight loans, credit card loans, overdrafts on transaction accounts, revolving loans, transaction accounts, savings deposits, deposits redeemable at notice, hardware-based and software-based e-money. All of them can be shown individually or grouped with other instruments.

Data on new business and outstanding amounts are broken down by many criteria: clients on an individual and group basis, economic sector and residency, product category, currency and indexation, maturity, period of notice, period of initial rate of fixation, risk category, amount of a loan and collateral/guarantee. Some of them are introduced for harmonization with ECB reporting standards and some for CNB purposes. Before we go any further with explanations of these breakdowns, the new reporting system should be introduced.

4. New reporting system

The new MFI interest rate statistics are based on a broader reporting system for statistical and supervisory purposes. The CNB started to develop that system in 2007 to ensure that data met the ECB, Eurostat and Committee of European Banking Supervisors (CEBS) requirements in part of the FINREP reports, since neither of the current systems was appropriate for the complexity of those requirements. The idea was to cover all the data needed for both purposes through the single reporting system and thus to reduce the reporting burden for reporting institutions. The new flexible reporting system enables compilation of aggregates by different rules and can be easily adjusted to any new methodological updates. As a result, a new set of data will be used for a wide range of purposes: balance sheet statistics, interest rate statistics, balance of payments statistics, financial accounts, securities statistics, supervisory statistics (which include data on supervisory balance sheets, profit and loss accounts, exposures of credit institutions, bank shareholders, significant debtors, investments in capital of nonfinancial corporations) and so on.

In order to provide all the necessary information for these purposes, the new reporting system is designed to collect the data on an elementary basis, to the extent possible. The major principle here is to collect the data on a client-instrument principle, enabling reporting institutions to provide the data directly from their bookkeeping records instead of preparing any structured scheme for the data provided. This gives the possibility for the compiler (instead of reporting institutions) to aggregate data in a very flexible manner, in order to cover any structural dimension of aggregates that might be needed for any of the above-mentioned purposes. For example, it enables the compilation of balance sheet data for monetary statistics, in which breakdowns by sectors and types of instruments are essential, or for supervision, where aggregates are broken down by portfolios. Also, in such a flexible

system, any possible changes of rules for aggregation that might appear as a result of changes in the requirements (and that relate to some of the attributes that describe each individual record in the database) can be easily implemented without any additional requirement for reporting institutions.

One of the major advantages of the client-instrument principle of the system is that reporting institutions do not group resident counterparties by sector, but rather submit the data at the level of an individual counterparty (legal persons) or group of counterparties (physical persons, which comprises sole proprietors and other physical persons). Instead of reporting institutions, the CNB classifies resident clients in appropriate sectors, following the classification rules given by the European System of Accounts (ESA95)[8]. This leads to a better accuracy of data, avoiding the possibility of the sectoral misclassification of clients, which happened sometimes in the old system that was based on the methodological description of sectors provided to reporting institutions (those mistakes became apparent via the comparison of aggregated data from the two systems). Also, if there are any future changes in sector definitions or if certain clients change sectors, this can be easily carried out by the compiler (the sector classification database itself has a time dimension). Finally, in this system the CNB has the possibility of excluding or including certain groups of clients for its specific analyses or even tracking the data on individual clients.

As already mentioned, the data are supplied in the form of records, instead of tables, which gives more flexibility in collecting and compiling the data. The system as a whole comprises 18 different records for now, which are used for different purposes, but the same logic of structure is applied to most of them – each reported amount (corresponding to one record) has to be uniquely described in order to allow the formation of different aggregates. There are three main groups of attributes that describe reported amounts. The first group of attributes (group A) enables the identification of a report, reporting period, type of report, reporting institution and counterparty (residency, country, etc.). The second group of attributes (group B) enables the identification of instruments and their characteristics (currency and indexation, original maturity, portfolio, risk category, etc). The third group of attributes (group C) enables the identification of the type of amount (outstanding amount, accrued interest, principal and interest arrears, value adjustments, nominal and effective interest rates, etc.). In addition, the fourth group of attributes (group D) provides information on the record number and the status concerning its correctness.

Figure 1

The concept of reporting records

Description			**Amount**
Reporting institution and client	Instrument	Type of amount	Amount

Source: CNB, Instructions for statistical and supervisory reporting.

The types of records included in the new reporting system can be classified into four groups: those related to the balance sheet, those related to the individual data on specific clients, those related to the data on interest rates and those related to the profit and loss account.

[8] In order to harmonize the existing sectors in all official statistics in Croatia, a working group was established with representatives of three institutions: the Croatian National Bank, the Central Bureau of Statistics and the Ministry of Finance.

The basic reporting record is “AA”, through which the individual data on balance sheet and off-balance sheet items is reported. In additional reporting records the following data are reported: remaining maturity, possibility of interest rate reset, overdue receivables, changes in the balance sheet used for flows statistics, cumulative changes in value adjustments and provisions, currency-induced credit risk, financial positions of specific clients, exposure to clients, investments in capital, tangible and repossessed assets, providers of collaterals and guarantees and fiduciary shareholders, specific indicators and accompanying lists of certain clients. Also, one additional reporting record is related to MFI interest rate statistics, and in the future the record for the profit and loss account will be introduced.

The current reporting framework was put into force via the CNB’s decision and is accompanied by comprehensive instructions that provide all methodological explanations, lists of possible modalities for all attributes, rules for combining attributes, and their fulfillment with accurate modalities for each report.

All reports consist of the obligatory number of attributes that have to be completed depending on the type of reporting record. Additional reporting records are created on the principles of the basic report, resulting in mutual comparability to some extent (where the attributes are the same). The attributes in each report are completed with different modalities (from a predefined list) according to the permitted combinations of instruments and counterparties (for example, each report has defined instruments, types of amounts, etc.). If there are two records in which all attribute modalities are the same, they should be aggregated for reporting purposes, but if the modality of any single attribute differs, a new reporting record should be created.

5. Input side of the system – the new report “KS”

One of the additional reporting records is related to the MFI interest rate statistics (reporting record “KS”). During 2010 this record is in a testing period, in which reporting institutions are supposed to provide the CNB with data on interest rates through both systems (old and new).

The reporting record “KS” is designed based on the same logic as the basic reporting record “AA” and its attributes. Most of the attributes are the same, although some of the attributes of “AA” are not relevant for the MFI interest rate statistics and therefore are excluded from “KS”. On the other hand, some new attributes are added.

Due to the client-instrument principle and the mutual consistency of the attributes between “AA” and “KS”, the compiler is able to link clients’ outstanding amounts from the balance sheet with their interest rates.

The scheme of the reporting record “KS” is given below:

Figure 2

Reporting record "KS"

A group of attributes									
Report				Reporting institution		Counterparty (client)			
Report	Reporting period	(Un)consoli-dated report	Temporary or revised report	Identification number	Tax number	Identification number of a client	Tax number of a client	Country or international institution	Non-resident sector
B group of attributes									
Instrument	Currency	Original maturity	Period of notice	Indexation	Portfolio	Risk category	Amount of a loan	Initial period of interest rate fixation	Collateral/ Guarantees
C group of attributes									
Type of amount									
D group of attributes									
Record number	Status								

Source: CNB, Instructions for statistical and prudential reporting.

The attributes "Type of report" (report "AA", report "KS", etc.), "(Un)consolidated report" and "Temporary or revised report" describe the type of report and enable the subsequent grouping of records. The last two are more important for reports which can have all combinations (for example, the balance sheet), but for report "KS" predefined codes should be entered. "Reporting period" enables the identification of the period to which a particular record relates and the creation of time series. In the case of "KS" it refers to the end of the reporting month.

"Identification number" and "Tax number" should be reported for the reporting institution and its counterparties. The identification number is a unique number for each resident legal entity assigned by the Croatian Central Bureau of Statistics. The tax number is given by the Ministry of Finance for residents, both legal and physical persons. It will eventually replace the identification number but for now it is still in the process of implementation in Croatia. For clients, in addition, "Type of counterparty" is requested to separate residents from nonresidents. For residents, legal persons, sole proprietors and physical persons are identified, which enables CNB to perform appropriate sector classification. Nonresidents are divided into MFIs from the EU and other nonresidents. The identification of MFIs from the EU is based on the list issued by the ECB on the last day of the reporting period. Nonresidents are additionally broken down by "Country or international institution" according to international standards (ISO standard 3166) and the BoP Vademecum (Annex I and Annex II) and by "Nonresident sector" defined by ESA95. Code lists for these two attributes are provided and maintained by the CNB.

"Instruments" covers all types of loans and deposits on the asset and liability sides of the balance sheet (45 instruments with a unique code and definition for each of them). Their definitions are the same as for the balance sheet report (record "AA") to ensure their mutual consistency. In selecting the proper instrument for a type of loan, a specific algorithm should be followed: the first step is to determine whether it is a specific loan or a loan whose purpose is known, after which nonpurpose loans are classified by type of collateral.

"Currency" enables the breakdown of instruments by all world currencies in which they are denominated (defined by ISO standard 4217). The code list is provided and maintained by the CNB. "Original maturity"[9] is determined at the moment the deposit or loan is agreed on

[9] Original maturity refers to the fixed period of life of a financial instrument before which it cannot be redeemed or before which it can be redeemed only with some kind of penalty.

and it remains unchanged during the life of the financial instrument. In addition, this attribute includes information on the grace period (if any) and it is counted in months. “Period of notice” is the period between the moment a holder gives notice of an intention to redeem the deposit and the time when the holder is allowed to convert it into cash without incurring a penalty. It is counted in months, and it is to be reported only before the period of notice has been initiated. “Indexation” relates to instruments denominated in one currency but payable in another. It covers instruments that are not indexed, or are indexed to a currency with a two-way currency clause and with a one-way currency clause. It shows the data on domestic currency not indexed and indexed to a foreign currency (for example, the kuna indexed to the euro) and foreign currency not indexed and indexed to another foreign currency.

The “Portfolio” attribute relates not only to portfolios of financial assets or financial liabilities in accordance with the International Accounting Standards, but generally to the linking of specific instruments according to certain common criteria. The CNB defined 17 portfolios to fit supervision needs. For example, there is a portfolio of financial instruments held by trading, a portfolio of financial instruments available for sale, a portfolio of loans and receivables, etc. This attribute is not important for MFI interest rate statistics, and the predefined value “Not applicable” is used in order to be in line with the concept of logical checks for the whole system[10]. “Risk category” shows the type of loan according to the degree of credit risk for reporting institutions. It helps in determining bad loans that should be excluded from MFI interest rate statistics. The risk categories are: fully recoverable loans without delay and with delay in collection of more than 90 days, partly recoverable loans and fully irrecoverable loans.

“Amount of a loan” enables a breakdown according to the amount of new loans. It comprises three groups – up to 2 million kuna, from 2 to 7.5 million kuna and over 7.5 million kuna, in order to be in line with ECB requirements. “Amount of a loan” relates to one credit transaction and not to the entire business between companies and reporting units. This attribute enables an insight into the financing of small, medium and big enterprises. “Initial interest rate fixation period” enables a distinction between variable interest rates, interest rates fixed for a certain period and interest rates fixed through the whole original maturity of new loans. “Initial interest rate fixation period” is defined as a predetermined period at the start of a contract during which the value of the interest rate cannot change[11]. The attribute “Collateral/Guarantee” determines whether new loans are collateralized or not.

The attribute “Type of amount” enables the identification of all elements in the reporting record and the proper interpretation of received amounts (is it principal, accrued interest, value adjustments, write-down/write-off, etc.). For report “KS” there are four types of amounts – amount of new business, nominal interest rates on new business, nominal interest rates on outstanding amounts and effective interest rates on new loans.

“Record number” and “Status” are technical attributes, describing the position and the character of the record (whether it is a regular or a corrected record). Records are corrected according to the cancellation-correction principle, i.e. every row has to be cancelled with a new row before the corrected row can be received.

---

[10] The concept of logical checks for the new reporting system is based on three key attributes: instrument – portfolio – type of amount. Therefore, key attributes have to be filled in for each record.

[11] The value of the interest rate is considered to be unchangeable if it is defined as the exact level, such as 10% or a differential with reference to a reference rate at a certain point in time, for example, six-month EURIBOR plus two percentage points at a certain date and time.

6. Data aggregation

There are two levels of aggregating data in the new MFI interest rate statistics: at the level of the reporting agents and at the level of the CNB. Once Croatia enters the EU and adopts the euro as its national currency, the third step of aggregation will be performed at the ECB.

Reporting agents should aggregate data only when there are records with the same characteristics for all attributes (the same counterparty, instrument, currency, type of interest rate, etc.) or when clients are reported on a group basis. Weighted average interest rates should be calculated according to their volume. The formula for weighted average interest rates is:

$$WAIR = \frac{\sum_{i=1}^{n} AAR_i \times w_i}{\sum_{i=1}^{n} w_i}$$

where:

WAIR	The weighted average interest rate (nominal or effective).
AAR_i	The adjusted nominal interest rates.
wi	The weights for calculation of the weighted average interest rate (nominal or effective) on new business are amounts on new business operations conducted during the entire reporting month. The weights for calculation of the weighted average interest rate (nominal) on outstanding amounts are stocks on the last day of the reporting month (including due stocks, fully recoverable, with a delay in collection of less than 90 days).

The second level of aggregation is done in the CNB, whose task is to calculate weighted average interest rates on new business and outstanding amounts for Croatia.

Data on new business – amounts and interest rates – are collected through report “KS”. The CNB is able to calculate weighted average interest rates on every type of aggregate, and it is only necessary to connect records on amounts and interest rates with the same characteristics, i.e. the modalities used in each attribute.

Outstanding amounts are taken from the basic report for data on balance sheet and off-balance sheet items (report “AA”). Report “AA” has a few more attributes than report "KS", but it can be easily adjusted by aggregating unnecessary attributes or their modalities in order to be comparable with the scheme of report “KS”. For every interest rate from report “KS”, an appropriate outstanding amount from report “AA” should be found. Outstanding amounts have to be calculated on a gross basis, without netting by impairments or adding accrued interest, before being taken from report “AA”. After that, weighted average interest rates for MFI interest rate statistics can be calculated.

Report "AA" consists of 25 attributes (see picture below). Compared to report "KS", the additional attributes are: "County"[12], "Relationship between reporting institutions and clients"[13], "ISIN"[14], "Marketability of loans"[15], "Equity characteristics"[16], "Embedded derivative"[17] and "Underlying variable"[18]. Aggregation of these attributes results in the same scheme for interest rates on outstanding amounts, considering that the last three attributes from the B group in reporting record "KS" are only used for new business. Pairs can be formed where the same combinations of attribute modalities exist in both records. Exceptionally, the attribute "Portfolio" in report "KS" represents all portfolios in report "AA", so for data pairing, all codes in "AA" have to be summarized. Also, securitized loans are excluded from "AA".

The scheme of basic reporting record "AA" is given below:

Figure 3

Basic reporting record "AA"

A group of attributes											
Report				Reporting institution		Counterparty (client)					
Report	Reporting period	(Un)consoli-dated report	Temporary or revised report	Identification number	Tax number	Identification number of a client	Tax number of a client	County	Country or international institution	Non-resident sector	Relationship between reporting institutions and clients
B group of attributes											
Instrument	ISIN	Currency	Original maturity	Period of notice	Indexation	Portfolio	Marketability of loans	Equity character-istics	Risk category	Embedded derivative	Underlying variable
C group of attributes											
Type of amount											

Source: CNB, Instructions for statistical and supervisory reporting.

In addition, in the following figure the schemes of both records are given, showing attributes that should be aggregated (marked in gray) in order to be able to interlink them.

[12] "County" is not obligatory and it is completed only for domestic physical persons or sole proprietors.

[13] "Relationship between reporting institutions and clients" enables identification of the ownership relationship between reporting institutions and clients. There can be no relationship, a primary relationship (mother-daughter) and a secondary relationship (sisters). In addition, the percentage of ownership is shown, denoting the holdings of the client in the reporting institution and/or the holdings of the reporting institution in a client (both ways).

[14] "ISIN" enables identification of the ISIN code assigned to securities in accordance with the ISO standards used in international securities trading or the CNB code for specific securities without ISIN codes, shares in investment funds and specific short-term papers.

[15] "Marketability of loans" describes degrees of marketability: non-marketable, occasionally traded and securitized loans.

[16] "Equity characteristics" enables identification of subordinated debt instruments, giving them some of the characteristics of shares and other equity. The code list is provided in accordance with the supervisory regulation on capital adequacy of banks.

[17] "Embedded derivative" defines whether a financial instrument has an embedded derivative. An embedded derivative is an inseparable component of a financial instrument, unlike a derivative that is attached to a financial instrument but is contractually transferable independently of that instrument, or which has a different counterparty (this is a separate financial instrument).

[18] "Underlying variable" denotes a variable whose value changes affect the value of a derivative or a financial instrument with an embedded derivative. Underlying variables relate to interest rates, exchange rates, share prices, goods, etc.

Figure 4

Linkage between reporting records "AA" and "KS"

Report "AA"

A group of attributes											
Report				Reporting institution		Counterparty (client)					
Report	Reporting period	(Un)consoli-dated report	Temporary or revised report	Identification number	Tax number	Identification number of a client	Tax number of a client	County	Country or international institution	Non-resident sector	Relationship between reporting institutions and clients
B group of attributes											
Instrument	ISIN	Currency	Original maturity	Period of notice	Indexation	Portfolio	Marketability of loans	Equity character-istics	Risk category	Embedded derivative	Underlying variable
C group of attributes											
Type of amount											

Report "KS"

A group of attributes									
Report				Reporting institution		Counterparty (client)			
Report	Reporting period	(Un)consoli-dated report	Temporary or revised report	Identification number	Tax number	Identification number of a client	Tax number of a client	Country or international institution	Non-resident sector
B group of attributes									
Instrument	Currency	Original maturity	Period of notice	Indexation	Portfolio	Risk category	Amount of a loan	Initial period of interest rate fixation	Collateral/ Guarantees
C group of attributes									
Type of amount									

Source: CNB, Instructions for statistical and supervisory reporting.

7. Output side of the system – data warehouse

The CNB designed a data warehouse (DWH), which contains all data delivered through the new reporting system. The DWH enables searching by parameterized reports with the possibility of filtering, navigation and data decomposition. It includes interactive dashboards with predefined queries, such as aggregated balance sheet for a specific period and in time series, parts of assets and liabilities presented by different breakdowns and levels of aggregation, etc. Also, it provides creation of users' own reports for analysis, monitoring and business planning in the CNB. Ad hoc analysis for business decision-making can be easily created too. Also, the DWH offers personalization of the working environment by selecting the required reports according to users' needs.

For the purposes of MFI interest rate statistics, the DWH will offer:

a) a summary report with the possibility of drilling down to the data at the lowest level of detail stored in the DWH;

b) continuation of current time series through the compilation of existing reports from new data, allowing only limited decomposition of the data;

c) indicators on outstanding amounts and new business for ECB purposes, allowing only limited decomposition of data;

d) creation of ad hoc reports for different analysis by combining different attributes depending on users' needs.

8. Usability of the new MFI interest rate statistics

In general, information on credit and deposit interest rates is necessary to make decisions in conducting monetary policy, and monetary authorities should be promptly and continually informed about their changes. Detailed data on the level of interest rates and their changes over time help in monitoring monetary developments in the country.

The new MFI interest rate statistics collected and compiled through the new reporting system will bring new dimensions to this information. They will improve the quality of reports for the CNB management and the quality of the CNB analyses in different fields (financial stability, external debt, etc.). Many new data analyses will be enabled (data on individual clients and nonresidents, interest rates on outstanding amounts, etc.) Also, once Croatia enters the EU, the CNB will be ready to deliver all the indicators on interest rates and their amounts (for outstanding amounts and new business) required by the EU statistical standards. These indicators will enable comparisons of Croatia's interest rates with those of other EU countries.

Interest rates on outstanding amounts for residents and nonresidents can be helpful for the internal and external debt statistics. If the data on all currencies and indexation are added, they can be connected with the currency structure on loans and deposits. Also, one of the CNB analyses deals with data on deposits and loans that domestic banks accepted and borrowed from their majority foreign owners (usually foreign banks). The aim is to recognize how much domestic banks depend on them due to the fact that over 90% of total bank assets in Croatia are foreign-owned. By expanding data on all deposits and loans from the balance sheet, nonresidents and all other criteria, the new MFI interest rate statistics will provide useful information for this area.

If we move to the financial stability field, which observes movements of banks' interest margins, changes in bank profitability and the potential negative trends that may distort financial stability, it is obvious that new detailed data can improve these analyses.

One of CNB's regular tasks, concerning financial stability analyses, is to determine the degree of indebtedness of particular sectors. Indebtedness depends on the amount of debt and the dynamics of its repayment in relation to the debtor's assets and income. It is important that repayments do not burden the debtor to the extent that the debtor is no longer able to repay the debt. To estimate this reporting burden, different statistical data are used. The amounts of debt and revenues of "a representative debtor" are often estimated on the basis of stock aggregates. The amount of periodic repayments is often calculated from the average aggregate stocks and interest rates on new loans. By introducing the data on interest rates on outstanding amounts, this calculation is significantly improved, because currently a different approach is used: data on new business is combined with data on outstanding amounts.

Bank interest rate policies, set against a background of insured deposits, are prone to moral hazard. At the same time, high deposit rates feed into loan rates, increasing them and driving away most creditworthy customers. Such a phenomenon, known as "adverse selection", may significantly increase the overall riskiness of a bank's balance sheets. Kraft and Galac [9] demonstrate, using the Croatian example, that expansion of moral hazard and adverse selection may be of practical importance for the stability of the banking system. They showed that high deposit interest rates in risk-loving banks helped fund their expansion in the late 1990s as depositors didn't care about the underlying risks. Moreover, the level of bank interest rates was a reliable signal of increased bank asset risk and subsequent distress.

This makes data on deposit and loan interest rates for individual banks an important component of the early warning systems on potential distress risk[19].

One of the analyses in the financial stability area refers to the possibility of income smoothing by banks' management. Income smoothing is defined as manipulation, using provisions for bad loans to smooth incomes: in bad years incomes are evaluated with smaller growth of provisions, which is compensated in good years. The objective is to moderate income variability over the years by shifting income from good years to bad years. The analyses use data on bank loans classified by risk category to determine whether and how the evaluation of the risk category for loans given to the same legal entity differs across reporting agents. New data on interest rates on outstanding amounts for loans broken down by clients and risk categories will help the CNB to determine how much interest rates on these loans differ and correspond to their degree of risk.

Furthermore, use of banks' internal risk assessments, which have a prominent role in the Basel II system, is increasing. Having a correct risk assessment is a source of comparative advantage for a bank, since inconsistencies and errors in a bank's rating may cut into its income or exacerbate the problem of adverse selection. The availability of firm-level interest rate data will enable comparisons of credit ratings and interest rate patterns across companies and banks. This analysis could point to practices of excessive risk accumulation, which may be especially dangerous if coupled with underpricing of risk. Banks may even engage in evergreening on purpose, i.e. lending to insolvent borrowers whose repayment is very doubtful. Usually, this so-called "zombie" lending is provided in the form of restructured loans[20]. Without this restructuring, banks would be forced to classify these loans as "at risk" and then increase their provisions for bad loans, which has an impact on maintaining an adequate level of capital. Also, by keeping unprofitable borrowers alive, banks allow them to distort competition between other firms.

In future CNB analyses, zombie firms could be identified as firms which are receiving an interest rate subsidy[21]. In order to single them out, the firm-level interest rate data can be used to detect the companies whose loans are prolonged with interest rates below the market rate. It can be investigated, whether and to what extent borrowers are able to compensate for the contraction of credit supplied by certain types of banks, by increasing loans from other banks. Then, whether and how the impact of the credit crunch is differentiated according to the firm size (small, medium or big) can be analyzed. Differences according to the size and capitalization of banks can be examined too[22]. Using data on interest rates, the CNB will be able to test the existence of this phenomenon by the following hypothesis: loans not associated with evergreening to riskier borrowers should be linked to higher interest rates. Due to the link between the data on interest rates on outstanding amounts and the balance sheet data, additional information can be provided on the ownership relationship between the client and the reporting institution, which is one of the attributes in report "AA".

---

19 Kraft and Galac, 2007.

20 I.e. granting a new loan to close the existing one or changing the terms of the existing loan.

21 As defined by Caballero, Hoshi and Kashyap, 2008 [1].

22 Caballero, Hoshi and Kashyap showed that in smaller, low-capitalized banks where discretion in lending decisions is higher, the weight of credit scoring is lower than in larger banks where lending decisions are based on more automatic procedures and there is a bigger possibility of providing these kinds of loans.

9. Conclusion

In this paper, the new system for the compilation of MFI interest rate statistics in Croatia is described. The new system was introduced in order to obtain more atomized data (to the level of instrument-client specification) that would allow a more flexible approach to the compilation procedures and thus ensure both a higher quality for the existing series and consistency with the ECB requirement (via the methodological improvement of the new system), as well as a fast response to possible future changes in the requirements with zero cost for the reporting population. The system is actually part of the wider collection system developed within the CNB that covers the whole monetary statistics, as well as the FINREP part of the supervision.

Deriving from the new system, the atomized data, enriched with a comprehensive description by many different attributes, allow not only a perfect fit of the output to the requirements deriving from the EU standards, but also much more intensive (and methodologically more correct) use of these statistics in different analyses, such as the structural analyses of external debt, financial stability analyses and econometric modeling.

Regarding the use of MFI interest rate statistics in the stability analyses, a possible further step in enriching the information could be the introduction of a new attribute – the indexed variable, which would describe for each relationship with the client not only whether the interest rate is fixed, variable or linked to some parameter, but also, in the latter case, to which parameter the rate is indexed. That might give insight into the vulnerability of the system (especially regarding the external debt) to different movements in different economic areas.

References

1. Caballero R.J., Hoshi T. and Kashyap A.K.: “Zombie lending and depressed restructuring in Japan”, American Economic Review, 2008, 1943–1977.
2. Croatian National Bank, Financial stability report, various issues.
3. Croatian National Bank, Instructions for the completion of the report on interest rates on loans and deposits.
4. Croatian National Bank, Instructions for statistical and prudential reporting.
5. European Central Bank, Manual on MFI interest rate statistics.
6. European Central Bank, Regulation (EC) No 63/2002 of the ECB of 20 December 2001 concerning statistics on interest rates applied by monetary financial institutions to deposits and loans vis-à-vis households and non-financial corporations.
7. European Central Bank, Regulation (EC) No 290/2009 of the ECB of 31 March 2009 amending Regulation (EC) No 63/2002 (ECB/2001/18) concerning statistics on interest rates applied by monetary financial institutions to deposits and loans vis-à-vis households and non-financial corporations (ECB/2009/7).
8. European Central Bank, Regulation (EC) No 2423/2001 of the ECB of 22 November 2001 concerning the consolidated balance sheet of the monetary financial institutions sector (ECB/2001/13).
9. Kraft E. and Galac T.: “Deposit Interest Rates, Asset Risk and Bank Failure in Croatia”, Journal of Financial Stability 2, 2007, 312–336.

Session 3 A

The use of surveys to remedy data gaps

Chair: Alberto Karlen, Central Bank of Argentina

Papers:

Capturing the evolution of dealer credit terms related to securities financing and OTC derivatives: some initial results from the new Senior Credit Officer Opinion Survey on Dealer Financing Terms
Matthew J Eichner and Fabio M Natalucci, Board of Governors of the Federal Reserve System

The process of formation of inflation expectations in an information economy
Anna Loleyt and Ilya Gurov, Bank of Russia

Quantifying qualitative data from expectation surveys: how well do expectation surveys forecast inflation?
Teresita Bascos-Deveza, Bangko Sentral ng Pilipinas

Capturing the evolution of dealer credit terms related to securities financing and OTC derivatives: some initial results from the new Senior Credit Officer Opinion Survey on Dealer Financing Terms

Matthew J Eichner and Fabio M Natalucci[1]

Introduction

The Federal Reserve recently initiated a new quarterly survey – the Senior Credit Officer Opinion Survey on Dealer Financing Terms (SCOOS) – collecting *qualitative* information on credit terms and conditions in securities financing and over-the-counter (OTC) derivatives markets. The survey solicits the views of senior credit officers at major dealer firms, in other words those individuals responsible for maintaining a consolidated view of the credit exposures faced by the firm. In several key respects, including its qualitative character and the public dissemination of its results, this new survey is modeled after the Federal Reserve's long-established Senior Loan Officer Opinion Survey on Bank Lending Practices (SLOOS), which provides information about changes in supply and demand conditions for bank loans to businesses and households in the United States. The new survey complements the SLOOS by providing a qualitative picture of changes in credit conditions in the wholesale credit markets that are key conduits for leverage in the financial system.

While there are inherent limitations to a qualitative survey, there are also offsetting strengths. In particular, a survey such as the SCOOS is sufficiently flexible to provide meaningful signals despite the continual evolution of market practices over time, whereas more quantitative approaches constructed around a static set of metrics are vulnerable to financial market developments that render those metrics less relevant or, in the worst case, misleading.[2]

The SCOOS includes a core set of questions that will be posed in identical form each quarter, a practice that will, over time, add a time series dimension to the analysis of the results from the survey. These core questions are organized into three groups. The first group of questions covers credit terms applicable to particular types of counterparties across the entire spectrum of OTC derivatives and securities financing transactions. The second group of questions asks about OTC derivatives trades, differentiating among the underlying asset classes (underlyings) and also between "plain vanilla" derivatives and those that are more highly customized. The third group of questions queries about securities financing trades – that is, lending to clients collateralized by securities – differentiating among different collateral types and recognizing that the terms available to an institution's most favored

---

[1] Board of Governors of the Federal Reserve System.

We appreciate comments and suggestions from Jim Clouse, Bill English, Mike Gibson, Frank Keane, Brian Madigan, Patrick McCabe, Patricia Mosser, Bill Nelson, Michael Palumbo, Pat White, and David Wilcox. The views expressed in this paper are solely the responsibility of the authors and should not be interpreted as reflecting the views of the Board of Governors of the Federal Reserve System or of anyone else associated with the Federal Reserve System.

[2] For a discussion of the potential problem, refer to Eichner, M. J., D. L. Kohn, and M. G. Palumbo (2010): "Financial Statistics for the United States and the Crisis: What Did They Get Right, What Did They Miss, and How Should They Change?" Finance and Economics Discussion Series Paper 2010-20. Available at http://www.federalreserve.gov/pubs/feds/2010/201020/201020abs.html.

clients may differ from those available to average clients. The design of the SCOOS also envisions the periodic inclusion of "special" questions, posed on a one-time basis, to deal with issues of topical interest to policymakers and market participants.

The inaugural SCOOS was conducted in June 2010, and focused on the three-month period ending in May 2010. Responses were received from twenty financial institutions that account for almost all of the dealer financing of dollar-denominated securities to nondealers and that are the most active intermediaries in OTC derivatives markets. Overall, responses pointed to some noteworthy developments with respect to counterparty relationships and securities financing over the previous three months. By contrast, the responses indicated little change in terms and conditions prevalent in OTC derivatives markets over this reference period. For instance:

- Survey respondents reported that the amount of resources and attention devoted by dealers to management of concentrated credit exposures to dealers and other financial intermediaries had increased.
- Dealers indicated that they had generally loosened credit terms offered to important groups of clients – including hedge funds and other private pools of capital, insurance companies and other institutional investors, and nonfinancial firms – across the entire spectrum of securities financing and OTC derivatives transactions. Dealers also noted that efforts by clients of all these types to negotiate more favorable terms had increased in intensity.
- With respect to OTC derivatives transactions, including those for both plain vanilla and customized derivatives, respondents reported that nonprice terms had changed little across different types of underlyings.
- Responses to questions focused on securities financing suggested an increase in demand for funding high-grade corporate bonds, equities, agency residential mortgage-backed securities (RMBS), and other asset-backed securities (ABS).
- Dealers reported that the volume of mark and collateral disputes with clients remained basically unchanged across counterparty and transaction types.[3]
- Unsurprisingly, responses to "special" questions, which were included in the inaugural survey on a one-time basis to provide perspective on how current credit terms compared with those prevailing at the end of 2006, suggested that current credit terms applicable to all counterparty and transaction types were uniformly more stringent than before the onset of the financial crisis.

This paper describes in greater detail the motivations for the new survey, its design, and the results of the inaugural survey.

Motivations for Developing a New Survey of Dealer Financing Terms

As noted in the introduction, the new survey is modeled after the SLOOS, which has been conducted by the Federal Reserve in various forms since 1964. The SLOOS asks domestic commercial banks and branches and agencies of foreign banks in the United States about supply and demand conditions in bank credit markets. It has proved to be an important

[3] Mark and collateral disputes refer to a claim by one party that is not immediately recognized by the other regarding the valuation of an OTC instrument or the collateral for a securities financing transaction.

source of information during the recent financial crisis, providing the Federal Reserve with insight into the effects of the crisis on the availability of credit to households and businesses.

The financial crisis, however, also highlighted that a significant volume of credit intermediation had moved outside of the traditional banking sector and emphasized the importance of the "shadow" banking system in the provision of credit to businesses and households and as a conduit for leverage and maturity transformation in the financial system.[4] Moreover, instruments closely associated with the shadow banking system – including OTC derivatives and securities financing transactions – contributed to the buildup of risk prior to the crisis and to the transmission of financial distress across seemingly separate parts of the financial system during the crisis.[5] Looking back, some policymakers have suggested that they should have perhaps more effectively resisted the tendency towards procyclicality in credit terms, possibly through supervisory action. Similarly, some market participants have questioned whether they, the private sector, should have acted more forcefully to stem the erosion of credit terms which had the effect of enabling greater leverage in the years leading up to the crisis.[6] However, because little or no systematic data was available on credit terms in wholesale markets, the buildup of risks was not as obvious at the time as it is in hindsight. Clearly, having a better perspective on the amount and sources of leverage employed in the financial system outside of traditional banking institutions is a necessary prerequisite for action, whether by policymakers or market participants, to deal more promptly with such situations in the future.

For these reasons, and given not only its monetary policy responsibilities but also its role in promoting and maintaining the stability of the financial system, the Federal Reserve decided to expand the collection of qualitative information on the availability of credit and leverage beyond the traditional banking sector to the extension of credit by dealers. By providing information on changes in the availability and use of leverage in the financial system, the new survey also has the potential to inform broader macroprudential approaches to the supervision and regulation of financial firms and markets. Indeed, a recent Committee on the Global Financial System (CGFS) study group recommended that central banks and supervisors consider the value of regularly conducting qualitative surveys focused on collateral haircuts, margin terms, and other topics covered extensively in the SCOOS, arguing that such surveys are potentially important tools for macroprudential authorities.[7] Already several projects are underway – involving not only the Federal Reserve but also regulators in other jurisdictions and multilateral agencies – that focus on understanding and tracking the aggregate amount of leverage in the financial system. The SCOOS should provide useful input to such efforts by helping to identify market developments that might call for a more focused collection of detailed quantitative information.

---

[4] Refer to Pozsar, Z., T. Adrian, A. Ashcraft, and H. Boesky (2010): "Shadow Banking," Federal Reserve Bank of New York Staff Reports No. 458. Available at http://www.newyorkfed.org/research/staff_reports/sr458.html.

[5] Of course the proximate causes of the crisis go well beyond the particular mechanisms utilized to lever exposures, including those prevalent in the shadow banking system. For example, there is little doubt that lax underwriting standards, overreliance on public credit ratings, and poor discipline around the marking of positions were significant factors. For further discussion of underlying causes of the crisis, refer to "Policy Statement on Financial Market Developments," President's Working Group on Financial Markets, March 2008. Available at www.treasury.gov/resource-center/fin-mkts/Documents/pwgpolicystatemktturmoil_03122008.pdf.

[6] Refer to "The Role of Valuation and Leverage in Procyclicality," published by the Committee on the Global Financial System, for a discussion of sources of procyclicality in the financial system prior to the crisis. Available at http://www.bis.org/publ/cgfs34.pdf.

[7] Refer to "The Role of Margin Requirements and Haircuts in Procyclicality," published by the Committee on the Global Financial System, for further discussion of the procyclicality of margin requirements and haircuts. Available at http://www.bis.org/publ/cgfs36.pdf.

While there are inherent limitations to a qualitative survey, this approach also has certain advantages. Dealer credit terms applicable to counterparties such as hedge funds, institutional investors, and corporate clients involve a large number of parameters, many of which vary across both counterparties and products. For example, collateral and margin terms distinguish between initial margin requirements and transfers required in response to market movements, with each set of parameters generally depending on both the type of product and the strength and nature of the client relationship. Consequently, any effort to describe the resulting vector of credit terms quantitatively would have to not only deal with these multiple dimensions but also do so in a manner that does not quickly become out of date as a result of changes in market practices. In contrast, a qualitative survey can provide a strong directional indication as to whether terms have broadly become more or less stringent without requiring a quantitative reporting of the specific terms and market conventions that may be driving the changes at a particular time.

The Design of the New Survey

The SCOOS is intended to be sent quarterly to the twenty U.S. and foreign dealers that, in the aggregate, account for almost all of the dealer financing of dollar-denominated securities to nondealers and that are the most active intermediaries in OTC derivative instruments. The survey is directed to senior credit officers who maintain a consolidated perspective regarding the activities that are the focus of the survey, irrespective of the business area or areas in which they are conducted and the legal entity in which they are booked.[8]

The SCOOS includes a core set of 47 questions designed to collect qualitative information on the stringency of credit terms, credit availability and demand across the entire range of securities financing and OTC derivatives transactions, and the evolution of market conditions and practices applicable to such activities. The core questions, organized in three groups, include both retrospective items, focusing on changes in market conditions over the prior three months, and prospective items, focusing on expectations for the coming three months. The first group of questions covers the credit terms applicable to particular types of counterparties – including dealers and other financial intermediaries, hedge funds and other private pools of capital, institutional investors such as insurance companies and pension funds, and corporate clients – across the entire spectrum of transactions.[9]

The second group of questions focuses on OTC derivatives trades, differentiating among different underlyings (foreign exchange, interest rates, equities, credit, commodities, and total return swaps referencing nonsecurities) and also between plain vanilla derivatives and those that are more highly customized.[10]

---

[8] The activities that are the focus of the SCOOS may be conducted by large financial institutions through multiple business units and legal entities. For example, a significant volume of securities financing may be conducted from a prime brokerage platform. Nevertheless, other similar activities, perhaps with clients other than hedge funds, also occur on trading desks with mandates that include making markets in the securities being financed or on centralized securities financing desks. In a similar vein, OTC derivatives transactions may occur on dedicated equity or interest rate derivatives desks that are primarily engaged in derivatives transactions, but can also flow through businesses like corporate credit and commodities that trade both derivatives and the related cash instruments.

[9] Questions include changes over the past three months in the stringency of price terms (e.g., financing rates) and nonprice terms (e.g., haircuts, maximum maturity, covenants, cure periods, cross-default provisions, and other documentation features), reasons for changes, intensity of efforts to negotiate more favorable terms, and expectations for price and nonprice term changes over the next three months.

[10] Questions include changes over the past three months in nonprice terms and the volume of mark and collateral disputes with clients.

The third group of questions queries about securities financing transactions – that is, lending to clients collateralized by securities – differentiating among different collateral types (high-grade corporate bonds, equities, agency RMBS, and other ABS) and recognizing that the terms available to an institution's most favored clients may differ from those available to average clients.[11]

Of note, with regard to OTC derivatives and securities financing transactions, questions are posed about changes in the prevalence of mark and collateral disputes with clients as an increase in such disputes may suggest emerging operational stresses or other risk issues. Indeed, during the recent financial crisis, an uptick in mark and collateral disputes proved a good leading indicator of stress within the financial system. In addition, in the section focused on securities financing transactions, qualitative assessments are solicited regarding market liquidity and functioning with respect to each specific type of collateral. A final question invites respondents to comment on other issues of particular interest not addressed elsewhere in the survey.

In addition to these core questions, topical questions can be added each quarter, as is done in the SLOOS, to deal with issues of particular immediate concern and relevance.

Implementation of the New Survey

Implementation of the new survey began with an extensive process of consultation with market participants by staff members at the Federal Reserve Board and Federal Reserve Bank of New York (FRBNY). The purpose of these discussions was two-fold: First, the staff sought to understand the degree to which the survey under consideration might be useful to market participants. Second, specific feedback was solicited concerning the broad content of a draft survey instrument as well as the optimal framing of specific questions. While indicating significant support for the survey on the part of market participants, the meetings suggested a number of respects in which the draft survey could be improved. For example, the draft survey did not sufficiently distinguish between the set of credit terms relevant for other financial intermediaries and those applicable to clients. These early discussions also highlighted that the draft survey was too detailed in asking about some credit terms, but not sufficiently detailed in collecting information in other areas. The incorporation of feedback from these conversations into the final draft of the survey is described in greater detail in the final Federal Register notice published by the Federal Reserve on March 30, 2010.[12]

To facilitate the ongoing administration of the survey once the design and approval phases were complete, the Statistics unit at the FRBNY designed and constructed a secure web interface, similar to systems that they had developed for other data collection efforts. The system provides significant functionality to both respondents and Federal Reserve staff. From the perspective of the Federal Reserve, the system allows for the generation of reports in spreadsheet formats at the push of a button.

In order to make the results available to market participants, central banks, supervisors, and multilateral organizations as a common benchmark for assessing trends in the availability and use of leverage in the financial system, the survey is made available to the public on the Federal Reserve Board's website. However, individual firm responses to the survey are not

[11] Questions include changes over the past three months in price and nonprice terms, the amount of vendor financing (that is, financing provided on more favorable terms for securities that were underwritten by the respondent institution), clients' demand for funding, volume of mark and collateral disputes with clients, and liquidity and functioning of the markets for the underlying collateral.

[12] Refer to http://www.federalreserve.gov/reportforms/formsreview/FR2034_20100330_ffr.pdf.

published to allow frank and complete responses on the part of the surveyed firms, without raising concerns about revealing sensitive proprietary information.

Responses to the June 2010 SCOOS[13]

The inaugural SCOOS survey was conducted during the period from May 24, 2010, to June 4, 2010, and the reference period for the core questions of the survey was March 2010 through May 2010. In addition to the core questions, special questions were included asking survey respondents to characterize the current stringency of credit terms relative to the end of 2006, before the onset of the crisis. These questions were intended to provide a benchmark *level* for interpreting a survey that is focused on *changes* yet was being administered for the first time.[14] As noted in the introduction, responses pointed to some noteworthy developments with respect to counterparty relationships and securities financing over the previous three months, but the responses indicated little change in the terms and conditions prevalent in OTC derivatives markets over this reference period.

Although the survey encompasses essentially all of the financial institutions active in the relevant areas across the entire range of securities financing and OTC derivatives transactions, some caution in interpreting the results is warranted due to the fairly small number of firms surveyed and the fact that the modal responses to many questions indicated that credit terms and conditions were generally little changed over the past three months. With a sample of just twenty firms (and some firms not active in all areas), some apparent adjustments in lending posture may reflect a change in the behavior or perceptions of only a few firms. Over time, as additional surveys allow a time series dimension to be incorporated into the analysis, the staff should develop a better sense for when reported changes are likely to be economically important.

Counterparty Types

Dealers and other financial intermediaries. More than one-half of the respondents indicated that the amount of resources and attention devoted by dealers to management of concentrated exposures to dealers and other financial intermediaries had increased somewhat over the past three months, with the remainder characterizing their focus as unchanged. The vast majority of respondents, however, reported that the volume of mark and collateral disputes with dealers and other financial intermediaries had remained basically unchanged over the past three months.[15]

---

[13] Tables with the distribution of individual responses are available on the Federal Reserve Board website at http://www.federalreserve.gov/econresdata/releases/scoos.htm.

[14] Like the core survey, the special questions focused separately on credit terms applicable to particular counterparty types across the entire spectrum of transactions, to OTC derivatives trades, and to securities financing transactions.

[15] The section on exposure to dealers and other financial intermediaries is structured somewhat differently from the sections dealing with clients of various types. Conversations with market participants indicated that the individual price and nonprice terms – ranging from financing rates to haircuts, collateral requirements, limits on maturity and documentation provisions – are very important in the process of dealers managing exposures to clients, but are far less relevant in the management of exposure to other dealers. In dealer-to-dealer interactions, terms are essentially very standardized and are not subject to regular fine adjustments. Thus, as seen during the financial crisis, the critical decision for a dealer in managing exposure to another dealer is a binary choice about whether to continue transacting or not. For this reason, the questions dealing with dealer counterparties focus only on the amount of resources and attention devoted to monitoring other dealers, as well as the prevalence of mark and collateral disputes which occur disproportionately among dealers. For

Hedge funds, private equity firms, and other similar private pools of capital. Responses with respect to credit terms applicable to hedge funds, private equity firms, and other similar private pools of capital indicated that, across several dimensions, dealers had provided somewhat more favorable terms over the past three months. A small net fraction of respondents had eased price terms, which include, most importantly, financing rates.[16] One-fourth of respondents, on balance, reported having loosened nonprice terms, which include haircuts, maximum maturity, covenants, cure periods, cross-default provisions, and other documentation features. According to the survey, the predominant reasons cited for loosening price and nonprice terms offered to hedge fund counterparties over the past three months were more aggressive competition from other institutions, improvement in the current or expected financial strength of counterparties, and improvement in general market liquidity and functioning.[17] In characterizing their interactions with hedge fund counterparties, almost two-thirds of dealers indicated that the intensity of efforts by these counterparties to negotiate more favorable price and nonprice terms had increased over the past three months. Of note, one-fourth of respondents reported a considerable increase in the intensity of these efforts. Looking forward over the next three months, a small net fraction of dealers expected somewhat tighter price and nonprice terms, with more than one-half of survey respondents anticipating terms to remain basically unchanged.

Insurance companies, pension funds, and other institutional investors. Responses to questions about credit terms for insurance companies, pension funds, and other institutional investors showed similar but more muted trends. Small net fractions of dealers indicated that they had loosened both price and nonprice terms over the past three months for such counterparties. The three factors that were reported to have exerted the greatest influence on dealers' policies were improvement in the current or expected financial strength of counterparties, improvement in general market liquidity and functioning, and more aggressive competition from other institutions. More than one-third of respondents indicated that the intensity of efforts by insurance companies, pension funds, and other institutional investors to negotiate more favorable price and nonprice terms had increased over the past three months. Looking forward over the next three months, more than one-half of dealers anticipated that price and nonprice terms would remain basically unchanged.

Nonfinancial corporations. The responses to questions about credit terms applicable to nonfinancial corporations also suggest a loosening over the past three months. One-fourth of dealers, on balance, reported a loosening of price terms offered to these counterparties, while a small net fraction of respondents indicated that they had eased nonprice terms. The most important reasons cited for the loosening in credit terms were broadly consistent with those for other counterparty types: Respondents pointed to improvement in general market liquidity and functioning, more aggressive competition from other institutions, and improvement in the current or expected financial strength of counterparties. Dealers reported some pressure on terms from nonfinancial counterparties, with one-half of survey

---

other types of counterparties, the survey poses more granular questions focusing on particular terms that function as "dials" that dealers can adjust to actively manage their exposures.

[16] Consistent with the language used in the SLOOS, for questions that ask about credit terms, reported net percentages equal the percentage of institutions that reported tightening terms ("tightened considerably" or "tightened somewhat") minus the percentage of institutions that reported loosening terms ("loosened considerably" or "loosened somewhat"). For questions that ask about demand, reported net fractions equal the percentage of institutions that reported increased demand ("increased considerably" or "increased somewhat") minus the percentage of institutions that reported decreased demand ("decreased considerably" or "decreased somewhat").

[17] Consistent with the longstanding SLOOS practice, an ordinal ranking of reasons for loosening or tightening is produced by adding the number of respondents characterizing each reason as "very important" to the number characterizing the reason as "somewhat important" and then sorting the sums in descending order.

respondents noting that the intensity of efforts to negotiate more favorable terms had increased over the past three months. Looking forward, almost one-fifth of dealers, on net, expected a further loosening of the price and nonprice terms under which they transact with nonfinancial corporations.

Over-the-Counter Derivatives

Overall, the responses to the questions dealing with OTC derivatives trades suggested little change over the past three months in terms for plain vanilla and customized derivatives as well as in the volume of mark and collateral disputes with clients across the various underlyings – foreign exchange, interest rates, equities, credit, commodities, and total return swaps referencing nonsecurities (such as bank debt and whole loans).[18]

Securities Financing

The most important trend evident from the responses to questions dealing with securities financing related to demand for funding.[19] Survey respondents indicated that, on net, demand for funding had generally increased over the past three months. Of note, among dealers that offer such financing, one-third reported an increase in demand for funding of agency RMBS and one-half reported an increase in demand for funding of other ABS, on net.

Broad trends regarding changes in terms were more difficult to discern from the dealer responses. However, certain specific changes in terms were identified by several dealers. For example, small net fractions of respondents reported having increased financing rates at which high-grade corporate bonds are funded for both average and most favored clients over the past three months. By contrast, small net fractions of dealers reported lengthening the maximum maturity over which they would fund equities for both average and most favored clients. In the case of agency RMBS, small net fractions of survey respondents indicated that they had eased a couple of terms (maximum maturity and haircuts) for both average and most favored clients. On net, small fractions of dealers active in other ABS reported a reduction in haircuts applicable to both average and most favored clients.

Questions about liquidity and market functioning for various types of collateral funded through repurchase agreements and similar secured financing transactions, which are included in this section of the survey, generally suggested no major change in the views of senior credit officers. About one-fourth of respondents, however, indicated that liquidity and functioning in the market for other ABS had deteriorated over the past three months. There was no indication of an increase in collateral and mark disputes with clients for funding of any collateral, including other ABS.

Special Questions on the Stringency of Credit Terms Relative to the End of 2006

Not surprisingly, responses to the special questions pointed to significantly tighter credit terms across counterparty and transaction types relative to the end of 2006. All respondents but one characterized credit terms applicable to hedge fund counterparties as currently tighter than in the reference period. A significant majority of respondents also reported tighter

---

[18] Market practices with respect to OTC derivatives require a more extensive vector of terms to adequately capture all the dimensions across which terms can change. But this granularity makes it more difficult to distill broad trends from the responses in this section.

[19] In the SCOOS, securities financing includes lending to clients collateralized by high-grade corporate bonds, equities, agency RMBS, and other ABS.

credit terms for insurance companies, pension funds, and other institutional investors. By contrast, about one-third of dealers noted that the current stringency of credit terms applicable to nonfinancial corporations was basically unchanged relative to the end of 2006. In general, the vast majority of dealers reported tighter credit terms relative to the end of 2006 with regard to both OTC derivatives and securities financing transactions.

Conclusion

The inaugural SCOOS raised no significant unexpected technical or methodological issues, and yielded responses that were broadly consistent with the limited available evidence regarding trends in the relevant markets during the reference period. Thus, early indications support the proposition that the survey will be a useful addition to the toolkit available to policymakers and members of the public seeking to better understand the amounts and sources of leverage utilized in the financial system. This information will be particularly useful for those working on macroprudential approaches to the supervision and regulation of financial firms and markets. As the survey's core questions are posed repeatedly in the coming quarters, the additional time series dimension should increase the possibilities for analyzing survey results, both to allow further validation of the signals coming from the SCOOS against other sources of information and to inform analysis of the substantive issues.

The process of formation of inflation expectations in an information economy

Anna Loleyt[1] and Ilya Gurov[2, 3]

> "No intelligence system can predict what government will do if it doesn't know itself."
>
> *John Kenneth Galbraith*

Introduction

Before beginning our analysis of the process of inflation expectation formation, we wish to note the universal influence of key features of the modern economy on agent forecasts. The expectations channel undoubtedly is a very important part of the transmission mechanism for the conduct of monetary policy. The evolution of central bank activities and the appearance of new theoretical and practical papers demonstrate the significant role of inflation expectations.

The modern economy has been defined in a variety of ways: as a knowledge economy, as an information economy or as the new economy.[4]

In 1962, Fritz Machlup published a paper [31] on the measurement of US knowledge production and distribution. This article enhanced a wide range of research studies dedicated to investigations of principles, norms and measurements of knowledge that resulted in the appearance of a new area of the economy – the knowledge economy. Ouwersloot, Nijkamp and Rietveld (1990) [35] assumed that information and knowledge are linked in the sense that "information is the meaning assigned to data by known conventions, and knowledge is the integration of processed information". John Galbraith (1967) [20] indicated the enhanced role of knowledge in the middle of the 20th century. From his point of view, the locus of power had shifted from managers to technocrats, i.e., to a group of highly-trained experts who, collectively, have a monopoly on scarce skills and crucial knowledge and thus increasingly make the best decisions. Thus, Galbraith regarded the time-varying role of information as a basis for fundamental economic changes.

---

[1] General Economic Department, Bank of Russia, 12 Neglinnaya Street, Moscow, 107016 Russia. Faculty of Economics, Lomonosov Moscow State University, Moscow, Russia. Email: las2@cbr.ru

[2] General Economic Department, Bank of Russia, 12 Neglinnaya Street, Moscow, 107016 Russia. Faculty of Economics, Lomonosov Moscow State University, Moscow, Russia. Email: ilya.n.gurov@gmail.com

[3] Acknowledgments: The authors gratefully acknowledge the support of the Bank of Russia. In particular, we would like to thank Mr. Alexey V. Ulyukaev for helpful research assistance and Mrs. Nadezhda Yu. Ivanova for strong support. We are also grateful to Mr. Sergey S. Studnikov for his comments and to Mr. Richard Walton for his active encouragement and editing of the manuscript.

[4] Debates on the definition of the current status of the economy – as an information economy or a new economy – were held, for example, at a symposium sponsored by the Federal Reserve Bank of Kansas in Wyoming (2001) [18] with the participation of M. Woodford, J. Taylor, K. Murphy, A. Greenspan, M. King and many others.

Before 1980, the “economics of information” was mainly understood as the “economics of search” derived from Stigler’s papers [39]. Stigler had modified competitive pricing theory by representing price as a random variable with a given cumulative distribution curve. Thus, he had amplified the pricing theory by integrating search activity as a necessity for price data acquisition.

The use of game theory in pricing research became the next important stage in the development of the information economy. This method of problem solving is based on analysis of the origin, duration and termination of contractual relations. Agents’ incentives to negotiate are defined by the information they possess. The problem of this information asymmetry is solved by an analysis of conduct of the contracting parties and the information structure of the object to be evaluated. Thereby, problems of information economy based on interrelations of contracting parties can be solved by means of Nash’s non-cooperative games [28].

The contemporary economy is also called the “new economy”. The term “new economy”, according to Baily [2], may incompletely reflect current activity as it is too broad and implies more frequent and deeper changes than actually take place. Nevertheless, the term “information economy”, from his point of view, appears to be too narrow, as it does not fully reflect all of the changes that are inherent in the current economy, e.g., increased globalisation, more intense pressure for competition, and rapid development. This last feature of the contemporary economy is considered as a basic feature of the current economy, in this study.

One of the main tasks of monetary authorities is to provide financial stability, which primarily concerns price stability mandates. Long-term price maintenance is a prerequisite for both improvement of economic health and economic growth as a whole. Thus, for example, Charles Goodhart [22] has defined two core purposes of central banks: taking the responsibility for achieving price stability and acting as a lender of last resort, thereby maintaining the financial stability and confidence in authorities in the conduct of monetary policy [3], which directly impacts the behaviour of economic agents.

A large number of research studies dedicated to the analysis of economic agents’ inflation expectations have been published recently. It is possible to identify the main research trends by conventional means, i.e., articles dedicated to the problem of inflation expectation synthesis (see, e.g., Lines and Westerhoff (2009) [27]). These works are based on the consideration of the simultaneous existence of agents in the economy characterised by different types of expectations. Some other works are based on an examination of agent expectation management. In this case, agent expectations are modelled by endogenous variables that depend particularly on monetary transparency. At the same time, the current economic structure is also of interest to many researchers, as it provides a possibility to refine the linkages among the indicators.

These research guidelines are, for example, in the ECB and Bank of Canada sphere of interest. Staff at the Bank of Canada study the extent to which the price variance from the monetary target affects agents’ beliefs in the monetary authorities [9].

This research subject is also alluded to in the papers of Carboni and Ellison (2009) [8], Doepke, Dovern, Fritsche and Slacalec (2008) [17], Demertzis and Viegi (2008) [15], Andolfatto, Hendry, Moran (2007) [1], Castelnuovo, Nicoletti-Altimari and Rodriguez-Palenzuela (2003) [10], Blinder, Ehrmann, Fratzscher, De Haan and Jansen (2008) [5], and others.

The study of Van Raaij (1989) [41] appears to be of peculiar interest in the context of this research. This paper is based on the analysis of differences in the psychological and economic motives of agent expectation formation. The statement about the importance of psychological motives is contingent on inflation perception.

Thus, for example, Demertzis and Viegi (2008) [15] assumed that agents' expectations resulted not only from their own opinions but also from other economic agents' decisions. Demertzis and Hallett (2008) [13] also tested an economy with agents characterised by bounded rationality with and without information asymmetry of central bank actions. Lines and Westerhoff (2009) [27] presented a dynamic macroeconomic model in which they described the inflation rate in terms of economic agents' aggregated expectations. The authors assumed that the economy is characterised by two types of agent expectations: rational and extrapolative ones. Blinder, Ehrmann, Fratzscher, De Haan and Jansen (2008) [5] insisted on the importance of central bank transparency in the framework of irrational economic agent expectations and the presence of information asymmetry. This paper is based on an analysis of agents' cognitive psychology. The aim of the work is to classify and systematise groups of economic agents with different types of inflation expectations in the information economy and to analyse the uncertainty that occurs in the economy when the authorities redeem monetary policy promises but their action has no influence on the average inflation expectations of economic agents.

The plan for the rest of the paper is as follows. We present in the first part of the article a general description of the model that characterises the process of inflation expectation formation, including the definition of information as a source of agent expectation formation. The second part of the work presents the research on information signal perception by economic agents, their belief in this information, the estimate of the aggregated value of their consequent inflation expectations, and the effect that monetary authority activities have on agent inflation forecasts, along with an estimate of the risk of the absence of such an effect.

Model

The model of inflation expectation formation is based on the assumption that any agent in an economy possesses inflation expectations. Note that it is impossible to consider a single representative agent, due to differences in socioeconomic conditions. Both individuals and institutions are regarded as economic agents in this paper.

Economic agents maximise the objective function

$$f\left(\pi - \pi^{e}\right) \rightarrow \max, \tag{1}$$

whose values are directly proportional to the accuracy of inflation expectations, i.e.,

$$f'\left(\left|\pi - \pi^{e}\right|\right) < 0. \tag{2}$$

To create inflation expectations, an economic agent should use information signals, which we treat as resources. According to the new institutional economic theory, information acquisition and analysis are associated with costs. Note that information is considered in the research not in the capacity of a normal good, for example, as fixed in the work of Ouwersloot, Nijkamp and Rietveld (1990) [35], but rather in the capacity of a good that conditionally exhibits properties of various types of goods,[5] similar to a merit good [32, 33].

To investigate information perceptions, we should first define the term "information signal". This reflects some data that can be useful in compiling agent inflation forecasts.

Information signals are collected cumulatively, and at period *t,* there may be an infinite but countable number of information signals in the economy, whereby it is possible to assign a particular number $q \mid q \in N$ to each signal. Denote the set of information signals by *W* and each of its elements by *w.* In this case, an information signal can be understood as either an

[5] For example, Ricardo analyzed the value of goods based on the example of diamonds and water, each possessing different values due to their degree of scarcity.

abstract or an intensional notion, i.e., we can consider the set of information signals as a homogeneous set, or in terms of information content as a source of heterogeneity. The whole set of information signals W_t includes all of the information signals $W_t = \bigcup_i w_i$, $i \in N$ collected by period of time *t*. In addition, we should single out information signals such that two signals should not have any intensional recurrences, i.e., $w_i \cup w_j = \varnothing \quad \forall i, j \in N \mid i \neq j$. It is also necessary to separate information by substance wherever it is possible. For example, we should consider unique signals for official forecasts and monetary targets instead of a single signal both for official forecasts and inflation targets.

As a result, we can identify a perceived part of the information set *W* perceived by agent *x* as a combination of two constituent parts *q* and ^{S_q} , where *q* is the number of signals and s_q is a parameter that reflects the content of the *q* signal. In addition, s_q is associated with a vector $\vec{s}_t$ that is a linear combination of vectors (with the sum of coefficients equals unit) $\vec{s}_t^{of,N}, \vec{s}_t^{\varepsilon}$, $N \in R$, where $\vec{s}_t^{of,N}$ is a linear combination of the information vectors of the monetary authorities. In particular, $\vec{s}_t^{cb}$ is a vector that reflects central bank information signals, as defined by Blinder, Ehrmann, Fratzscher, de Haan, and Jansen [5], and $\vec{s}_t^{\varepsilon}$ is a vector that expressly or by implication reflects information on external inflation shocks.

Thus, we can say that inflation expectations are formed on the basis of information signals perceived by the economic agent. The sources of information signals include the whole range of existing communication means.

The concepts of agent expectations regarding macroeconomic indicators have been studied by economists over several decades. The concepts of rationality and adaptivity of economic agents are considered basic to theories of inflation expectation formation. According to this statement, we judge that agents in an economy are presented with both rational and adaptive inflation expectations. This assumption is in line with Lucas' interpretation that adaptive expectations theory was an isolated instance of rational expectations theory [29, 30]. This dichotomy can be explained by the differences in agent education levels. The more agents are educated, the lower the costs of information signals acquisition and processing they incur. Ceteris paribus, the more an individual is educated, the more information signals of the current period he perceives to maximise the objective function. The first problem is that statistics on economic agents' levels of education are published annually. Secondly, attempts to define the educational level of legal entities among the economic agents are a priori doomed to fail. This limits the feasibility of such a method of determining the inflation forecasts. To avoid this problem, we suggest using statistics on agent incomes, which are published frequently. This approach is based on the assumption that to achieve a high level of income under current economic conditions (i.e., in an information or in a knowledge economy) both individual and institutional units must be well qualified for data acquisition and analysis. Moreover, the greater the agent income, the greater the risk he bears in case of a wrong inflation forecast, i.e., the greater his incentives to perceive an additional unit of information. Therefore, agents with higher incomes demand relatively greater accuracy of their own inflation forecasts to maximise their objective functions, under which they, ceteris paribus, perceive relatively more signals. Accordingly (as mentioned above), it is possible to single out discrete groups of economic agents that are characterised by differential aptitudes of available data acquisition and analysis. Therefore, despite neo-classical theories, we do not find it appropriate to regard the set of economic agents as a homogenous one with the same features, and we consider it reasonable to single out economic agents with different levels of available information perception, corresponding to agent-based models inherently based on the papers of Burrell (1951) [7] and Kahneman and Tversky (1979) [23]. The macroeconomic approach of these models was explained, for example, by Axel Leijonhufvud (2006) [26] and Leigh Tesfatsion (2005) [40].

Facing uncertainty, economic agents behave in accordance with their inherent characteristics (according to their own preferences based on both individual peculiarities[6] and particular economic circumstances).

We consider it impossible to rule out an agent's ability to obtain current-term signals in an information economy. We also assume that it is reasonable to use the general government as an original source of actual or future inflation information. It is essential to note that in general, the government has especially wide access to special-purpose sources of information, and the bulk of inflation fluctuations are integrated in forecasts published by the authorities.

As mentioned above, economic agents maximise their objective function, whose values are directly proportional to the accuracy of inflation expectations, which in turn is affected by monetary authorities' fulfilment of macroeconomic indicators targets,[7] i.e., it is influenced by the degree to which authorities are following ex-ante policy. Accordingly, we define the term "belief". An individual's belief in authorities is regarded as the subjective probability of how well the actual inflation coincides with the value forecasted by authorities.

Thus, we can formally assign the criterion of belief in monetary authorities

$$\left|\pi_{of}^{e_T} - \pi_T^e\right| \to o \text{, where} \qquad (3)$$

$\pi_{of}^{e_T}$ is the inflation forecast officially published by the authorities in the current term T, and

π_T^e is average agent inflation expectations in the current term T.

Thus, we can assume that there is a direct dependence between the degree of adherence of authorities to declared targets and agents' levels of belief. It is essential to note that the level of agent confidence will also be directly dependent on both the coordination of inflation forecasts published by authorities and macroeconomic circumstances.

Under differences in receptivity levels, agents obtain various volumes of data to set their own levels of belief in the authorities. The higher the levels of agent receptivity, the more information they obtain to set their levels of belief in the authorities.

To define the average inflation expectations on the basis of data perceptivity and belief in this information, for convenience, we single out four main types of inflation expectations (notice that every agent in the economy has just one type of expectations).

It is not assumed in adaptive expectation theory that agents acquire current-term signals. However, as mentioned above, one cannot rule out that possibility in an information economy. Therefore, we consider these agents as characterised by *quasi-adaptive expectations:*[8]

$$\lim_{p \to 0} \pi_t^e = \pi_t^{e^{qaa}} .$$

1. Economic agents with low levels of both data perceptivity and authority belief are characterised by *adaptive expectations*:

---

6 For example, particularly, under the influence of the incentives that Keynes defined as "animal spirits".

7 Kohn and Sack (2004) [24] stated, for instance, that economic agents can feel confidence in the central bank's press releases if it has demonstrated a conscientious attitude toward its published forecasts.

8 In other words, if agents are characterised by quasi-adaptive inflation expectations, i.e., they perceive some current-term signals but, for whatever reasons, do not trust this information, then they are actually characterised as having classical adaptive expectations. Thus, expectations specified according to adaptive expectations theory are a special case of the quasi-adaptive expectations defined in the present work.

$\lim_{\substack{p\to 0\\ s\to 0}} \pi_t^{e\,qaa} = \pi_t^{e\,a\partial}$, where

p– level of data perceptivity of agent *x*, $p \in [0;1]$,

s– level of belief in perceived information signals of agent *x*, $s \in [0;1]$ (for more details see below), i.e.,

$$\lim_{\substack{p\to 0\\ s\to 0}} \pi_t^{e\,qaa} = \pi_{t-1}^{e} + \beta(\pi_{t-1} - \pi_{t-1}^{e}) . \quad (4)$$

2. The expectations of agents with low levels of signal perceptivity and high levels of belief in this information tend towards the official inflation forecasts published by the authorities.

$$\lim_{\substack{p\to 0\\ s\to 1}} \pi_t^{e\,qaa} = \pi_{of\,t}^{e} . \quad (5)$$

Note that agents with a high level of information perceptivity, i.e., receiving and analysing more data on economic circumstances, are characterised by more sensitive confidence in authorities' actions than agents with quasi-adaptive expectations. As mentioned above, the forecasts of these agents are said to be made under *rational expectations*[9] theory.

$\lim_{p\to 1} \pi_t^{e} = \pi_t^{e\,rat}$, i.e.,

$\lim_{p\to 1} \pi_t^{e\,rat} = E[\pi_t \mid I_{t-1}]$.

3. In particular, the expectations of agents with high levels of signal perceptivity and belief in monetary authorities' actions are also based on inflation targets, i.e.,

$$\lim_{\substack{p\to 1\\ s\to 1}} \pi_t^{e\,rat} = \pi_{of\,t}^{e} . \quad (6)$$

Assume also that rational agents with high levels of belief in monetary authorities' actions create their expectations on the basis of all available current-term information, particularly as related to inflation targets, monetary transparency level, seasonality and other relevant data.

4. Expectations of agents with high levels of signal perceptivity and low levels of belief in monetary authorities' activities per se are also in line with *rational expectations* theory, but the wider the spread between actual inflation and its official target, the greater is the possibility that agents' decisions on monetary authorities will contradict the declared conduct of monetary policy, i.e., in the agents' minds, the actual inflation is under some pressure external to the actions of the monetary authority. Thus, the share of agents characterised by rational expectations on inflation considers the risk that monetary authorities may not be able to assure that actual inflation attains its target. This is a consequence of the existence of economic agents with quasi-adaptive (including adaptive) expectations that expect worse inflation values. In this case, rational agents consciously orient their own forecasts to these

[9] Agents with high levels of information perceptivity are also characterised by both extra facilities to acquire data and greater abilities to analyse it. That is to say, they need minimal time to process information and to integrate signals into their expectations. In other words, rational agents acquire more current-term information signals and thereby have an advantage in future inflation assessments.

agents' expectations.[10] We identify such agent forecasts as *arbitral* ones, by analogy with OTC and stock trading strategy:

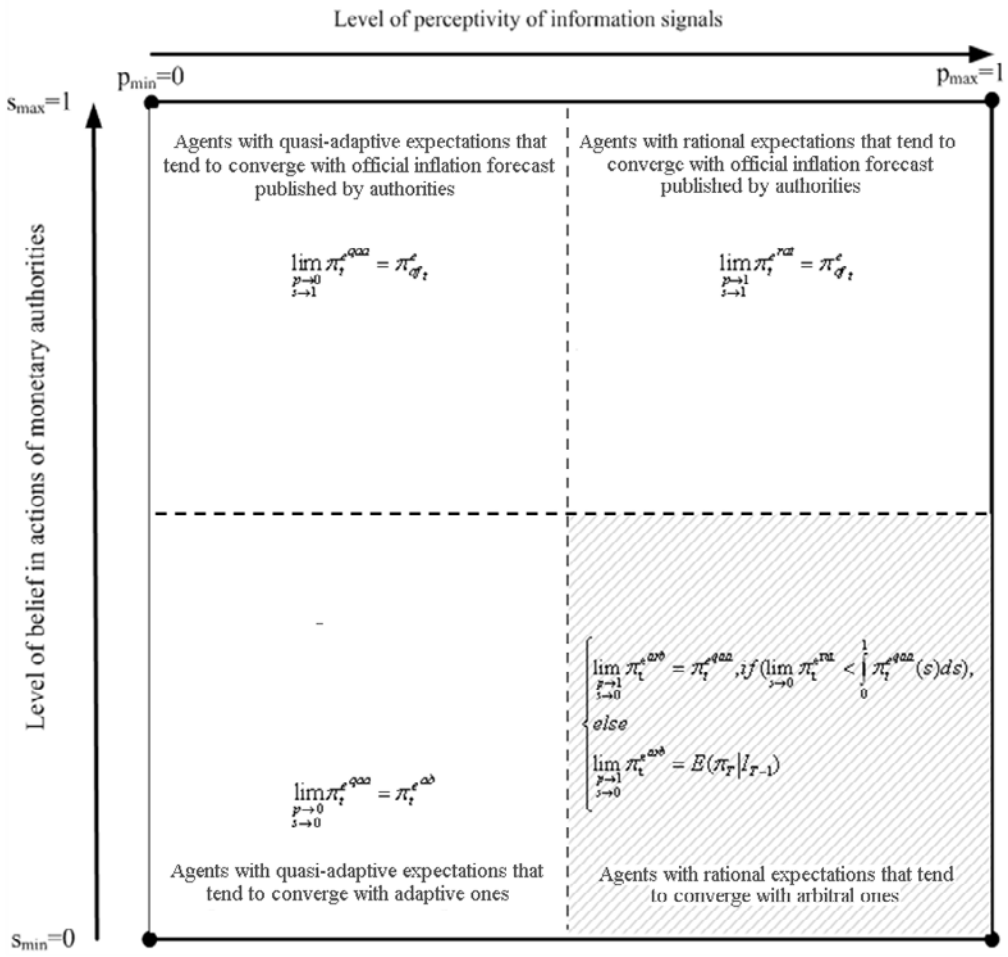
$$\lim_{\substack{p\to 1\\ s\to 0}} \pi_t^{e\,rat} = \pi_t^{e\,arb}, \text{ and}$$

$$\begin{cases} \lim\limits_{\substack{p\to 1\\ s\to 0}} \pi_t^{e\,arb} = \pi_t^{e\,qaa}, if \left(\lim\limits_{s\to 0} \pi_t^{e\,rat} < \int\limits_0^1 \pi_t^{e\,qaa}(s)ds\right), \\ else \\ \lim\limits_{\substack{p\to 1\\ s\to 0}} \pi_t^{e\,arb} = E(\pi_T \,|\, I_{T-1}) \end{cases} . \qquad (7)$$

The scheme of types of inflation expectations is represented in Figure 1.

Figure 1

Schematic representation of types of inflation expectations



Note: Multiplicity of economic agents.

[10] Notice that economic agents with arbitral inflation expectations follow a deliberate prediction strategy. This can be explained by the fact that we consider these agents as individuals defined, according to Neumann-Morgenstern theory, as risk-averse agents. According to this theory, if inflation expectations of arbitral agents are higher than average forecasts of agents with quasi-adaptive expectations, they don't resort to arbitrage and we classify them as rational agents.

1. The process of inflation expectation formation

In accordance with the concept of bounded rationality, developed by Simon in 1972 [38] (in contrast to the rational expectation hypothesis, this concept considers the limitations of the available information and of human intelligence), economic agents in this study are defined by their levels of information perception. Note that because of the bounded rationality of agents,[11] it is impossible to achieve the maximal theoretical level of information perception. Therefore, we bound the lowest level of information perception to the point that can be attributed to an agent that perceives only the public signals of the current term. We bound the maximum tolerance range to the point that can be attributed to an agent that perceives the greatest volume of information (note that this agent is not completely rational). This statement is made in accordance with the current concept of the information economy and the availability of online sources of information. Thus, such agents are considered pro tanto with the unit and zero levels of information perception.

In a similar way, we define the agents' levels of belief in the monetary authority's actions – those agents that completely distrust perceived information will be identified as possessing a zero level of belief, and those with absolute trust towards perceived information are identified as possessing a unit level of belief.

This simplification allows us to define the inflation expectations type of any agent in economy through linear combinations:

$$\pi_t^e(p,s)\ . \tag{8}$$

Thereafter, to define the average inflation expectations of economic agents, we must first determine the agent unit distributions on information perception and its confidence level.

The analysis of agents' inflation expectations based on information perception and belief is presented in the first part of this work. The aim of this article is to describe the process of inflation expectation formation. Thus, we find it necessary to characterise and formalise these notions.

A. Agents' perception of information signals

Before we analyse agent information perception, it is essential to evaluate the number of incoming information signals to an agent in the economy. Assume that I_t^s [12] information signals are supplied at time t that directly or indirectly characterise the economic environment; in addition, these signals reflect both previous-period events (up to and including period [t-1]) and current changes (taking place at time t).

$$I_t^s = q_t^{of} + q_{s_t^\varepsilon}^{\varepsilon}\ , \text{ where} \tag{9}$$

---

[11] This assertion does not contradict the concept of quasi-adaptive expectations presented in this paper since, because of the limited nature of human intelligence, every economic agent is boundedly rational (possessing both rational and quasi-adaptive expectations).

[12] It is necessary to note that each country is characterized both with its own information volume ($I_t^{s^j}, j \in N$ where *j* is a country, and s - supply) and with its own indexes reflecting information asymmetry ($\Delta_t^{i^j}$) and monetary transparency ($\delta_t^{m^j}$) characterizing the particular country. Additionally, as already mentioned above, according to Hegel's dialectical principle (the transition from quantity to quality), we can affirm that an agent's information perception increases as its total volume increases meeting its asymmetry decrease.

q_t^{of} is the number of information signals that overtly or covertly characterise the future rate of inflation predicted by monetary authorities, i.e., characterise the inflation target value.

$q_{s_t^{\varepsilon}}^{\varepsilon}$ is the number of information signals that characterise external shocks (independent of the actions of monetary authorities) that affect the inflation rate.

However, every agent in the economy at time *t* can perceive only some nuggets of information I_t^s as a consequence of information asymmetry, and I_t^a reflects the highest available volume:

$$I_t^a = f(I_t^s, \Delta_m^{i_t}) = f(q_t^{of}, q_{s_t^{\varepsilon}}^{\varepsilon}, \Delta_m^{i_t}), \text{ where} \quad (10)$$

$\Delta_m^{i_t}$ is the level of information asymmetry at time *t*.

Note that monetary transparency facilitates the decrease in the volatility of agents' inflation expectations, i.e., expectations tend to converge with official inflation forecast, and thus tend to decrease the degree of agent nervousness and to increase financial stability. In other words, more perfect monetary transparency leads to less information asymmetry between authorities and economic agents:

$\Delta_m^{i_t} = f(\Delta_t^i, \delta_t^m)$, where

Δ_t^i is the level of information asymmetry at time *t* (non-adjusted for monetary transparency), and δ_t^m is the level of monetary transparency at time *t*.

It is essential to note that, in our model, we define the monetary transparency as a whole instead of focusing on the central bank transparency, as do many research studies.[13] The index of monetary transparency reflects not only explicit policy models, the regularity of policy decision announcements, the open monetary transmission mechanism and other factors integrated into the central bank transparency index [21], but moreover, it also reveals, for example, the quantity and quality of information sources, their semantics and many other determinants.

At the same time, it is important to note that none of the monetary transparency assessments published to date can be used as the only correct one to reduce the asymmetry without applying additional adjustments. This is due, among other factors, to the lack of information on the evaluation technique (see, for example, Oxford Analytica Country Report) [43].

An economic agent perceives at time *t* only a small piece I_t^m [14] of all available information I_t^a that defines its level of information perception. Suppose that the number of apprehended information signals depends on the agent's income. Because the levels of information perception p_t and p_{t-j}[15] are generally strongly correlated with relatively small *j*, high-income agents in general are characterised by a high degree of information perception. Thus,

---

[13] See for example [14, 16, 21, 36].

[14] The isolation of perceived signals I_t^m by agents from all available information I_t^a is explained by limitations of human intelligence, i.e., in philosophical terms, by the problem of ideal objects, insofar as ideal objects in combination with material objects provide the sophistication of a perpetual universe.

[15] This statement reflects an assumption that the economic agent in the short run cannot change his own level of information perception.

$p = f(y_x; I_t^m) \in [0;1]$, where (11)

y_x – income of agent x, and p - level of information perception of agent x.

The volume of acquired information is measured by the use of signals, i.e., announcements or statistical data on the economic environment that expressly or by implication affect the future value of inflation.

Some agents (the adaptive ones) acquire and analyse only the information on the previous periods, distrusting any fresh information. Others are oriented to the most available signals disseminated by monetary authorities. The higher the level of agent signal perception, the greater the attention paid to the latest information (rational behaviour). Assume also that it is possible to determine the number of information signals such that an additional one would not substantially improve one's personal inflation forecast. Thus it is possible to limit the infinite number of information signals such that

$I^{\max} \mid p = 1.$ (12)

An economic agent acquires and analyses information and makes a decision on the basis of this analysis. Therefore, the income distribution is taken to represent the distribution of economic agents according to their capability to perceive information. The income increase per unit is much more significant for an economic agent that owns just one unit of income than for an agent that owns one thousand income units. Thus, we assume that a shift in the level of agent information perception depends on the percentage income change. For the purposes of further analysis, it is necessary to formalise the distribution function of agent incomes $B(y_x)$[16] that reflects the share of economic agents with income lower than the defined one.

Designate the density function of agent incomes by $b(y_x)$ and constrain the maximum income to y_{max}, which corresponds to the set of agents with income $y \geq y_{\max}$. This function is continuous and thus integrable. According to the above analysis, information perception and processing is associated with data acquisition costs and other problems of information asymmetry. Therefore, we use a parameter to reflect the information asymmetry adjusted for monetary transparency, $\Delta_t^i \in [0;1]$, $\delta_t^m \in [0;1]$.

Thus, two parameters affect an agent's level of information perception:

1. Relative value of income reduced to semi-elasticity:

$$\tilde{y}_x = \ln\left(\frac{y_x}{y_{\max}}\right). \quad (13)$$

2. Coefficient reflecting the relative number of information signals, adjusted for information asymmetry, monetary transparency and bounded rationality:

$\theta = \frac{I^a}{I^{\max}}$, i.e.,

$$\theta = \frac{I^{\delta^m \times (1-\Delta^i)}}{I^{\max}}. \quad (14)$$

[16] It is possible to use statistical data on income distributions of both households and legal entities for model verification.

The level of information perception depends on information processing as well as on monetary transparency and asymmetry per information unit:

$$p = \frac{1}{1+\left|\tilde{y}_x\right|^{\theta}}. \tag{15}$$

The density function of $\tilde{y}_x$ can be expressed in terms of the density function of agent incomes $b(y_x)$. According to (13),

$$y_x = y_{\max} \times e^{\tilde{y}x}, \text{ and} \tag{16}$$

$$dy_x = y_{\max} \times e^{\tilde{y}x} \times d\tilde{y}x;$$

thus, inverting the order of integration, we obtain

$$\int b(y)dy = \int b(y_{\max} \times e^{\tilde{y}x}) \times y_{\max}\, \tilde{y}_x\, d\tilde{y}x. \tag{17}$$

Designate the distribution function of relative incomes in the logarithmic scale ($\tilde{y}_x$) as $\tilde{b}(\tilde{y}_x)$. Then the distribution function of information perception will be defined on the basis of the density function of relative incomes $\tilde{b}(\tilde{y}_x)$.

Given that $\left|\tilde{y}_x\right| = (\frac{1}{p} - 1)^{\frac{1}{\theta}}$, and for any $y_x \le y_{\max}$ we have $\tilde{y}_x \le 0$, it follows that

$$\tilde{y}_x = -(\frac{1}{p} - 1)^{\frac{1}{\theta}}$$

, whence

$$d\tilde{y}_x = \frac{1}{\theta} \times \frac{1}{p^2} \times (\frac{1}{p} - 1)^{\frac{1}{\theta}-1} dp.$$

Inverting the order of integration in (17), we obtain

$$\int \tilde{b}(\tilde{y}_x)d\tilde{y}_x = \int \tilde{b}(-(\frac{1}{p} - 1)^{\frac{1}{\theta}}) \times \frac{1}{\theta} \times \frac{1}{p^2} \times (\frac{1}{p} - 1)^{\frac{1}{\theta}-1} dp. \tag{18}$$

Designate the distribution function of information perception by *G*:

$$G = \int_0^p \tilde{b}(-(\frac{1}{v} - 1)^{\frac{1}{\theta}}) \times \frac{1}{\theta} \times \frac{1}{v^2} (\frac{1}{v} - 1)^{\frac{1}{\theta}-1} dv. \tag{19}$$

The function *G* is equally distributed among levels of belief *s*.

B. Belief in perceived information

Note that the belief levels of agents with different levels of information perception are different. Those agents who perceive information relatively deeply are able to acquire and analyse extra signals, but their belief level varies.

The level of belief of the agent with level of information perception *p* is defined as

$s_{|p} = (1-p) \times s_{|p=0} + p \times s_{|p=1}$, where (20)

$s_{|p=0}$ - belief level of the agent with zero information perception, and

$s_{|p=1}$ - belief level of the agent whose level of information perception is unity.

According to this analysis, we examine the process of formation of belief in the authority's actions for agents with zero and unit levels of information perception.

As mentioned above, economic agents rely on the previous period spreads between the actual inflation and its official targets in setting their own beliefs in perceived information. However, agents with zero level of information perception consider public authorities as a common source of information. Thus, for every period *t,* it is possible to determine the divergence:

$\chi_t = \pi_t - \pi_{of}^{e_t}$. (21)

For agents with weak information perception, the compact divergence χ reflects their willingness to trust the authorities (see [3]). However, economic agents assign different levels of relevance to events of various periods for at least two reasons. First, economic agents tend to give higher priority to recent events and lower priority to past ones. Second, if a certain government returns to power at intervals, then the events of those periods would be considered to have higher importance than events at other times. Thus, for example, if the US Democratic Party comes to power, then economic agents probably will give greater weight to the events of other periods of Democratic control. Therefore, to recognise the changing relevance of information over time, we introduce a coefficient $\lambda_{t,T}$ characterising changes in the significance of events occurring in a period *t* to set the belief level in the current period *T*.

To simplify the analysis, suppose that $\lambda_{t,T}$ does not depend either on *t* or on *T,* i.e., $\lambda_{t,t+1} = \lambda$. In this case, λ reflects the extent to which event relevance decreases up to period *t* (inclusively) transferring to period *t+1.*[17] Agents with low level of signal perceptivity are characterised by fewer opportunities to acquire and analyse information. Thus, it is difficult for them to keep data in mind for long periods of time. Therefore, it is logical to suppose that the information forgetfulness coefficient should vary for agents with different levels of information perception, i.e., $\lambda = \lambda(p)$.

Assume $\lambda(0) = \lambda_0$; then the set of deviations $\{\chi_t\}$ reduces to the set deviations $\left\{ \chi_t * \frac{\lambda^{T-t}}{\sum \lambda^{T-t}} \right\}$ that takes into consideration the changing relevance of information over time. Let

$\eta_t = \chi_t * \frac{\lambda^{T-t}}{\sum \lambda^{T-t}}$ for every t. (22)

[17] The use of this coefficient, for example, can explain the results of the Romer & Romer investigation (2000) [36]. They statistically substantiated that, over a period of several decades, forecasts published by Fed staff were more refined than inflation expectations of economic agents.

Thus, the set of deviations $\{\chi_t\}$ gives rise to the set of deviations $\{\eta_t\}$ that takes into consideration the changing relevance of information for every time *t*.

In this case, the belief level of agents with information perception equal to unity is evaluated on the basis of the set $\{\eta_t\}$. The spread between actual inflation and the official target is affected by various factors. Therefore, the current-term spread can be considered as a random variable with unknown distribution law. Therefore, the definition of the distribution is conceptually impossible under the additive and multiplicative influence that various factors (which can vary according to the country in question) have on divergences. In the general case, it seems fair to suppose that deviations are distributed as finite numbers of linear combinations of generalised hyperbolic distributions, where the linear factors are $\beta_1, \beta_2, ..., \beta_n \mid \sum_{i=1}^{n} \beta_i = 1$, i.e., a linear combination of distribution functions should also be a distribution function. We can determine the mean deviation value on the basis of data on the spreads between the actual inflation and its official target:

$$m_0 \mid_{p=0} = E\eta_T = \frac{\sum_{t=1}^{T-1} \eta_t}{t-1}, \tag{23}$$

and the unbiased estimated variance of the deviations:

$$\sigma_{0^2} \mid_{p=0} = V\eta_T = \frac{t}{t-1} \times \left(\frac{\sum_{t=1}^{T-1} \eta_t^2}{t-1} - \left(\frac{\sum_{t=1}^{T-1} \eta_t}{t-1} \right)^2 \right). \tag{24}$$

We assume in this case that agents do not recognise the distribution function of the differences between the actual inflation rate and the target. This follows for at least two reasons. First, in this instance, confidence is evaluated on the basis of the coincidence between the actual inflation and the official forecast, including the coordination of the authority's actions and excluding the possible influence of a statistically significant characterisation of spread behaviour. Second, the fitting of generalised hyperbolic distributions is a rather complex process that requires special software, and consequently, agents with even relatively low costs of information acquisition and analysis have some problems with the estimates of the distribution parameters. Nevertheless, economic agents align their forecasts on the basis of their own impressions on the authority's adherence to declared targets and price level forecasts. The subjective expectation of deviations by every agent is affected by various endogenous (a consequence of individual peculiarities) and exogenous factors. The latter include the average deviation (the mean, see [23]) and degree of fluctuation instability (the variance, see [24]). The endogenous peculiarities under a random selection of agents are chance factors. Therefore, considering a particular agent, we assume that the expected deviation is a normally distributed random variable with mean m_0 and variance σ_{0^2}.

$$\eta^e \sim \frac{1}{\sqrt{2\pi}\sigma_0} \times e^{\left(-\frac{(\eta - m_0)^2}{2\sigma_{0^2}}\right)}. \tag{25}$$

Insofar as an economic system in toto consists of large numbers of agents, the distribution function of this random variable thus reflects the distribution of expected deviations. As was mentioned above, the greater the difference between actual inflation and the forecast, the lower the level of belief in the monetary authority's actions. Consequently, the distribution

function of expected deviations is used as the basis for defining the belief distribution function.

Therefore, we estimate that the subjective probabilities of deviation lie within the determined interval [*a*;*b*]:

$$p(a < \eta_T < b) = \int_a^b \frac{1}{\sqrt{2\pi}\sigma} \times e^{(-\frac{(\eta - m)^2}{2\sigma^2})} d\eta . \quad (26)$$

If *p=0* and both *a* and *b* are close to к $m_{0,}$ and if, in addition, the probability of the deviation lying within the determined interval is high, then the economic agents will trust the authorities.

We define the belief function based on the distribution function. It is defined on the basis of the probability distribution $p(a < \eta_T < b)$.

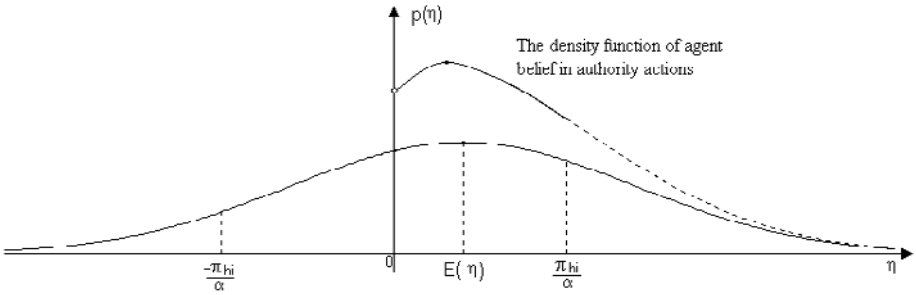
It is essential to note that under hyperinflation, in spite of the fulfilment of macroeconomic indicators targets, agents will have zero levels of belief. That is, the weakened belief in the authority's actions in the conduct of monetary policy correlates with the intersection of the hyperinflation threshold. Hence, for every critical η_{hi} such that at $\forall \eta > \eta_{hi}$, the level of belief in the authority's actions equals zero, $\eta_{hi} = \frac{\pi_{hi}}{\alpha}$, where α is the coefficient characterising the sensitivity of the agent's level of belief in the authority's actions.[18]

Therefore, the belief function is set on the basis of density function, which is defined on interval $\left[0; \frac{\pi_{hi}}{\alpha}\right]$ and is expressed as

$$\begin{cases} F = \int_0^{\eta} \frac{1}{\sqrt{2\pi}\sigma_0} \times e^{(-\frac{(\nu - m_0)^2}{2\sigma_0^2})} d\nu + \int_0^{\eta} \frac{1}{\sqrt{2\pi}\sigma_0} \times e^{(-\frac{(\nu + m_0)^2}{2\sigma_0^2})} d\nu, & \text{at } \eta \in [0; \frac{\pi_{hi}}{\alpha}) \\ F = \int_{\eta}^{+\infty} \frac{1}{\sqrt{2\pi}\sigma_0} \times e^{(-\frac{(\nu - m_0)^2}{2\sigma_0^2})} d\nu + \int_{\eta}^{+\infty} \frac{1}{\sqrt{2\pi}\sigma_0} \times e^{(-\frac{(\nu + m_0)^2}{2\sigma_0^2})} d\nu, & \text{at } \eta \in [\frac{\pi_{hi}}{\alpha}; +\infty) . \end{cases} \quad (27)$$

Figure 2

Distribution function of agent belief in monetary authority actions. (Reflects differences between actual inflation and official forecasts.)



Note: The coordinate of the punctured point on ordinate axis shows the value for agents with zero belief in monetary authority actions, which is determined, ceteris paribus, by the alpha value (the higher the alpha, the higher this point).

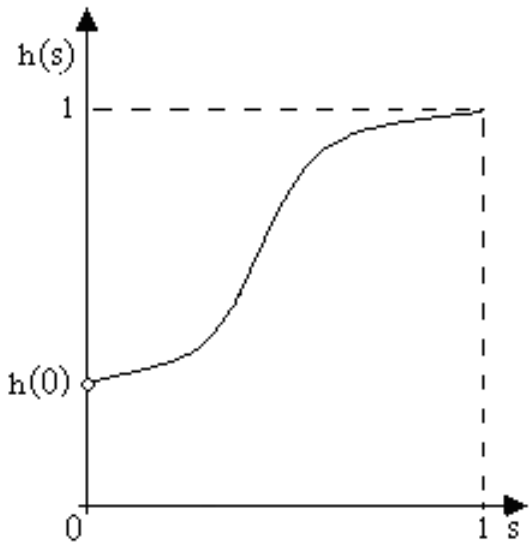
[18] The coefficient α also reflects agent nervousness, velocity of money and currency issue.

We should turn to the measure of belief $s|_{s\in[0;1]}=\frac{\pi_{hi}-\alpha\eta}{\pi_{hi}}$ to consider the distribution function of the agent belief. Therefore, if α is significantly greater than unity, then in response to a slight increase in the expected spread between actual and predicted inflation, the confidence in authority activities can decrease drastically. This thus confirms the above statement that "the wider the spread, the weaker the belief". Thus, by inverting the order of integration, we obtain

$$\begin{cases} H_0=\int_0^s \frac{\pi_{hi}}{\alpha\sqrt{2\pi}\sigma_0}\times e^{\left(-\frac{\left(\frac{\pi_{hi}}{\alpha}\right)^2(1-\nu-\frac{m_0}{\pi_{hi}/\alpha})^2}{2\sigma_0{}^2}\right)}d\nu+\int_0^s \frac{\pi_{hi}}{\alpha\sqrt{2\pi}\sigma_0}\times e^{\left(-\frac{\left(\frac{\pi_{hi}}{\alpha}\right)^2(1-\nu+\frac{m_0}{\pi_{hi}/\alpha})^2}{2\sigma_0{}^2}\right)}d\nu, at\ \ s\in(0;1] \\ H_0=1-H_{0|s\in(0;1]}, at\ \ s=0 \end{cases} \qquad (28)$$

Figure 3

Distribution function of spreads between actual inflation and official forecasts.



We have thus defined the distribution function of beliefs for agents with zero level of information perception.

The distribution function of beliefs for agents with unit level of information perception is defined analogously with the one exception that another approach is used to estimate divergences. These economic agents qualitatively distinguish all kinds of signals emanating from the authorities. Therefore, they can use different weighted coefficients to set their level of belief. In other words, they will rely on that source of information whose previous-period signals strongly correspond with actual rates of inflation. The sum of the squared deviations from actual inflation in response to this kind of signal can be used as a measure of its accuracy.

We should emphasise the significance of the coordinated actions by the authority, which is revealed by the coincidence of forecasts. This in and of itself cannot produce a strong belief in the authority's actions, but it can produce a certain multiplicative effect by sending a signal to agents that monetary actions are concerted.

Thus, agents with information perception equal to unity set their own level of belief in the authority's actions on the basis of the following deviations:

$$\gamma_t = (\pi_t - (\sum_{n=1}^{N}\left(\frac{q_t^{of,N}}{\sum_{n=1}^{N}\left(q_t^{of,N}\right)}\times\frac{\sum_{k=1}^{t-1}(\pi_t^{T}-\pi_t)^2}{\sum_{n=1}^{N}\left(\sum_{k=1}^{t-1}(\pi_t^{of,N}-\pi_t)^2\right)}\times\pi_t^{of,N}\right))\times$$
$$\times(1+\ln(\frac{\sum_{n=1}^{N}\left(\sum_{k=1}^{t-1}(\pi_t^{of,N}-\pi_t)^2\right)+\frac{1}{N}\times\sum_{n=1}^{N}\sum_{k=1}^{t}(\pi_t^{of,N}-\pi_t^{of,(N-1)})^2}{\sum_{n=1}^{N}\left(\sum_{k=1}^{t-1}(\pi_t^{of,N}-\pi_t)^2\right)})),\ N\in R. \quad (29)$$

These deviations are then adjusted by the coefficient λ, and we consider the set of adjusted deviations $\{\varphi_t\}$:

$$\varphi_t = \gamma_t * \frac{\lambda^{T-t}}{\sum\lambda^{T-t}}. \quad (30)$$

We determine the deviation mean value on the basis of data on spreads between actual and forecast inflation for agents with high level of information perception:

$$m_1\,|_{p=1} = E\varphi_T = \frac{\sum_{t=1}^{T-1}\varphi_t}{t-1}, \quad (31)$$

and the unbiased estimated variance of deviations:

$$\sigma_{1^2}\,|_{p=1} = V\varphi_T = \frac{t}{t-1}\times\left(\frac{\sum_{t=1}^{T-1}\varphi_t^2}{t-1}-\left(\frac{\sum_{t=1}^{T-1}\varphi_t}{t-1}\right)\right)^2. \quad (32)$$

We define the distribution function of the beliefs of agents with unit level of information perception on the basis of hypotheses on the normalcy of the expected deviation of data distribution, as described above:

$$\begin{cases} H_1 = \int_0^s \frac{\pi_{hi}}{\alpha\sqrt{2\pi}\sigma_1}\times e^{\left(-\frac{\left(\frac{\pi_{hi}}{\alpha}\right)^2(1-\nu-\frac{m_1}{\pi_{hi}/\alpha})^2}{2\sigma_1^2}\right)}d\nu + \int_0^s \frac{\pi_{hi}}{\alpha\sqrt{2\pi}\sigma_1}\times e^{\left(-\frac{\left(\frac{\pi_{hi}}{\alpha}\right)^2(1-\nu+\frac{m_1}{\pi_{hi}/\alpha})^2}{2\sigma_1^2}\right)}d\nu,\ s\in(0;1] \\ H_1 = 1-H_{1|s\in(0;1]},\ s=0 \end{cases}. \quad (33)$$

The belief distribution function of agent *x* with level of information perception equal to *p* is defined as a linear combination of H_0 and H_1:

$$H_e = (1-p)\times H_0 + p\times H_1. \quad (34)$$

C. Average inflation expectations

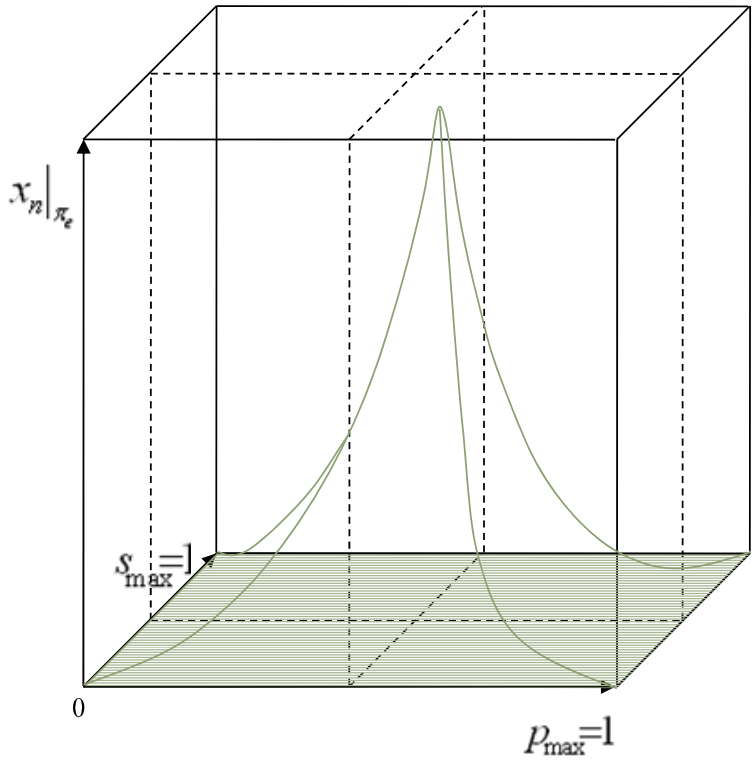
We do not consider merely one representative agent in this research. Therefore, various economic agents are characterised by divergent inflation expectations. However, it is feasible to calculate the integral of the agent inflation expectations in the economy. Therefore, it is necessary to weight the inflation expectations of economic agents by their numbers. For this purpose, we define the density function of agent inflation expectations (F_H^G) based on the

signal perception and confidence in this information. This distribution function is the combination of the belief *G(s,p)* and the information perception *H(p)* distribution functions that are defined above:

$$F_H^G = \int_0^p H \times G(v)dv \ . \tag{35}$$

Figure 4

Graphic representation of density function of agents' inflation expectations, reflecting signal perception and belief in the information.



Note: The peak is associated with the weighted average of expected rates of inflation (weighted by number of agents). Thus it enables one to define the predominant type of agents' inflation expectations.

This figure reflects a simplified interpretation of our research results, by means of which the predominant type of inflation expectations can be represented graphically, thus making it possible to evaluate the risks inherent in it.

Then, the average inflation expectation of economic agents is equal to the weighted (in inflation expectations) average of the above function:

$$\pi_t^e = \int_0^1 \int_0^1 \pi^e(s,p) H_p G_s dpds \ . \tag{36}$$

D. Risk of arbitrage

One of the practical aspects of applying this concept is that it makes it possible to define the risk that agents with arbitral inflation expectations are present in an economy. The corresponding uncertainty in the evaluation of average inflation expectations, i.e., the

potential contribution of agents with arbitral expectations to the average anticipations, is considered to be the arbitral risk. We consider this case to be one with risk, given the uncertainty surrounding the monetary authority actions at which they were to meet macroeconomic indicator targets but would not affect the average agent inflation expectations. This occurs when agents with quasi-adaptive expectations forecast higher inflation owing to a lack of information available from monetary authorities. In this case, some agents characterised by rational expectations and with access to a volume of information sufficient to define both the share of quasi-adaptive agents and their average inflation expectations forecast the same inflation value. Thus, the average inflation forecasts of economic agents depend on the presence of agents with arbitral inflation expectations in the economy. It is essential to note that as the average agent belief increases, any inflation fluctuations increase the future average rate more than it would be in the case if this group of agents were not identified.

Note that average inflation expectations are defined according to (36) and that agents are characterised by various levels of confidence in acquired information:

$\pi^e = k_1\pi^{qad} + k_2\pi^{\text{rat}}$, where

k_j - share of agents with the proper type of inflation expectations, $j \in [1;2]$, $j \in N$.

Alternatively,

$$\pi^e = \kappa_1 \times \pi^{ad}_{qad} + \kappa_2\pi^{of}_{qad} + \kappa_3\pi^{arb}_{\text{rat}} + \kappa_4\pi^{\text{of}}_{\text{rat}} \text{, where} \quad (37)$$

κ_i - a share of agents with the proper type of inflation expectations, $i \in [1;4], i \in N$.

We evaluate the share of agents with arbitral inflation expectations at time *T*. For each kind of agent with a fixed defined level of information perception *p=p*,* the share is

$$\tilde{\kappa}_4 = \int_0^1 (1-s) \times H_{|p=const} ds \,. \quad (38)$$

This value can be determined on the basis of each level of perception. Thus, it is possible to evaluate the share of agents with arbitral inflation expectations α_4 by weighting and summing up each level:

$$\kappa_4 = \int_0^1 \int_0^1 (1-s) \times p \times H_{|p=const} \times G ds dp \,. \quad (39)$$

That is,

$$\kappa_4 = \int_0^1 \int_0^1 (1-s) \times p \times \left(\int_0^s \frac{\pi_{hi}}{\alpha\sqrt{2\pi}\sigma_p} \times e^{\left(-\frac{\left(\frac{\pi_{hi}}{\alpha}\right)^2 (1-\nu-\frac{m_p}{(\pi_{hi}/\alpha)})^2}{2\sigma_p^2}\right)} d\nu + \right.$$

$$\left. + \int_0^s \frac{\pi_{hi}}{\sqrt{2\pi}\sigma_p} \times e^{\left(-\frac{\left(\frac{\pi_{hi}}{\alpha}\right)^2 (1-\nu+\frac{m_p}{(\pi_{hi}/\alpha)})^2}{2\sigma_p^2}\right)} d\nu\right) \times \left(\int_0^p \tilde{b}\left(-\left(\frac{1}{v}-1\right)^{\frac{1}{\theta}}\right) \times \frac{1}{\theta} \times \frac{1}{v^2} \times \left(\frac{1}{v}-1\right)^{\frac{1}{\theta}-1} d\nu\right) ds dp \,. \quad (40)$$

This is the contribution that agents with arbitral expectations make to the change in average expectations according to (7).

Thus, it is possible to define the significance of the influence of the arbitral formation of expectations on previous rates of inflation. It is also possible, using this model, to measure the magnitude of the risk in the current term and, thus, to establish the optimal conduct of monetary policy for achieving a given inflation target and a stable price level over the long run.

Conclusion

There is no doubt about the importance of the expectation channel of transmission in the conduct of monetary policy. Ben Bernanke,[19] for example, noted the incontestability of a significant influence of inflation expectations on its actual value and thus on achievement of price stability. This can also be seen in the ECB paper[20] on the analysis of agent expectations, which asserts that in the conduct of monetary policy, central banks need to form and to monitor expectations of economic agents on a continuing basis. Insofar as the authority actions affect the macro parameters with lags, monetary policy needs levers against agent anticipations of random processes within a framework of financial stability, in order to keep current economic risks to a minimum. In addition, expected changes in economic variables can strongly influence current agent behaviour by means of various channels of the transmission mechanism.[21] It should be noted that understanding the formation of agents' expectations makes them more manageable for monetary authorities, which in turn facilitates, for example, asset price management. The importance of this is demonstrated by Japan, which has struggled with the consequences of the collapse of the asset price bubble over the last twenty years.

Accordingly, we wish to note that to manage agents' inflation expectations, it is essential to analyse and use all sources of information. A lack of coordination on the part of the authorities can lead at least to a decreasing level of agents' belief, thus increasing the number of agents with arbitral expectations. The only way to avoid agents' distrust and thus decrease the risk of arbitrage is to publish monetary targets on a monthly basis using various information sources simultaneously to provide sufficient access to this information.

In conclusion, we would like to note that for the purposes of addressing crisis phenomena, the feasibility of defining the inflation expectations that economic agents form based on perceived data in the information economy appears to be an extremely important issue.

---

[19] Ben S. Bernanke: Inflation expectations and inflation forecasting, National Bureau of Economic Research Summer Institute, Cambridge, Massachusetts, 10 July 2007, BIS Review 79/2007.

[20] Expectations and the conduct of monetary policy, ECB Monthly Bulletin No 5, May 2009, pp.75-90.

[21] B. Wickman-Parak. Inflation targeting and the financial crisis, BIS Review, No 2, 2009, pp. 10-17.

Abbreviations

W	a set of information signals
w	a single element in a set of information signals
x	economic agents
q	a number of signals
s_q	a parameter that reflects the content of the signal *q*
I_t^s	supplied information signals at time *t* that directly or indirectly characterise the economic environment
I_t^a	the highest available volume of information at time *t*
I_t^m	a piece of the available information I_t^a perceived by an economic agent at time *t* that defines its level of information perception
$I^{\max}$	the maximum number of information signals perceived by an economic agent at time *t*
θ	a coefficient reflecting the relative number of information signals adjusted for information asymmetry, monetary transparency and bounded rationality
Δ_t^i	the level of information asymmetry at the time t (non-adjusted for monetary transparency)
$\Delta_m^{i_t}$	the level of information asymmetry at the time t (adjusted for monetary transparency)
δ_t^m	the level of monetary transparency at the time t
$\vec{s}_t^{of,N}$	a linear combination of vectors of information emanating from monetary authorities
$\vec{s}_t^{cb}$	a vector defined according to [5] that reflects central bank information signals
$\vec{s}_t^{\varepsilon}$	a vector that expressly or by implication reflects information on external inflation shocks
q_t^{of}	the number of information signals that overtly or covertly characterise the future rate of inflation predicted by monetary authorities (i.e., that characterise the target inflation rate)
$q_{s_t^{\varepsilon}}^{\varepsilon}$	the number of information signals that characterise external shocks (independent of monetary authorities' actions) affecting the inflation rate
$\pi_{of}^{e_T}$	inflation forecast published by the authorities in the current term T
π_T^e	average inflation expectations of agents in the current term T
$\pi_t^{e^{ad}}$	adaptive inflation expectations
$\pi_t^{e^{qad}}$	quasi-adaptive inflation expectations
$\pi_t^{e^{rat}}$	rational inflation expectations

$\pi_t^{e^{arb}}$	arbitrary inflation expectations
π_{hi}	hyperinflation
α	the coefficient characterising the sensitivity of the agent's belief in the actions of the authority
p	level of information perceptivity of agent x, $p \in [0;1]$
s	level of belief in the perceived information signals of agent *x*, $s \in [0;1]$
y_x	income of agent x
$y_{\max}$	maximum agent income
$B(y_x)$	distribution function of agent incomes that reflects a share of economic agents with incomes lower than the defined one
$b(y_x)$	density function of agent incomes in b(y_x)
G	distribution function of information perception
$\{\chi_t\}$	set of deviations $\{\chi_t\}$ of actual inflation from its official forecast
$\lambda_{t,T}$	coefficient characterising changes in the significance of events occurring in period *t* to set the belief level in current period *T*
$\{\eta_t\}$	set of deviations obtained from the set of deviations $\{\chi_t\}$ considering the changing relevance of information over time for every *t*
$\{\gamma_t\}$	set of deviations of actual inflation from its official forecast, providing an indicator of the maximum number of information signals
$\{\varphi_t\}$	set of deviations obtained from the set of deviations $\{\gamma_t\}$ providing an indicator of the maximum number of information signals and considering the changing relevance of information over time for every *t*
H_e	belief distribution function of agent *x* with level of information perception equal to *p*
F_H^G	density function of agent inflation expectations reflecting signal perception and confidence in the information
κ_i	proportion of agents with *i*-type inflation expectations

References

1. Andolfatto D., Hendry S., Moran K. Are Inflation Expectations Rational? Simon Fraser University and Rimini Centre for Economic Analysis; Bank of Canada; Université Laval, Canada, WP 27-07, 2007.

2. Baily M. Macroeconomic Implications of the New Economy. Economic Policy for the Information Economy, A symposium sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, Wyoming, 30 August – 1 September, 2001.

3. Bini Smaghi L. Restoring confidence, BIS Review, Madrid, 148/2008.

4. Bernanke Ben S. Inflation expectations and inflation forecasting, National Bureau of Economic Research Summer Institute, Cambridge, Massachusetts, 10 July 2007, BIS Review 79/2007.

5. Blinder S., Ehrmann M., Fratzscher M., De Haan J., and D.-Jan Jansen. Central Bank Communication and Monetary Policy: A Survey of Theory and Evidence. Journal of Economic Literature, December 2008, 46:4, 910–945.

Available at: http:www.aeaweb.org/articles.php?doi=10.1257/jel.46.4.910

6. Bofinger P. Monetary Policy: Goals, Institutions, Strategies, and Instruments. Oxford University Press, Oxford, New York, 2001.

7. Burrell O.K. Possibility of an Experimental Approach to Investment Studies. The Journal of Finance, Vol 6, No 2, June 1951, pp. 211-219.

8. Carboni G., and Ellison M. Inflation and Output Volatility under Asymmetric Incomplete Information. ECB Working Paper Series, No 1092, September 2009.

9. Carney M. Flexibility versus credibility in inflation-targeting frameworks. Bank for International Settlements. BIS Review: Bank for International Settlements, 2008. No 85, p.1-5.

10. Castelnuovo E., Nicoletti-Altimari S. and Rodriguez-Palenzuela D. Definition of price stability, range and point inflation targets: the anchoring of long-term inflation expectations. ECB Working Paper No 273, September 2003.

11. Chenault A., Flueckiger G. E. An information theoretic model of bounded rationality. Mathematical social sciences. 6 (1987) 227-243.

12. Cukierman A., Meltzer A. A Theory of Ambiguity, Credibility and Inflation under Discretion and Asymmetric Information. Econometrica, 1986.

13. Demertzis M., Hallett A. H. Asymmetric information and rational expectations: When is it right to be ‘‘wrong’’? De Nederlandsche Bank. Amsterdam, Netherlands George Mason School of Public Policy, George Mason University, CEPR, London, UK, Journal of International Money and Finance No 27, 2008, pp. 1407–1419.

14. Demertzis M., Hallett A. H. Central Bank Transparency in Theory and Practice. De Nederlandsche Bank, University of Amsterdam, Vanderbilt University, CEPR, September 2005.

15. Demertzis M., and Viegi N. Inflation Targets as Focal Points. International Journal of Central Banking, Vol 4, No 1, March 2008.

16. Dincer N., Eichengreen B. Central Bank Transparency: causes, consequences and updates. NBER, Working Paper No 14791, Cambridge, March 2009.

17. Doepke J., Dovern J., Fritsche U., and Slacalek J. The Dynamics of European Inflation Expectations. The B.E. Journal of Macroeconomics: Vol 8: Iss. 1 (Topics), Article 12, 2008.

Available at: http://www.bepress.com/bejm/vol8/iss1/art12

18. Economic Policy for the Information Economy, A symposium sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, Wyoming, 30 August – 1 September, 2001.

19. Expectations and the conduct of monetary policy, ECB Monthly Bulletin No 5, May 2009, pp.75-90.

20. Galbraith J.K. The new Industrial State. Princeton University Press, 1967.

21. Geraats P. Trends in Monetary Policy Transparency. CESIFO Working paper No 2584, Category 7: Monetary Policy and International Finance, March 2009.

22. Goodhart C. Central banks' function to maintain financial stability: An uncomplemented task. Financial Markets Group, London School of Economics, June 2008.

23. Kahneman D., Tversky A. Prospect Theory: An Analysis of Decision under Risk, Econometrica, Vol 47, No 2, March 1979, pp. 263-291.

24. Kohn D. L., Sack B. Central Bank Talk: Does It Matter and Why? In Macroeconomics, Monetary Policy, and Financial Stability, 175–206. Ottawa: Bank of Canada, 2004.

25. Laurens B., Arnone M., Segalotto J.-F. Central Bank Independence, Accountability, and Transparency: A Global Perspective. New York, Palgrave Macmillan, 2009.

26. Leijonhufvud A. Agent-based macro. UCLA, USA, University of Trento, Trento, Italy, Handbook of Computational Economics, Vol 2. Edited by Leigh Tesfatsion and Kenneth L. Judd, 2006 Elsevier B.V.

DOI: 10.1016/S1574-0021(05)02036-8

27. Lines M., Westerhoff F. Inflation expectations and macroeconomic dynamics: the case of rational versus extrapolative expectations. Journal of Economic Dynamics & Control, September 2009, doi:10.1016/j.jedc.2009.09.004.

28. Lippman S. A. and McCall J. J. Economics of Information. Elsevier Science Ltd., 2004.

29. Lucas R. Expectations and the Neutrality of Money. Journal of Economic Theory, 1972, pp. 103–124.

30. Lucas R.E., Jr. Monetary neutrality. Prize Lecture, University of Chicago, USA, 7 December, 1995

31. Machlup F. The Production and Distribution of Knowledge in the United States. Princeton University Press, Princeton, N.J., 1962.

32. Musgrave R. A. A Multiple Theory of Budget Determination. FinanzArchiv, New Series 25(1), 1957, pp.33-43.

33. Musgrave R. A. The Theory of Public Finance. 1959, pp.13-15.

34. Muth J. Rational Expectations and the Theory of Price Movements, 1961. Reprinted in The new classical macroeconomics. Vol 1, 1992.

35. Ouwersloot H., Nijkamp R, Rietveld P. Economic Aspects of Information and Communication: Some Considerations. Research Memorandum 1990-93, Faculteit der Economische Wetenschappen en Econometrie, vrije Universiteit, Amsterdam, December 1990.

36. Romer Ch. D., and Romer D. H. Federal Reserve Information and the Behavior of Interest Rates. American Economic Review, 90(3): 429–57, 2000.

37. Sargent T. J. Bounded rationality in macroeconomics. The Arne Ryde Memorial Lectures. Oxford University Press, Oxford, New York, reprinted 2001.

38. Simon H. A. “Theories of bounded rationality”, in McGuire C. B., Radner R. (eds.). Decision and Organisation. North-Holland, Amsterdam, 1972, pp. 161-176.

39. Stigler G J. The economics of information. Journal of Political Economy, 69, 1961, pp. 213–225.

40. Tesfatsion L. Agent-based computational economies: a constructive approach to economic theory. Department of Economics, Iowa State University, Ames, 18 December 2005.

41. Van Raaij W. F. Economic News, Expectations and Macro-Economic Behaviour. Erasmus University, Rotterdam, The Netherlands, Journal of Economic Psychology No 10, November 1989, pp.473 – 493.

42. Wickman-Parak B. Inflation targeting and the financial crisis, BIS Review, No 2, 2009, pp. 10-17.

43. http://www.oxan.com (Oxford Analytica).

Quantifying qualitative data from expectation surveys: how well do expectation surveys forecast inflation?

Teresita Bascos-Deveza[1]

As early as 2001, the Bangko Sentral ng Pilipinas adopted new measures of collecting information that could assess the direction and general state of business and the economy especially during times of economic uncertainties. These new measures consist of two quarterly opinion surveys – the Business Expectations Survey of top corporations in the Philippines and the Consumer Expectations Survey of households in the country. Both surveys provide a quarterly outlook on the economy by corporates and consumers all over the country. This paper examines the ability of confidence indicators from the Business Expectations Survey to provide advance warning on the peaks and troughs of the Philippine business cycle measured through the real gross domestic product growth rate. This is the first comprehensive analysis of survey data fitting both in-sample and out-of-sample real time data to track the peaks and troughs of the Philippine business cycle. It was found that the resulting turning points at downturns coincide with actual critical conditions and events in the Philippine economy which triggered a real contraction or slowdown during those periods. The paper further examines the ability of confidence indicators to predict future movements of inflation and exchange rates applying a modified "KLR signals approach" of setting thresholds and estimating conditional probabilities empirically from the survey data. Results show that confidence indicators from the Business Expectations Survey are useful tools for an advanced assessment of macroeconomic and financial risks.

I. The Rationale for Conducting Business and Consumer Surveys

The conduct of surveys is almost as old as recorded history. During the early times, censuses were conducted to enumerate citizens for taxation and military purposes. Two thousand years later, technology and communications development modernized the world as well as the tools for the conduct of surveys – creating a huge demand for information and making data collection and processing swift and efficient. As a result, surveys are being conducted to fill in the data gaps in all aspects of economic and social life – industry, trade, finance, government, health, education, and other economic and social activities worldwide.

At present, many central banks are conducting business and consumer expectation surveys with corporates and households as survey respondents, respectively. These two sectors were identified under the System of National Income and Product Accounts as the major producers of goods and services for the whole economy as well as for the rest of the world. Hence, decisions made on future economic activities based on the expectations of businesses and consumers would largely determine the future course of business and the economy. Through the conduct of these two surveys, expectations of businesses and consumers are recorded and transformed into advance information on business and the economy including the likely paths of inflation, interest rates, and exchange rates in the near future.

[1] Bangko Sentral ng Pilipinas.

Two questions on the analysis of survey results are: 1. Do the indicators derived from the surveys provide correct or reliable advance information on the whole economy and on key economic indicators like inflation and the exchange rate? And 2. Aside from the direction of change, which is computed through the difference or changes in values of the indicators from the survey, how would one interpret the actual numerical values of the said indicators?

The first question is answered in Section III, which shows the tracking ability of the indicators derived from the surveys with respect to the movements of gross domestic product (GDP) growth rates, inflation rates, interest rates, employment, and exchange rates.

The second question is also addressed in the succeeding sections, which demonstrate the application of the Kaminsky, Lizondo, and Reinhart (KLR) signals approach to calculate empirical probabilities (based on the numerical values of the survey indicators from the survey data) to predict the future movements of inflation and exchange rates.

II. Business and Consumer Expectations Surveys in the Philippines

The Business Expectations Survey (BES) and the Consumer Expectations Survey (CES) are currently being conducted quarterly by the Bangko Sentral ng Pilipinas (BSP). These two quarterly surveys are intended to provide advance indicators on the overall direction of business and economic activities during the current and next quarters from the viewpoint of a representative sample of the top 7000 corporations in the Philippines covered by the BES, and a random nationwide sample of 5000 households for the CES.

The Questionnaires

Both the BES and CES ask mostly qualitative questions usually answerable with three possible choices as shown below:

Business Expectations Survey Sample Questions

	Current Quarter (Jul-Sep 2010)			Next Quarter (Oct-Dec 2010)		
	Improving	No Change	Deteriorating	Improving	No Change	Deteriorating
Business Outlook						

What are your company's expectations with respect to the following?

	Current Quarter (Jul-Sep 2010)			Next Quarter (Oct-Dec 2010)		
Economic Indicators	Up	No Change	Down	Up	No Change	Down
Average Peso Borrowing Rate						
Average Inflation Rate						
Average (P/$) Exchange Rate (up – appreciation; down – depreciation)						

Consumer Expectations Survey Sample Questions

What do you think of the country's present economic condition compared to that of 12 months ago *(cite reference period)*?

1 – Better 2 – Same 3 – Worse

What is the present financial situation of your family compared to that of 12 months ago *(cite reference period)*?

1 – Better 2 – Same 3 – Worse

The Indicators

Qualitative data derived from the two surveys are quantified into indicators using diffusion indices or balance statistics. The diffusion index (D) is a measure of the difference between the percentage of corporates/consumers with an "improving or positive outlook" and those with a "deteriorating or negative outlook". The diffusion index in the BES is measured by:

$D = (100*\sum\sum w_j Y_{ij})/n$ $\quad -100 \leq D \leq 100$

Where:

$W_j = N_j/N$ is the weight of the response of the respondent firms in the j^{th} sector
N_j = number of firms in the top 7000 corporations belonging to the j^{th} sector
N = 7000
i = 1 to n_j; n_j = number of sample firms in the jth sector
j = 1 to k; k = the number of sectors
n = total number of sample firms = $n_1 + n_2 + \ldots + n_k$

Y_i = 1 if respondent's outlook is improving

0 if no change, and

-1 if deteriorating

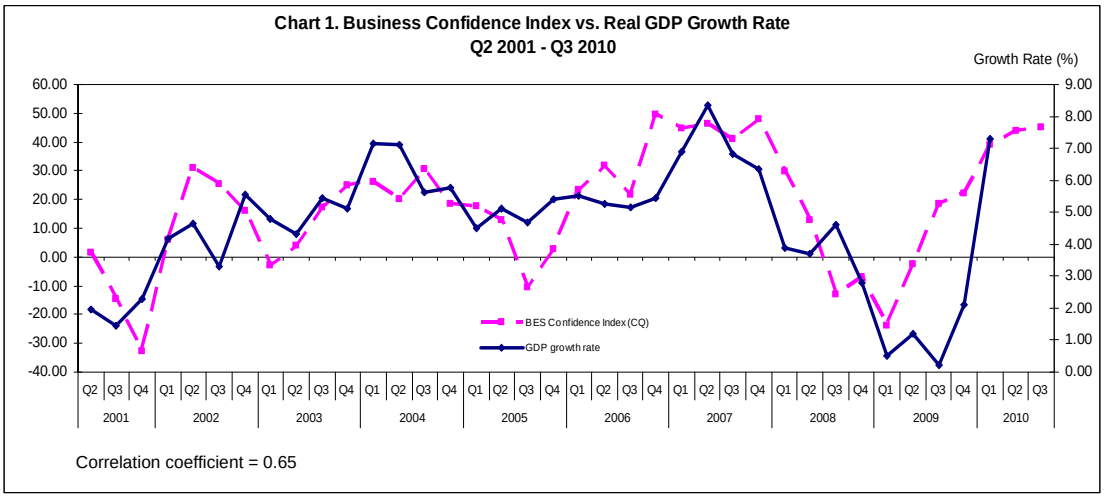
D > 0 means that optimistic respondents outnumber the pessimists;
D = 0 optimistic respondents equal the pessimists;
D < 0 pessimistic respondents outnumber the optimists.

Except for average capacity utilization, expansion plans and business constraints, which are computed in actual percentages, all of the other indicators are diffusion indices which are estimated using the above formula. The same computing methodology is also applied in the computation of the consumer outlook indices, but the weights are based on population size in the sampling areas. Time series data are available from these two surveys. Quarterly indices from the BES are available as from 2001, while those for the CES started in 2007. Listed below are the indicators derived from the two surveys:

BES INDICATORS	CES INDICATORS
Business confidence index on the macroeconomy (current and next quarters) – overall, for industry, construction, services, and trade, and by region	Consumer outlook index – average of 3 indicators – family financial situation, family income, and economic condition of the country (current quarter, next quarter, and in the next 12 months)
Business confidence index on own operations (current and next quarters) – overall, for industry, construction, services, and trade, and by region	Buying conditions index for consumer durables
Volume of business activity index	Buying intentions index for consumer durables
Volume of total order book index	Buying intentions index for house and lot
Credit access index	Buying conditions index for house and lot
Financial conditions index	Financial situation index
Average capacity utilization	Buying conditions index for motor vehicles
Employment outlook index	Unemployment expectation index
Expansion plans - manufacturing	Buying intentions index for motor vehicles
Inflation expectation index	Inflation expectation index
Exchange rate expectation index	Exchange rate expectation index
Interest rate expectation index	Interest rate expectation index

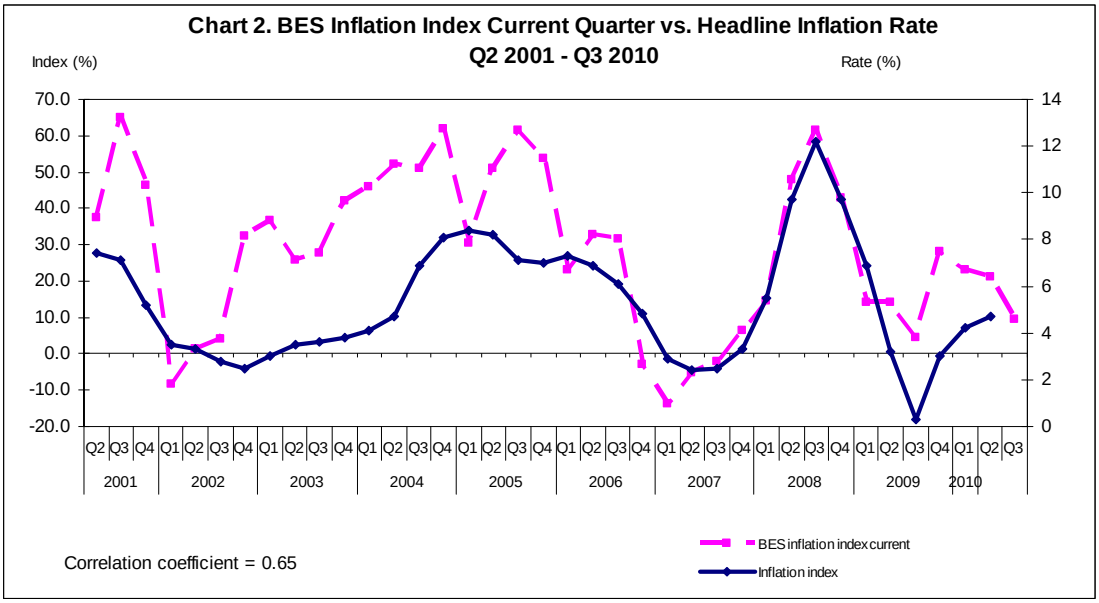
III. Tracking Ability of BES Indices

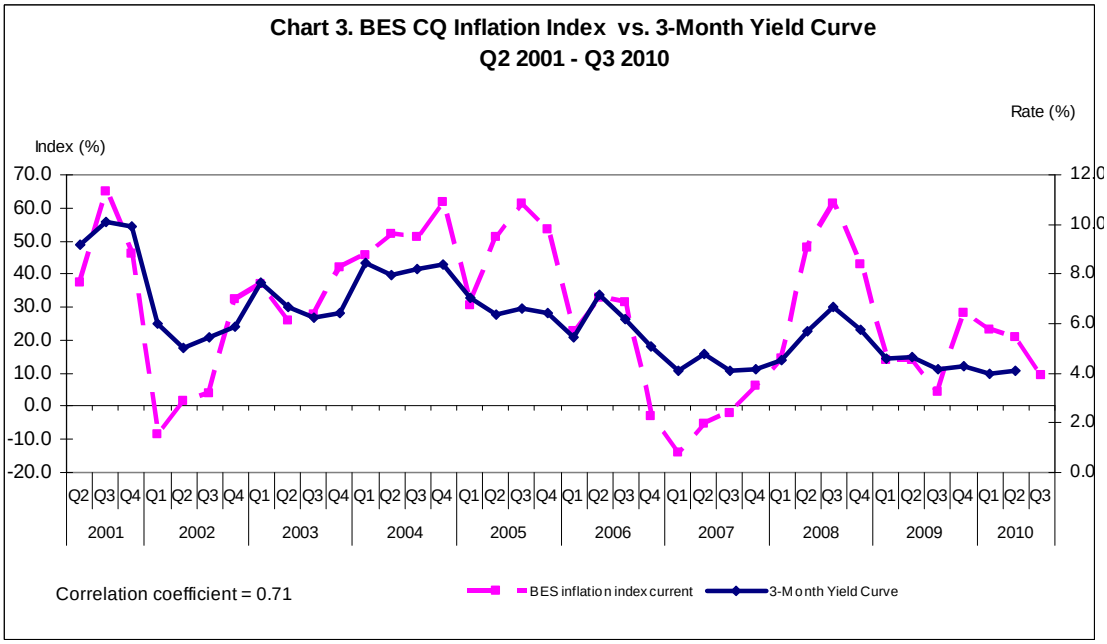
The BSP regularly monitors the ability of the BES and CES diffusion indices to track the quarterly movements of economic indicators. Empirical data from the survey results show that the business confidence index of the BES is positively correlated with the real gross domestic product growth rate of the Philippines with a correlation coefficient of 0.65.



It can also be seen from the chart that the BES business confidence index generally tracks the movement of the GDP growth rate starting from Q1 2001. Moreover, during the 2007 financial crisis the index registered a downturn and succeeding upturn ahead of the GDP growth rates in Q1 2007 and in Q2 2009, respectively.

Likewise, the BES inflation index and headline inflation rate are also positively correlated, with a correlation coefficient of 0.65. The inflation index rises ahead of headline inflation in Q1 2002 and Q1 2007 where inflation registered a turning point from a downturn to an upturn phase. The BES inflation index also correlates significantly with the three-month yield curve for government securities, with a correlation coefficient of 0.71. The BES inflation index also leads the three-month yield curve during periods of turning points from a downturn to an upturn phase.





Significant but lower correlations were also observed for the peso borrowing rate, exchange rate, and employment indices.

BES INDICES AND ECONOMIC INDICATORS	CORRELATION COEFFICIENT
BES peso borrowing rate and the three-month yield curve	0.60
BES exchange rate index and the average exchange rate	0.52
BES employment outlook index and the employment rate	0.56

Although the correlations are not remarkably high (ranging from 0.52 to 0.71) all of the correlation coefficients are statistically significant at the 1% level. These results indicate that that the indices derived from the BES track the movement of its counterpart indicators and even lead these indicators at some turning points. This validates the economic framework that business expectations of corporates determine the near future course of business and the economy.

In the case of the CES indices, the analysis of the tracking ability will not be presented due to the lack of sufficient data points necessary for a robust analysis.

IV. Predictive Ability of BES Indices

The Modified Signals Approach

Following the Kaminsky-Reinhart signals approach, which was used to test leading indicators of currency crisis, a modified signals approach probability table was used to evaluate the ability of the BES inflation index to provide an advance warning signal on an impending increase in the inflation rate. The succeeding discussion describes the application of the modified signals approach.

When an indicator deviates from its “normal value” and assumes an “extreme value” beyond a certain threshold, this is taken as a warning signal of an impending increase in inflation. The possible thresholds of an indicator were the values corresponding to some predetermined value of the index (BES inflation index) such as 10%, 20%, 30%, and so on. For each threshold value, the quarterly values of an indicator[2] were transformed into a binary variable defined as:

Let Y_t be the inflation index

Let I_t be a binary variable such as

I_t = 1 if $Y_t > T$

0 if $Y_t <= T$, for T = 10%, 20%, 30% and/or any predetermined threshold level for the inflation index value.

Setting the signalling horizon at the current quarter, the effectiveness of the index in signalling an impending increase in inflation for the current quarter is evaluated using the following matrix:

[2] Prior to the indicator’s transformation into a binary variable, the BES inflation index has been transformed into a diffusion index as defined on page 3 of this paper.

Table 1. True and False Warning Signals		
	No Increase in Inflation	Increase in Inflation
No Signal	**A**	**B**
Signal	**C**	**D**

In this matrix:

- **A** is the number of quarters when the inflation index did not issue a signal ($I_t = 0$) and no increase in inflation occurred during the current quarter.
- **B** is the number of quarters in which the inflation index failed to issue a signal. This means that the indicator did not signal an increase in inflation ($I_t = 0$) and inflation actually increased during the current quarter.
- **C** is the number of quarters in which the inflation index issued a bad signal or noise. A bad signal is when the indicator signalled an increase in inflation ($I_t = 1$) and no increase occurred during the current quarter.
- **D** is the number of quarters in which the inflation index issued a good signal. A good signal is when the index signalled an increase in inflation ($I_t = 1$) and inflation actually increased during the current quarter.

From this matrix, the performance of the inflation index in predicting an increase in inflation was examined in the following way:

- Signal = D/(B+D) measures the percentage of correct signals issued by the inflation index;
- Noise = C/(A+C) measures the percentage of wrong signals issued by the inflation index;
- Noise to Signal = {C/(A+C)}/{D/(B+D)} measures the ratio of the percentage of wrong signals (Noise) to the percentage of correct signals (Signal) issued by the index;
- Conditional Probability of Higher Inflation = D/(C+D) measures the probability of an increase in inflation occurring during the current quarter given that the index emitted a signal;
- Unconditional Probability of Higher Inflation = (B+D)/(A+B+C+D) measures the probability of higher inflation in the current quarter.

If, as the threshold increases, the conditional probability of higher inflation increases, then the predictive power of the BES inflation index in projecting a possible increase in inflation will be confirmed. Moreover, the significance of this approach lies in its capability of providing estimates of the probability of an increase in inflation given the value of the inflation index in any given quarter.

Modified Signals Approach on the BES Inflation Index

The unconditional probability of an increase in inflation during the current quarter, without considering the value of the BES inflation index, is 0.5 or 50-50. Given the value of the BES inflation index, the signals approach test confirmed that as the BES inflation index gets higher, the probability of an increase in inflation rate during the quarter increases as shown in the table below. Furthermore, the results could be used in evaluating the probability of an

increase in inflation rate during the quarter once the BES inflation index is known. For example if the BES inflation index at any given quarter is 45%, then the probability of higher inflation is 0.85 and it becomes a certainty if the BES inflation index exceeds 50%. Moreover, the “Noise” disappears as the BES inflation index increases. As more data comes in from the BES results, the empirical conditional probabilities could also be updated regularly.

SIGNALS APPROACH PROBABILITY TABLE ON HIGHER INFLATION BASED ON THE BUSINESS EXPECTATIONS SURVEY INFLATION INDEX Q2 2001-Q2 2009				
Threshold	Signal D/(B+D)	Probability of higher inflation during the current quarter given that the BES inflation index is above the threshold D/(C+D)	Noise C/(A+C)	Noise to signal ratio (C/(A+C)/(dD(B+D))
5%	0.88	0.56	0.69	0.79
10%	0.88	0.58	0.69	0.79
20%	0.81	0.62	0.50	0.62
30%	0.75	0.67	0.38	0.50
40%	0.69	0.85	0.14	0.21
50%	0.50	1.00	0.00	0.00
60%	0.33	1.00	0.00	0.00
Unconditional probability of higher inflation			0.50	

Modified Signals Approach on the BES Exchange Rate Index

Similarly, the signals approach test confirmed that as the BES exchange rate index increases, the probability of an exchange rate appreciation also increases. The probability table below could be used to evaluate the probability of an exchange rate appreciation for a given value of the exchange rate index.

SIGNALS APPROACH PROBABILITY TABLE ON PESO APPRECIATION ESTIMATED BASED ON THE BUSINESS EXPECTATIONS SURVEY EXCHANGE RATE INDEX Q2 2001-Q2 2009				
Threshold	Signal D/(B+D)	Probability of exchange rate appreciation during the current quarter given that the BES exchange rate index is above the threshold D/(C+D)	Noise C/(A+C)	Noise to signal ratio (C/(A+C)/(D/(B+D))
-15%	1.00	0.58	0.80	0.80
-10%	0.94	0.62	0.67	0.71
-5%	1.00	0.59	0.80	0.80
0%	0.82	0.67	0.47	0.57
5%	0.82	0.78	0.27	0.32
10%	0.69	0.75	0.20	0.28
15%	0.41	0.88	0.07	0.16
20%	0.41	0.88	0.07	0.16
25%	0.35	0.86	0.07	0.19
40%	0.06	1.00	0.00	0.00
Unconditional probability of peso appreciation			0.53	

V. Summary

Empirical results confirm that tracking the Philippine business cycle through the business confidence index shows significant and consistent results. The same encouraging results hold for the other BES diffusion indices on inflation, the exchange rate, the peso borrowing rate, and employment. The application of the turning point cyclical analysis as well as simple correlation techniques proved to be a simple but useful approach in monitoring the movements of key economic indicators.

The predictive ability of the BES diffusion indices for possible inflationary pressures and exchange rate appreciation using empirical conditional probabilities from the BES were also found to be significant.

The application of the modified signals approach to estimate the probability of higher inflation and exchange rate appreciation from the counterpart BES diffusion indices proved to be a useful tool for estimating conditional probabilities for higher inflation and exchange rate appreciation.

The conduct of the BES was demonstrated to be a very useful instrument for monitoring and predicting the movement of the economy, inflation, the exchange rate, and other economic indicators, which in turn underscore its importance in generating advance indicators for monetary policy.

The application of the simple statistical techniques on cyclical analysis and the use of the modified signals approach probability table have enhanced the analysis of the BES results.

In the future, the analysis of BES results could be further enhanced through the application of statistical techniques which could make use of the BES survey results not only for tracking and predicting the movements of key economic indicators but also for forecasting the growth rates of these indicators.

References

Arnold, S. (2005), “Non-Parametric Statistics”, Pennsylvania State University.

Batchelor, R. (2006), “How Robust Are Quantified Survey Data? Evidence from the United States”, Cass Business School, London.

Cintura, Cruz, Deveza, and Guerrero (2005), “Early Warning System for Macroeconomic Vulnerability”, *BS Review*, Bangko Sentral ng Pilipinas.

Deveza, T. (2006), “Early Warning System on the Macroeconomy: Business Cycles and Leading Economic Indicators”, *BS Review*, Bangko Sentral ng Pilipinas.

Goldstein, Kaminsky, and Reinhart (2000), “Assessing Financial Vulnerability, an Early Warning System for Emerging Markets”, Institute for International Economics.

Henzel and Wollmershauser (2005), “An alternative to the Carlson-Parkin Method for the Quantification of Qualitative Inflation Expectations: Evidence from the Ifo World Economic Survey”, *Ifo Working Paper No. 9.*

Mevik, A.K. (2004), “Uncertainty in the Norwegian Business Tendency Survey”, Statistics Norway, Statistical Methods and Standards.

Muller, Wirz, and Sydow (2007), “A Note on the Carlson-Parkin Method of Quantifying Qualitative Data”, KOF-Swiss Economic Institute.

Shenker, R. (2008), “Methods of Quantifying Qualitative Data”, ETH, Swiss Federal Institute of Technology Zurich.

Sheufele, R. (2009), “Are Qualitative Inflation Expectations Useful to Predict Inflation?”, *IFO-INSEE-ISAE Macroeconomic Forecasting Conference*, Halle Institute for Economic Research (IWH).

Evaluating Value-at-Risk models via Quantile Regression
Wagner Piazza Gaglianone_ Luiz Renato Limay Oliver Lintonz
Revise and Resubmit at JBES
26th September 2008
Nonparametric Statistics
By Steven Arnold
Professor of Statistics-Penn State University
Quantile Regression
Roger Koenker and Kevin F. H
Journal of Economic Perspectives—Volume 15, Number 4—Fall 2001—Pages 143–156

Session 3 B

The usefulness of micro data

Chair: Chihiro Sakuraba, Bank of Japan

Papers:

Addressing data gaps revealed by the financial crisis: European Central Bank statistics on holdings of securities
Pierre Sola and Francesco Strobbe, European Central Bank

A framework to assess vulnerabilities arising from household indebtedness using microdata
Ramdane Djoudad, Bank of Canada

Exploring the statistical potential of micro-databases
Isabel Lavrador, Bank of Portugal

Addressing data gaps revealed by the financial crisis: European Central Bank statistics on holdings of securities

Pierre Sola and Francesco Strobbe[1]

Introduction

As a follow-up to the recent financial crisis, a number of studies have been launched to identify the main causes of the adverse developments that took place in this period, as well as the information that would have been required to identify in advance the corresponding build-up of risks. Statisticians have launched various initiatives to reduce the identified gaps: from an international perspective, several of these initiatives have been endorsed by the G20 and will give rise to a coordinated implementation in the countries involved.

The present paper aims to provide an overview of a further ESCB initiative which has been taken regarding holdings of securities – to develop a new statistical dataset, to be collected in the form of micro statistics, i.e. on a security-by-security basis.

The paper is organised as follows: Section 1 provides an overview of data needs highlighted by the recent financial developments; Section 2 focuses on the steps to develop securities holdings statistics (SHS) both in terms of data inputs and in terms of potential outputs; Section 3 summarises the way forward with reference to initiatives under way and further challenges.

1. Data needs highlighted by the recent financial developments

a. General limitations in the information available on holdings of securities

Securities markets have always been relatively opaque with respect to the identification of the lender, as issuers and most market participants do not generally know who is holding the securities issued by a certain borrower. They have therefore triggered requests from policymakers – related to, e.g. monetary policy or financial stability – for information on the links between holders and issuers of securities.

Such limitations in the transparency of securities markets and the need for more detailed information (especially regarding holdings of securities) had been flagged even before the financial developments since 2007 by data users and market analysts. The information currently available refers mainly to highly aggregated data. For example, while financial accounts statistics provide data on overall holdings of securities of each resident sector in most countries, they do not allow identification of the institutional sector of the resident *issuers* of these securities. Such a detailed breakdown of securities holdings data (also called “from-whom-to-whom” tables) has been deemed desirable by ESCB users for a long time for the purpose of monetary analysis.

---

[1] Directorate General Statistics, European Central Bank (ECB).

The views expressed in this paper are those of the authors and do not necessarily reflect the views of the ECB.

Limitations in data availability are even more salient regarding cross-border holdings, given that statistics and other data compilers have limited power to collect information on non-resident holders of securities. The International Monetary Fund (IMF) Coordinated Portfolio Investment Survey, launched in 1997, and which aimed to identify holders of securities from an international perspective, has closed some information gaps regarding these cross-border holdings of securities. However, it includes only limited information on issuers, with only the country of residence, and in some cases the institutional sector. The coverage is also not complete, as some important investing countries (e.g. China or Saudi Arabia) do not currently take part in this survey.

The international banking statistics collected by the Bank for International Settlements (BIS), and similar data in a number of countries, also provide useful indications of cross-border exposures by country for the banking sector of many industrialised countries. This covers all securities, and takes into account risk transfers related to, e.g. collateral, financial derivatives or guarantees. This information is nevertheless only available from cross-border assets by banks, and cannot be disaggregated into specific credit or market rate exposures.

b. Further statistical needs identified in the context of the recent crisis

Based on the limitations described above, policymakers, supervisors and other analysts have had extensive discussions on how to reduce the risk of systemic crises in the future, including issues that have a bearing on the collection and compilation of statistics.

As mentioned in the report by the Financial Stability Board (FSB) Secretariat and IMF staff to the G20 finance ministers and central bank governors on "The Financial Crisis and Information Gaps" of October 2009, data gaps are an inevitable consequence of the ongoing development of markets and institutions, and good data are fundamental for effective surveillance and policy responses at both the national and international levels[2].

However, as highlighted in the recommendations formulated by the Issing Committee (2009) on the New Financial Order, greater transparency does not mean just collecting more and more data, as this might lead to confusion rather than improving *transparency*. On the contrary, data have to be collected more systematically and with a clear orientation to the purpose for which they are needed.

More precisely, the report by the FSB Secretariat and IMF staff of October 2009 identifies among the main data gaps the need for information aimed at better capturing the build-up of risk in the financial sector (e.g. by strengthening the international reporting of indicators of current financial health and soundness of financial institutions; developing measures of aggregate leverage and maturity mismatches in the financial system; and improving coverage of risk transfer instruments, including data on the credit default swap markets) as well the need to improve data on international financial network connections (e.g. by enhancing information on the financial linkages of systemically important global financial institutions and strengthening data-gathering initiatives on cross-border banking flows, investment positions, and exposures, in particular to identify activities of non-bank financial institutions)[3].

---

[2] Further elaboration on these principles can be found in the Progress Report on Action Plans and Timetables published by the FSB in May 2010.

[3] This report includes one recommendation directly related to securities, i.e. recommendation 7, which encourages central banks and statistical offices to participate in the BIS data collection on (issues of) securities and to contribute to the further development of the BIS/ECB/IMF Handbook on Securities Statistics.

These general principles have the following implications regarding statistics on holdings of securities:

First, there is a need for a better identification of the risks taken by regulated and non-regulated institutions, and therefore of their *exposures.*

– When concerns were raised about the creditworthiness of specific entities or financial groups (e.g. Bear Stearns, American International Group (AIG), Lehman Brothers, and several European Union (EU) governments), a strong need arose to estimate which agents held exposures to these entities.

– The assessment of exposures was also made difficult by financial instruments such as collateralised debt obligations (CDOs), for which the actual risk borne by the investor is often difficult to identify and measure.

– The recourse to intermediate structures to invest in securities, e.g. securitisation vehicles or investment funds, has also blurred the link between investors and financial risks. Felettigh and Monti (2008) highlighted in particular that the country and instrument in which investors are exposed cannot be identified without "looking through" investment funds.

Second, a need to identify *linkages* between entities has been highlighted. Such a system-wide perspective would include at least the following dimensions, for all types of investors, and not only those monitored by supervisory authorities (see Caruana 2009): (a) to identify common counterparty exposures (and if possible correlated exposures) by one or several investors[4], and (b) to identify interconnections between entities: an entity A exposed to entity B, itself exposed to an entity C may lead to A being affected by, e.g. a fall in the share price of B, triggered itself by the bankruptcy of C. The latter was highlighted in particular by Castrén and Kavonius (2009), who showed that looking at the financial system as a network of interlinked exposures may be extremely helpful in revealing non-obvious transmission mechanisms: for instance, parts of the financial system that are not particularly vulnerable to a given adverse scenario could still be affected due to their interconnection with sectors that are directly confronted with unexpected shocks.

2. Steps to develop SHS

a. General approach of the ESCB and the main conceptual framework

Based on the background described in Section 1, the SHS initiative represents a key statistical dataset able to combine both the individual and the system-wide perspectives highlighted in the descriptions of current data needs. Moreover, the granularity of the collected information (i.e. on a security-by-security basis) has the advantage of ensuring substantial flexibility, making it possible to derive statistics that can be quickly adjusted in response to financial developments and innovations. In fact, it enables information on holdings to be linked with the characteristics of individual securities and their issuers, thus allowing for a much more detailed assessment of risk. The ESCB had already taken steps in the 2000s to collect data on the holding of securities on an instrument-by-instrument basis. A database called the Centralised Securities Database (CSDB)[5] was set up in order to collect and store the characteristics of securities and issuers, to be connected with the instruments

[4] See e.g. Borio 2009.

[5] See e.g. Sanchez Muñoz and Neudorfer (2005) and ECB (2010).

held by certain categories of investors via their identification number, i.e. generally their ISIN code[6].

On a legal level, several ECB legal acts already require or permit the collection of security-by-security (s.b.s.) data: Guideline ECB/2004/15 (as amended by ECB/2007/3) on the euro area balance of payments and international investment position; Regulation ECB/2007/8 on assets and liabilities of investment funds; Regulation ECB/2008/32 on assets and liabilities of monetary financial institutions (i.e. banks and money market funds); Regulation ECB/2008/30 on assets and liabilities of financial vehicle corporations. On this basis, further investigations were conducted in 2009 on the feasibility of collecting and compiling better statistics on holdings of securities. It was concluded that the overall availability of security-by-security data was already significant in the euro area and in several other EU countries. Subject to a further detailed assessment of costs, it may be feasible to extend the instruments covered to all holdings by euro area (and possibly all EU) residents of the main categories of securities, i.e. long-term and short-term debt securities, quoted shares and investment funds shares[7]. A further added value of the current initiative on SHS data collection will be to create a common data repository at the euro area (and possibly the EU) level for information on holdings of securities.

This approach would contribute to addressing the two main data gaps outlined in the FSB report, concerning the need for information aimed at better capturing the build-up of risk in the financial sector, as well as the need for improving information on international financial network connections.

Against this background, the main approach currently being considered in the ESCB refers to holdings of securities by institutional sectors or subsectors, as defined by the European System of Accounts (ESA95): essentially monetary financial institutions, insurance corporations and pension funds, other financial intermediaries, non-financial corporations and households. The conceptual framework applied to the ESCB initiatives related to holdings of securities generally follows national accounts statistical standards (System of National Accounts (SNA93), ESA95*,* supplemented by the BIS/ECB/IMF *Handbook on Securities Statistics).* However, certain features under consideration (e.g. the possibility of collecting data on the largest banking and insurance groups, including their affiliates abroad, i.e. focusing on multinational groups rather than resident statistical units) go beyond this framework where necessary.

The next two subsections will be devoted to explaining the data sources and main potential outputs related to the SHS data collection.

b. SHS input data and their implications

The approach of collecting s.b.s. holdings data aims at reducing the burden for reporting agents, who would have to provide only limited information (essentially the identification number and the quantities held[8]) and would not need to produce aggregations of their raw data for their statistical reporting.

---

6 See Hille and Sedlacek (2005).

7 For non-quoted shares, which often do not have any standard identification number, another approach may have to be considered.

8 Some other characteristics may be needed. For instance, if sources on prices of securities were not reliable for certain instruments, it might be necessary to collect them also from reporting agents.

Three main issues need to be taken into consideration regarding the characteristics of security-by-security inputs:

- What are the main data sources;
- What is the level of detail to be obtained on the investors to be monitored;
- What is the coverage (e.g. holdings by residents or by multinational group).

Data sources

A first key issue is the data source that may be used to collect s.b.s. information. For legal reasons, each country can impose mandatory reporting requirements only on resident entities. In this context, investigations have focused on two categories of agents having access to information on securities holdings, namely custodians (including centralised securities depositories) and resident investors (so-called "direct reporters").

Resident custodians may cover only a limited part of the holdings by resident investors, given that residents are usually free to give their securities into custody abroad. In addition, they are only able to identify the account holders, and these may be other custodians. If the account holders are non-resident custodians, the final holders of the corresponding securities cannot be identified. The limitation in coverage applies, in addition, in a specific way at the euro area level: securities may be in custody in the euro area, but in a country different from that of the issuer of the security and from that of the holder. For instance, a security issued by a German issuer may be held by an Italian investor in custody in Belgium. From the point of view of the country of the custodian, these data are "third party holdings"; they are not relevant for the compilation of national statistics, and in most cases are not collected. As a result, the coverage of custodian data obtained by summing up currently available national data for all euro area countries is lower than the securities held in custody in the euro area and either issued or held by euro area investors.

In addition, there are some limitations in the quality of the data reported by most custodians:

– The sector classification reported by custodians is deemed by several national compilers to be of much lower quality than sectorisation performed by statistics compilers themselves;

– A further difficulty arises with respect to the sectorisation of euro area residents not residing in the same country as the custodian: the ability of custodians to provide an accurate sector split is more limited;

– Repos and short selling can often not be identified by custodians.

These limitations generally affect non-financial investors to a much more limited extent than financial investors: (i) non-financial holders are usually not custodians themselves, and (ii) their activities in the repo markets are much more limited. For these reasons, and given the constraints related to direct reporting by a (too) large number of institutions, many ESCB compilers consider that custodian reporting is an acceptable approach to collecting holdings data, not only regarding households but also for non-financial corporations and non-profit institutions. Custodian reporting is also deemed appropriate for general government, as this allows national central banks (NCBs) to control the sector allocation by informing custodians of the institutions to be classified in this sector. The additional reporting of resident holdings in custody abroad/outside the euro area is in principle advisable, above a certain threshold, although this is acknowledged as difficult to implement.

In the financial sector, direct reporting by banks, which often also act as custodians, is applied in most countries, and is deemed most appropriate (also in connection with the issues raised by repos). This approach, already implemented in most euro area countries regarding investment funds and financial vehicle corporations, should also apply to insurance corporations and pension funds (ICPFs).

Level of detail: investor-by-investor data, or data by sector of investor

In custodian reporting, compilers must also make a decision on whether to collect investor-by-investor data or data by groups of investors. Investor-by-investor data have the advantage of ensuring substantial flexibility, and potentially making it possible to analyse risks (e.g. interconnectedness with other entities) in a much more detailed manner, in line with the data needs expressed in Section 1.

However, as usual, there is a trade-off to be taken into consideration: an investor-by-investor data collection further increases the volume of data to be reported and processed, and implies that protection measures on the data have to be made much more stringent. In this context, the data collection currently being considered by the ESCB would require investor-by-investor data only for large banking and insurance groups (which, for the reasons described above, would in principle be obtained from direct reporting rather than from custodians). For other categories of investors, national compilers may opt for collecting either investor-by-investor data or only aggregated data, depending on national constraints.

Coverage: data on resident investors, or also collection of data on non-resident investors

Given that data requirements can only be made legally mandatory for resident reporting entities, most data collections tend to focus on holdings by residents. However, consideration has been given to expanding the scope of data collections from residents in various directions, including:

– The collection of holdings by affiliates abroad of resident investors. While those holdings are treated as belonging to other institutions resident in other countries according to international statistical standards, they are very relevant to measuring the exposures of resident investors.

– The collection of holdings attributed to non-resident customers by resident custodians. Such data may provide a hint on, e.g. who are the holders of securities issued by residents of one economy, even though they may not be fully precise.

c. SHS output data and fulfilment of user needs

The collection of securities holdings allows for a wide range of outputs, with a high level of flexibility in terms of fulfilment of user needs, covering monetary policy analysis as well as financial stability or financial market analysis. This flexibility results from the granular data collection, together with detailed information on the micro data (namely the data on individual securities and issuers stored in the CSDB), which makes it possible to produce a wide range of aggregates on the characteristics of the reported holdings.

This framework makes it possible to produce standard output, e.g. the detailed breakdowns prescribed by international statistical standards (which otherwise are extremely difficult to produce, due to the prohibitive costs that such detailed data collections would involve). In particular, “from-whom-to-whom” tables of financial accounts statistics can be derived from this approach. Such tables may be used in the context of monetary analysis, but also for the purpose of macroprudential analysis, as they provide information on *linkages* across sectors of an economy, e.g. common exposures across sectors.

In addition, a wide variety of data could be produced, as illustrated by the following examples:

– A joint euro area/EU database would make it possible to compile from-whom-to-whom tables not only for the euro area/EU as one entity, but also with an identification of each national holdings and issuing sector.

This could allow further assessment of *linkages* across sectors and countries, including the extent to which exposures by certain sectors may be interconnected: for instance, Portuguese banks may be exposed to, say, the German insurance sector, while the latter could be exposed to Japanese government bonds. Of course, this might hide the fact that the German insurance corporations in which Portuguese banks are exposed could be different from the German insurance corporations being exposed to the Japanese government. However, a full assessment of interconnectedness would also depend on other instruments (exposure to credit risk should take into account loans and credit derivatives, and to a certain extent guarantees, collateral and other relevant contractual agreements). In this context, holdings by sector, which can often be collected at lower cost than investor-by-investor data, may provide a first assessment of potential links, which could be further assessed also via other data sources, such as detailed microprudential individual data.

– A focus on holdings of securities included in monetary aggregates may shed light on portfolio shifts between monetary and non-monetary assets.

– Time series with detailed data on holdings by non-financial sectors may allow analysis of the wealth effects implied for these sectors by changes in asset prices.

– *Exposures* related to specific categories of securities (e.g. vis-à-vis individual issuers, or financial groups, or country, or sector, or currency). Ideally, these data should make it possible to estimate potential mark to market writedowns, as the difference between outstanding amounts at nominal value and market values[9].

While a number of these data may be produced according to the accounting rules prescribed by international statistical standards, certain analyses could depart from these principles:

– *Exposures* should, to the extent possible, be measured not only for resident entities, but also taking into account holdings by affiliates resident in other territories. This is why the collection of data on holdings by institutional sector are planned to be supplemented by consolidated data on the holdings of the largest (as a proxy for systemic relevance) banking and insurance groups (LBIGs), group by group.

– This “group-by-group” approach could also allow for a more precise assessment of *interconnectedness* across LBIGs, by checking their common exposures as well as the bilateral exposures between them.

– The link between investors and financial risks when recourse to intermediate structures (e.g. securitisation vehicles or investment funds) to invest in securities is involved may be identified according to more detailed categories than those in the ESA, where analytically relevant: for instance, one may show holdings of CDOs issued by residents of a particular country, e.g. the United States of America, by linking the identifier code (ISIN) to information on securitised products.

[9] This would only be a broad estimate, as a market player may have bought a security at an even lower price than the market price at the reference date from another market participant, whose losses would be difficult to measure.

3. The way forward

Initiatives under way

As explained above, a procedure (so-called "merits and costs analysis") has been launched to assess the cost of enhancing the collection of security-by-security data. This work covers not only euro area (and other EU) holdings by institutional sector, for positions and transactions, but also (i) holdings by large individual banking and insurance groups (including those by their affiliates outside the euro area), and (ii) available information on holdings by non-euro area residents on euro area securities.

A further ESCB information technology project has been launched to set up a steady-state infrastructure in which holdings data could be pooled together. This database, which will benefit from the experience gathered with the prototype built by the Oesterreichische Nationalbank (Austrian National Bank – OeNB), is expected to be used to compile both national and euro area (and if possible EU) aggregates, and should meet ESCB user needs in a timely and efficient manner. This would be key in allowing the analysis of the potential impact of specific exposures to a certain market or geographical area or the analysis of changes due to financial innovation.

Investigations have also been performed to check in particular the confidentiality constraints to be followed in setting up such a database on holdings of securities. Legal experts have confirmed that at the European level, the confidentiality of holdings data would mainly apply to holdings for which the individual holders of a given security would be identifiable. Steps are being taken to set up a procedure to systematically identify those cases. It is important to facilitate the dissemination of non-confidential data to users, while still applying strict protection measures to confidential information.

Last but not least, an enhancement of the information on holdings of securities would require, rather than an extension of data collection, a further development of the variables collected and maintained in the CSDB on the characteristics of securities and issuers. A list of requirements has been set up for this purpose, including, for instance, information on collateral, credit rating and type of interest, as well as securitisation operations. Some of these variables are available, but may raise cost issues. Others, e.g. those related to securitisation, may not be fully available from commercial sources, or might involve limitations in coverage or in data quality.

Irrespective of data sources on securities available to the CSDB, there are some additional technical challenges to enhancing information about issuers. For example, being able to show holdings of securities issued by a certain individual borrower or financial group is very difficult, in the absence of (i) an international standard identification number for financial (and non-financial) institutions[10], and (ii) a register of the entities belonging to the main multinational groups. Progress in those areas largely depends on progress in the development of international standards; in that respect, it is worth mentioning that the International Organization for Standardization (ISO) is in the process of upgrading the ISO standard underlying the well-known BIC code with the aim of establishing a universal identifier for legal entities. Steps are also being taken in the ESCB to foster progress in those fields, e.g. by investigating the feasibility of standardising information on securities, and by contributing – with respect to financial entities – to the work initiated by Eurostat to identify EU entities belonging to multinational groups. Explorations are being conducted into the possibility of establishing an international infrastructure (Reference Data Utility) that would store in a standardised way descriptive information about financial instruments and legal

[10] Such an identification number would have to cover at least legal units. From a statistical perspective, the identification should cover also branches recognised as (statistical) institutional units.

entities (identification, main attributes, classifications, interrelations), data that are currently produced in many versions and "data dialects" by many data vendors. This would pave the way for a significant improvement in data quality and thus in the quality of statistics based on such micro data, and to a strong reduction in the costs of producing and using these data for all users, including industry. The approach being explored may be supported by the establishment in the United States of the Office of Financial Research, which is foreseen in the US Financial Stability Act.

Further challenges

As explained above, the ESCB approach in this field aims to follow a step-by-step approach by which improvements would be brought in parallel to the building of experience. The steps under way are aimed at capitalising on experience in the practical challenges related to the compilation of aggregates from micro data on holdings of securities. A number of special cases, such as securities being split, depository receipts (for which two ISIN codes may be held and which should sum to the originally issued amount), mergers (leading sometimes in principle, but not always in practice, to the disappearance of certain securities), or the identification of repos will certainly require more detailed investigations and an appropriate treatment.

Fully meeting user needs will also require further steps. In particular, looking through investment funds resident in the EU, and ideally also those not resident in the EU, as well as CDOs, would require significant additional efforts. The assessment of correlations between exposures might need a separate database, with long time series.

While it is not possible to fill quickly all identified data gaps, the initiative launched by the ESCB aims to result in rapid improvements in the available statistical framework, and in further incremental progress over time, in the field of securities. Looking ahead, consideration might be given to extending this approach based on micro data to other instruments, e.g. loans and/or possibly some financial derivatives. Among many factors, cost constraints, as well as standardisation issues (one important aspect being the availability of standard identification numbers for individual instruments) would have to be taken into account.

References

Bertaut Carol C., William L. Griever, and Ralph W. Tryon (2006) "Understanding U.S. Cross-Border Securities Data", Federal Reserve Bulletin (page A67).

Borio Claudio (2009) "Implementing the macroprudential approach to financial regulation and supervision" in the Banque de France Financial Stability Review No 13.

Caruana Jaime (2009) "Minimising the impact of future financial crises: six key elements of regulatory reform we have to get right" in the Banque de France Financial Stability Review No 13.

Castrén Olli and Ilja Kristian Kavonius (December 2009) "Balance Sheet Interlinkages and Macro-Financial Risk Analysis in the Euro Area" – ECB Working Paper No 1124.

De Larosière Group (2009), "The High Level Group on Financial Supervision in the EU – Report", http://ec.europa.eu/internal_market/finances/docs/de_larosiere_report_en.pdf.

ECB (2010) "The Centralised Securities Database in brief" https://www.ecb.int/pub/pdf/other/centralisedsecuritiesdatabase201002en.pdf.

European Commission/Eurostat (1995) "European System of Accounts".

Felettigh Alberto and Paola Monti (2008) “How to interpret the CPIS data on the distribution of foreign portfolio assets in the presence of sizeable cross-border positions in mutual funds – Evidence for Italy and the main euro area countries” Banca d’Italia Occasional papers.

Financial Stability Board (2009) “The Financial Crisis and Information Gap”, Report to the G-20 Finance Ministers and Central Banks Governors. http://www.financialstabilityboard.org/publications/r_091107e.pdf.

Financial Stability Board (2010) “The Financial Crisis and Information Gap – Progress report – Action plan and timetables”, Report to the G-20 Finance Ministers and Central Banks Governors. http://www.financialstabilityboard.org/publications/r_100510.pdf

Handbook on Securities Statistics (2010) – Part 2, *draft,* BIS, ECB, IMF.

Hille Erich and Guenther Sedlacek (2005) “Security by security collection system” in IFC Bulletin 22 (September 2005).

Issing Committee (2009), “New Financial Order – Recommendations by the Issing Committee”, http://www.bundesregierung.de/Content/DE/__Anlagen/2009/02/2009-02-09-finanzexpertengruppe,property=publicationFile.pdf.

Sanchez Muñoz Carlos and Peter Neudorfer (2005) “The pivotal role of the Centralised Securities Database for monitoring developments in financial markets within the European Union” in IFC Bulletin 23 (October 2005).

A framework to assess vulnerabilities arising from household indebtedness using microdata

Ramdane Djoudad[1]

I. Introduction

Over the last decade, significant increases in house prices, sustained income growth, record low interest rates, favourable financial conditions and financial innovations have all contributed to raising the level of indebtedness of Canadian households. The household debt-to-income ratio increased from 110% in early 2000 to approximately 127% at the beginning of the crisis,[2] before reaching 148% by the third quarter of 2010. In comparison, over the period between 1990 and 2000, the debt-to-income ratio increased from 90% to 110%. The period after 2000 coincided with rapid growth in household debt in other OECD countries as well (OECD 2010). The rapid increase in household indebtedness over the last decade has raised concerns in many countries regarding the deterioration of the resilience of households to negative shocks. It has also motivated many central banks to develop stress indicators for the household sector and closely monitor the evolution of households' financial obligations.

Changes in household debt-service costs as a share of income – i.e., the debt-service ratio, or DSR – are a measure of changing risk associated with household debt. An increase in the DSR could have a negative effect on both the real economy and the financial system. It might, in fact, translate into a decline in consumer spending, undermining economic growth (depending on the nature of the shock). For example, if the average DSR ratio increases subsequent to an interest rate hike, in the short run this would imply that less funds are available for spending. On the contrary, if this increase is driven by a rise in the level of household loans, this would boost household spending, in the short run, by relaxing the household income constraint. However, a higher DSR would imply that households are more vulnerable to negative shocks to income or to interest rates, making household balance sheets more precarious and having negative fallout on financial institutions. Since household debt constitutes a large part of the loan portfolio of Canadian banks, it is important to monitor and anticipate changes to household vulnerability as a function of developments in macroeconomic conditions.

While aggregate data provide an indication of average shifts in household debt positions, such variations frequently obscure vulnerabilities that only a review of the microdata can reveal. The availability of microdata for this type of review has assisted the Bank of Canada

---

[1] Financial Stability Department, Bank of Canada. Email: rdjoudad@bankofcanada.ca. Bank of Canada working papers are theoretical or empirical works-in-progress on subjects in economics and finance. The views expressed in this paper are those of the authors. No responsibility for them should be attributed to the Bank of Canada.

I thank Pierre Duguay, Pierre St-Amant and Paul Masson for their helpful comments. Special thanks go to Allan Crawford, who continuously contributed to the development of the methodology and the framework and strongly supported this project. My thanks also go to the participants at the Canadian Economics Association conference in May 2010 and to the participants at the Irving Fisher Committee conference where this paper was presented in August 2010.

[2] Average for 2007.

in developing an analytical framework for assessing risk in the household sector.[3] While aggregate approaches allow us to conduct these exercises in terms of averages, they do not permit us to assess the impact of alternative shocks on the distribution by income group, nor to determine the proportion of households that are vulnerable. Our work will thus complement previous efforts and inform us of the extent to which shocks to the interest rate, indebtedness, and income could lead to deterioration in the financial situation of Canadian households.

Microdata have been used by the Bank of Canada to examine the evolution of the distribution of the DSR since 2006. The novelty of our work lies in the development of a framework for using these microdata to evaluate the incidence of potential shocks (interest rate, indebtedness, income, etc.) on the distribution of the DSR and on households' payment defaults.

The purpose of this article is to present the analytical framework developed at the Bank of Canada to stress test household balance sheets using microdata. To assess the impact of changes in macroeconomic conditions on household vulnerabilities, it is necessary to understand how these changes will affect the DSR distribution going forward.

$$\text{DSR distribution} = F(\text{Income}, \text{Debt}, \text{Interest rates}, \text{Other household factors}) \quad (1)$$

As presented in equation (1), at every period, the DSR distribution will be a function of the distribution of income, debt, interest rates and some other structural factors that relate to household individual behaviour (amortization period, individual risk premium, debt structure, debt accumulation dynamics, etc.). This framework provides an internally consistent way to project this distribution over time according to a macro scenario and assess the impact of the projected path of the distribution on the resilience of the household sector.

The DSR distribution covers all households in the sample. However, given that every household will have a specific value for its DSR that relates to its own income, debt, interest rates and some other household specific factors, it is necessary to determine how the assumptions set in the macro scenario will affect each household in a specific way. To perform the whole exercise, there are three complementary steps (Table 1) that need to be conducted (Djoudad 2010, p. 57). Each of these steps is discussed after providing some general comments in section 2.

Table 1

Steps in the stress-testing exercise

Step 1	Step 2	Step 3
Establish the key assumptions for the macro scenario: – Growth in aggregate credit and income – Interest rate path	Calculate the implications of the macro scenario for the distribution of the household debt-service ratio	Estimate the impact of adverse shocks on bank loan portfolios

[3] Data are from the Canadian Financial Monitor (CFM) survey of approximately 12,000 households per year conducted by Ipsos Reid. The survey was launched in 1999.

II. General framework

The Statistics Canada aggregate DSR takes into account only interest payments. When calculating the DSR using microdata, principal repayments on all instalment loans are included. In order to calculate the DSR from microdata, we estimate the following three major elements: the interest rates paid, household income and the outstanding balance of household debt.

To calculate the micro DSR, we use the following formula:

$$DSR = \frac{\sum Payments}{Gross\ income} = \frac{\sum(Principal\ repayment + interest\ repayment)}{Gross\ income} \quad (2)$$

In the microdata used, there are five types of loans: credit card loans, personal loans, personal lines of credit, vehicle loans, and mortgage loans. The following information is available for all loans other than credit card loans:

– loan payments;

– interest rate paid on the loan;

– term of the loan (in years);[4] and

– the outstanding balance of the loan.

Changes in the DSR have been used at the Bank of Canada to assess variations in households' financial health. In issues of the *Financial System Review*,[5] the distribution of the DSR calculated using microdata helped to evaluate how risks related to financial obligations are distributed across households. All things being equal, households with a higher DSR will have more difficulty in meeting their financial obligations. Accordingly, the higher the household debt load, the greater the sensitivity of this household to any negative shock (such as illness, loss of a job, divorce, etc.).

In the model, changes in the interest rates affect the amount of interest payments and have no impact on the principal repayments that must be made by the households. Therefore, interest payments must be distinguished from repayments of principal.

Assume that the variable *PC* represents a household's total annual loan payments, *SC* is its current credit balance, and *ir*, the applicable interest rate. The amount of the principal repayments due is:

Principal = *PC* - Interest = *PC* - *(SC * ir*). (3)

Over the simulation period, principal payments are set as a constant share of the credit balance. In fact, this proportion may vary over time. However, over a short period of time, we believe that this assumption cannot significantly affect the results:

Share_Principal = (Principal/*SC*). (4)

At every period, a household is required to make the following payment:

PC = *SC* * (Share_Principal + *ir*). (5)

Future payments and the dynamics of the DSR will be determined by the simulated profile of changes in household income and debt, as well as interest rates.

---

[4] 6-month, 1-year, 2-year, 3-year, 5-year, 7-year, 10-year, and variable-rate loans. But we do not have any information on maturity dates.

[5] See all issues of the *Financial System Review* published since December 2007.

II.1 Missing data

For each household we have the information on the balances and interest rates for each loan held. To calculate the payments carried out by each household and to evaluate its DSR, it is necessary to incorporate the information relative to each of the loans. For example, the questionnaire gives the possibility to the household to list up to eight different mortgages. For each mortgage, the household must then provide information on the balance, the term, the interest rate paid, etc. But some households will only report part of the information requested. It is then difficult to carry out simulations of the DSR for these households given that some required information is missing. In fact, with the information provided, it may be difficult to break the payments into the share related to interest payments and that relating to principal repayment. Consequently, we were faced with two choices: either to exclude these households from our simulations, with the risk of biasing the composition of the sample, or to keep them in the sample and then make additional assumptions for the missing information. We believe that making reasonable supplementary assumptions for missing data would bias the results less than omitting these observations.[6]

Whenever the information on the interest rate for a specific loan is missing, we choose to assign to that household and for that specific loan the average interest rate calculated for all households belonging to the same income group and related to the same type of loans. For example, if we do not have information on the interest rate paid on its personal loans, we assign the average interest rate paid on personal loans by all households in the same income class to which the household belongs. If it is the information related to the outstanding balance of a loan that is missing, we assume that it is more appropriate to maintain a constant level of the payments carried out by the household for this loan, rather than to substitute any value which could be very different from the level of the balance actually held by the household. Thus, if a household states that it is paying $200 per month for a personal loan, but omits to indicate the balance on its loan, we assume, over the entire simulation, that the payments on this loan remain unchanged. Finally, when information on the term of the mortgage is missing, we consider that the mortgage is at a variable rate.

II.2 Macro scenario

In Step 1 of the exercise, we set the key assumptions of the macro scenario. For example, in the December 2009 issue of the FSR (pp. 23–24), the Bank conducted a stress test to evaluate the likely impact of a sharp and significant rise in interest rates and risk premiums. In the December 2010 issue of the FSR (p. 21), the Bank's stress test objective was to assess the potential impact of an increase in the unemployment rate. In both cases, these scenarios have to be completed by assuming coherent paths for growth of aggregate household debt and its components, as well as income (and interest rate path when necessary). It is important to maintain consistency between the paths for different macro variables. For example, we might want to assess the impact on households' balance sheets of a sudden and significant increase in interest rates (stress scenario). Or on the contrary, we may want to determine how current market expectations on interest rates would affect households' financial position while assuming a specific path for credit and income growth. As indicated in Table 1, these assumptions relate to growth of aggregate credit and income, unemployment and interest rate paths for the overnight rate as well as for all the mortgage terms available in the database. Once the aggregate assumptions are set, Step 2 consists of exploring how this macro scenario will affect every household in the sample.

---

[6] Missing data occur in around 1–2% of the households.

III. Interest rates, income and debt dynamics

The purpose of this section is to show, for every household, how interest rates, income and debt evolve in the model (Step 2 in Table 1). CFM data are not panel data. The CFM is essentially a cross-sectional database and most households are not in the sample for more than several years. This is not sufficient to allow us to use the raw microdata to estimate econometric equations that relate growth in debt to income, interest rates and other economic variables. Given that the time series information does not refer to the same households we use pseudo-panel techniques.[7]

III.1 Interest rate dynamics

All consumer[8] lending, except for credit cards, is assumed to be at variable rates. Each household pays an effective rate that is equal to the banks' prime rate plus an individual risk premium. We compute the premium for each household in the sample using the latest actual data. Any movement in the overnight rate directly affects the banks' prime rate. The new effective rate is calculated for each household by adding the individual risk premium, determined in advance, to the prime rate.

We can assume that the individual risk premium remains unchanged over time or, alternatively, varies with the economic conditions in the stress-test scenario. However, as a simplifying assumption we may suppose that the individual risk premiums will follow analogous paths for all households. For example, in the December 2010 issue of the FSR (p. 22), it was assumed that the risk premiums were decreasing over the simulation horizon. Similarly, we assume full passthrough of variations in the overnight rate to variable-rate mortgages.

Table 2

Distribution of mortgages between variable and fixed interest rate terms (%)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Fixed	91.58	92.12	89.35	81.00	78.55	74.59	70.77	73.96	76.50	75.26
Variable	8.42	7.88	10.65	19.00	21.45	25.41	29.23	26.01	23.50	24.74

For mortgage lending, there are two categories of term loans: variable-rate mortgages and fixed-rate mortgages. Table 2 presents the distribution of mortgage loans between variable and fixed interest rate loans by term for the period between 1999 and 2008. Two key points are worth highlighting: firstly, fixed interest rate loans represented the vast majority of mortgage loans over the last decade. Secondly, while in 1999, fixed interest rate mortgages represented 91.6% of all mortgages, in 2008, this proportion had decreased to 75.3%, indicating a shift toward variable-rate mortgages. This shift was fuelled by the significant gap that emerged between the overnight rate and fixed term mortgage rates. This gap rendered variable mortgage rates more attractive than fixed interest maturities in an environment where policy rates were low, compared to historical levels. Variable mortgage rates are linked to the overnight rate.

[7] For more details on building the pseudo-panel data used, please refer to Appendix 1.

[8] Consumer debt excludes mortgage debt.

Table 3 reports the distribution of fixed interest rate mortgages by maturity term. These data show that the 5-year fixed mortgage term is the most popular one. It has accounted for an average of 60% of all fixed mortgage terms over the last ten years. In the most recent years, the second most popular term is the 10+-year term, followed by the 3- to 4-year term. These three terms accounted for more than 80% of all fixed term mortgages over the last decade. A simulation exercise could take into account dynamic changes to the proportion of fixed versus variable and the proportion of fixed term mortgages by maturity according to changes in the macroeconomic conditions.

Table 3

Distribution of fixed interest mortgages by mortgage term (%)

	6 months	1 y	2 y	3-4 y	5 y	7 y	10+ y	Others	Total
1999	2.1	7.1	4.6	13.0	58.8	4.3	8.3	1.8	100
2000	2.4	6.8	4.2	12.2	58.4	4.1	10.1	1.9	100
2001	1.6	6.3	4.0	10.5	61.6	4.3	9.7	2.0	100
2002	1.5	6.6	3.4	13.0	60.6	4.7	8.3	1.8	100
2003	0.8	4.8	2.8	16.3	60.2	4.7	8.7	1.7	100
2004	1.0	7.0	3.2	14.9	58.1	4.9	8.8	2.2	100
2005	0.9	5.8	4.2	14.2	58.3	4.4	10.7	1.4	100
2006	0.9	4.8	3.5	12.7	60.2	5.5	9.9	2.4	100
2007	0.8	2.6	2.3	8.6	56.7	4.9	19.5	4.6	100
2008	0.7	2.0	1.9	8.3	53.1	5.4	22.7	5.9	100
Average	1.3	5.8	3.6	12.8	59.2	4.6	10.5	2.2	100

The CFM survey provides the maturity term of the fixed mortgage loan; however we do not have the information on when the mortgage is due for renewal. Accordingly, in the applied exercise we will be assuming that, for each fixed term mortgage, a given proportion of households will renew their mortgage every year. This proportion of households will be equal to the inverse of the term to maturity. For example, 20% (1/5 = 0.2) of households with a 5-year term would renew their mortgage each year (5% per quarter).

In summary, we assume full and immediate passthrough to variable-rate debt and slow passthrough to the stock of fixed-rate mortgages.

III.2 Income growth dynamics

Income is the second variable required to plot the projected evolution of the DSR. Household income is divided into four income classes (for details, see Djoudad 2009). The following equation represents the distribution of income growth for a particular class:

$$\text{Income} \sim N\left(r_j, \sigma_j\right) \quad j = 1, 2, 3, 4 \tag{6}$$

where:

j: household income class;

rj: average income growth of households in class *j*;

σj: estimated standard deviation of income growth for households in class *j* (see Djoudad 2009).

Table 4

Estimated standard deviation of income growth by income class (σ)

Income group	Less than $32,500	$32,500–57,499	$57,500–84,999	$85,000 and above
Standard deviation	0.04	0.03	0.025	0.006

In Table 4, we report the estimated standard deviations of income growth for each of the four income classes. Income growth is assumed to be heterogeneous within each class – that is, the simulated distribution of income growth across households is consistent with the standard deviation reported in Table 4. Between classes, the average growth may be assumed to be identical or different, although overall growth must be consistent with the aggregate scenario set in Step 1. For example, we may assume that a shock to income has a greater impact on income growth for households in the lowest income classes (1 and 2) relative to the households in the highest income classes (3 and 4). Note however that since the survey constrains us to define income classes in nominal terms, there will be a shift over time of households toward higher income categories.

III.3 Debt growth dynamics

One of the assumptions that have to be made in Step 1 relates to the dynamics of aggregate debt growth. This assumption should detail the respective paths considered in the macro scenario for growth in consumer and mortgage debt. We cannot assume that all households will experience equal debt growth. Therefore, we have to determine how aggregate debt growth will be distributed among all households according to each household's specific socio-economic characteristics. Debt growth is assumed to be heterogeneous across households.

In our sample, there are two types of households, in regard to home ownership. The first category of households does not yet own a house or have a mortgage. Some of the households in this category will buy a house and enter into the mortgage market during the simulation exercise. They will be called first-time homebuyers. Households in the second category already have a mortgage. In the treatment of debt growth, a specific distinction is made between first-time homebuyers, who have yet to contract mortgage debt, and all others.

III.3.1 First-time homebuyers

Over recent years, home ownership has increased significantly in Canada. This indicates that first-time homebuyers have been, over that period, an important contributor to the growth of mortgage credit. The Canadian Association of Accredited Mortgage Professionals (CAAMP 2010) reports that approximately 50% of all new mortgages in 2009 were the result of first-time homebuyers. Another survey report, from Canada Mortgage and Housing Corporation (CMHC 2010), estimates that approximately 43% of all households that bought a house in 2009 were first-time homebuyers. The dynamics of mortgages for first-time homebuyers are different from those of other mortgage holders.

To be eligible for being a first-time homebuyer, we identify households in the data set that have neither a mortgage debt nor a house. The value of the house this household can afford is related to the amount of its liquid savings and a maximum DSR that is randomly attributed. The DSR value allocated to this household is drawn from a random distribution whose average is consistent with observed data.

This feature tracks how household balance sheets change, for first-time homebuyers, both on the asset side and on the liability side. It also allows us to assess the impact of changes in house prices on the household balance sheet. If a crisis occurs, households that had liquidity but bought houses cannot use that liquidity for loan payments since it was used for the downpayment. However, households may have other assets that could be valued at market prices.

III.3.2 Other households

Using the pseudo-panel data set, we are able to estimate equations for the growth of household debt as a function of income, household wealth, house prices and interest rates. Housing wealth is defined as the difference between the value of the house and the amount of the mortgage.

We estimate the following equations for growth in total household debt and mortgage debt:

$$\Delta TC_t = c_{11} + \alpha_{11}\Delta r_t + \alpha_{12}\Delta i_t + \alpha_{21}(1 + hp_t)HW_{t-1}I_0 + \lambda_1(c_{11} + \alpha_{11}\Delta r_t + \alpha_{12}\Delta i_t + \alpha_{21}(1 + hp_t)HW_{t-1}I_0)D40 + \varepsilon_1 \quad (7)$$

$$\Delta MC_t = c_{12} + \alpha_{12}\Delta r_t + \alpha_{22}\Delta i_t + \alpha_{32}(1 + hp_t)HW_{t-1} + \lambda_2(c_{12} + \alpha_{12}\Delta r_t + \alpha_{22}\Delta i_t + \alpha_{32}(1 + hp_t)HW_{t-1})D40 + \varepsilon_2 \quad (8)$$

where:

t: time;

Δ: first-difference operator;

ΔTC and ΔMC: are respectively growth of total household debt and mortgage debt;

i: interest rate;

r: logarithm of household income;

hp: house price growth;

I_0: 1 for homeowners, 0 otherwise;

HW: logarithm of housing wealth;

D40: 1 if the household has a DSR level equal to or above 40%, 0 otherwise.

We consider equations (7) and (8) to be the reduced-form equations of demand and supply for household debt. Consequently, it would be difficult to formulate precise expectations regarding the signs of the coefficients.

The inclusion of λ_1 and λ_2 in both equations indicates a non-linearity in the growth of household debt for households with a DSR level at or above the 40% threshold, given that banks' decision to extend additional credit is influenced by the household's initial level of the DSR. There is a DSR threshold over which a household becomes more financially vulnerable. Financial institutions generally use a DSR threshold of 40%. Djoudad and Traclet (2007) use this industry threshold to sort financially vulnerable households in the CFM sample. Accordingly, we expect this parameter to be negative suggesting that growth of household debt will be lower for households with a DSR equal to or greater than 40%.

The purpose of these equations is to provide parameter estimates for the determinants of debt growth. When combined with the household specific path for income growth and assumptions for interest rates and property values (i.e., the explanatory variables in the equations), they allow us to simulate the distribution of debt growth across households.

The dynamics of debt growth follow the dynamics implied by equations (7) and (8). For each household in the sample, given its simulated income growth (see section II.2), changes in the overnight rate, its housing wealth and its current level of DSR, we calculate the corresponding growth in total credit and mortgage credit implied by these two equations. The mean of the distribution of growth implied by equations (7) and (8) is adjusted to comply with the aggregate assumptions from Step 1 using equations (9) and (10). We maintain the

distribution of credit growth but shift the overall mean by a constant, for all households. Future extensions to this framework may integrate the determinants of credit growth which would endogenously affect individual credit growth. However, for current purposes, we allow for heterogeneity and non-linearity in the debt growth dynamics by linking the distribution of credit growth to economic factors.

$$\Delta C_t = \frac{(\sum 1 + \Delta C_{it}) w_i C_{it-1} - \sum w_i C_{it-1})}{\sum w_i C_{it-1}} \quad (9)$$

$$\Delta C_{1it} = (AG - \Delta C_t) + \Delta C_{it} \quad (10)$$

With:

t: time;

i: household;

C: consumer or mortgage debt;

ΔC_{it}: individual growth of consumer and mortgage debt implied by equations (7) and (8);

ΔC_{1it}: adjusted individual growth of consumer and mortgage debt consistent with equations (7) and (8) and the aggregate scenario;

AG: assumed aggregate growth (adjusted for the first-time homebuyers).

Equations (9) and (10) will ensure that total growth of credit, in the simulation exercise, is consistent with aggregate assumptions set in Step 1. Debt growth (consumer and mortgage) for every household is adjusted so that the average growth across all households is equal to the assumptions set in Step 1.

III.3.3 Estimation and result

Table 5

Estimation results[a]

Variables	Total household credit equation	Mortgage credit equation
Constant	0.005	0.0155
Δ interest rate	-0.0266	-0.0538
Δ log of income	0.8030	0.5282
Δ log of housing wealth	0.0007	0.001
λ	-0.2163	-0.3367
$\bar{R}^2$	0.15	0.37

a. All coefficients are significant at the 1% level.

Results of the estimations are presented in Table 5. We use the method of weighted least squares with a corrected covariance matrix. All equations are estimated with debt, income, and housing wealth in first differences. We also added the lagged value of housing wealth (the difference between the property value and the mortgage debt), in levels, with a home ownership variable to the two debt equations. In both cases, the housing wealth variable is

significant. This indicates the importance not only of the growth in house prices, but also of the level of wealth. In order to avoid problems of simultaneity, this variable was lagged. The results indicate a negative and significant relationship between growth in debt and changes to the interest rate. The relationship is positive and significant for income. This result obtains for both equations. Finally, as to mortgage and total debt, their growth is also positively related to growth in property values and the level of housing wealth owned by the household. Finally, as expected λ is negative for both equations indicating that growth in debt will be reduced for households with a DSR equal to or greater than 40%. For example, everything else being equal, growth in mortgage debt will be 34% lower for a household with a DSR above the 40% threshold, compared to the same household with a DSR below 40%. Similarly, growth in total household debt will be reduced by 22% for a household with a DSR equal to or above 40%, compared to a similar household with a DSR below 40%.

The change in debt will not be identical across households since the model permits the growth of each household's debt to depend on household specific income and housing wealth according to empirical relationships (equations 7 and 8).

III.4 DSR calculations

Finally, the simulated DSR for every household and for each period is calculated using the household specific changes in income and debt and the assumed path for interest rates. This information is combined to construct the simulated distribution of the DSR.

IV. Household vulnerabilities and risk

In order to assess the vulnerabilities stemming from the household sector, we need to define a metric that will help us in quantifying the changes to the vulnerabilities in our simulation exercises. In our analysis, we will use two metrics.

IV.1 Vulnerable households

Vulnerable households are defined as those for which the DSR is equal to or greater than the 40% threshold. This measure is consistent with industry benchmarks and empirical results (Dey et al. 2008). Dey et al. suggest that the DSR level beyond which there is a qualitative and significant increase in a household's propensity to be delinquent on mortgage debt is consistent with 40%.

IV.2 Change in the aggregate probability of default given a negative employment shock

The change in the proportion of vulnerable households is, to a certain extent, an indication on how vulnerability levels change, rather than a direct measure of potential losses if a shock materializes. To address the latter issue, we examine the effect of a significant negative shock to employment on the probability of default on loan payments.

Since defaults will be affected by households' balance sheets (liabilities and assets) as well as their income and interest rates, this measure represents a more integrated view of the resilience of households to negative shocks. Interestingly, default rates allow us to directly quantify potential bank losses.[9] In the December 2010 issue of the FSR, the Bank of Canada

[9] When complemented with some other information.

calculated the effect of a severe negative shock to employment on the loan portfolios of banks. This approach provides a more direct indication of how risks are transmitted from households to the financial system than the measure based on the 40% threshold.

If a negative employment shock occurs, households that are affected will lose their income coming from employment. In our framework, the loss of jobs is distributed randomly among households with employment income. Thus, retirees, students, etc. will not be affected by this negative income shock. Once households are affected by an unemployment shock, there are two sources of funds that may be readily available to them to make loan payments: employment insurance income if they are qualified and proceeds of the sale of their liquid assets and part of their mutual funds if they have any. Liquid funds include all funds in chequing and savings accounts, term deposits, government bonds, GICs,[10] etc. "If a broader range of assets were used, then the second-round effects would also need to be considered in the model." Djoudad (2010, p. 61). In fact, severe stress situations may trigger asset fire sales from households that would potentially have feedback effects on aggregate variables like house prices. To take fully into account the dynamic of the shocks, a broader model is needed.

Empirical data suggest that only a proportion of households qualify to receive unemployment benefits, once they become unemployed. CFM data show that in 2010, almost half of households were double income earners. We assume that if a double income household is hit by an unemployment shock, the household keeps half of its income plus the unemployment benefits (if any) for the other half.

In our empirical exercise, we assume that only part of the liquid funds available to the households is used to service the debt, while the other portion is directed toward household expenses. If a household is not able to meet its financial obligations (servicing its debt), over the course of its unemployment spell, for at least three consecutive months, this household will be deemed insolvent. Default on any unsecured outstanding debt will then be considered a loss to financial institutions.

Our simulations assume that the duration of unemployment varies among households and follows a chi-squared distribution. Duration of unemployment is a critical factor in assessing whether a household will become insolvent. The longer the duration of unemployment, the bigger is the stock of liquid assets needed to continue making loan repayments. Consistent with historical evidence, the higher the unemployment rate, the longer is the assumed average period of unemployment.

IV.3 The implementation of an unemployment shock

Now that we have discussed the framework driving a negative employment shock, we will proceed in this section by presenting the technical steps used to implement it in our model.

In order to perform this simulation, we need the following information for every household:

i. income level;

ii. working status;

iii. total loan payments;

iv. liquid assets (and other assets if taken into account in the exercise);

v. household weights.

[10] GIC: guaranteed investment certificate.

In the survey, each participant is attributed a population weight. In order to perform the simulations, we first rebuild the population distribution. We use the weights to match the distribution of the population. All calculations are based on the distribution of the population and not on the sample distribution. For example, if the survey attributes an eight (x_a) to household (A), there will be x_a identical households in the generated sample. The number of households in the new sample will be equal to the summation of all weights. This feature is important in the simulations to avoid any bias toward any specific representative household.

V. Numerical example

To illustrate the capabilities of the framework, we will use 2008 CFM data to simulate the impact of various shocks on the distribution of the debt-service ratio and, therefore, the probability of default for households.

V.1 DSR distribution for 2008

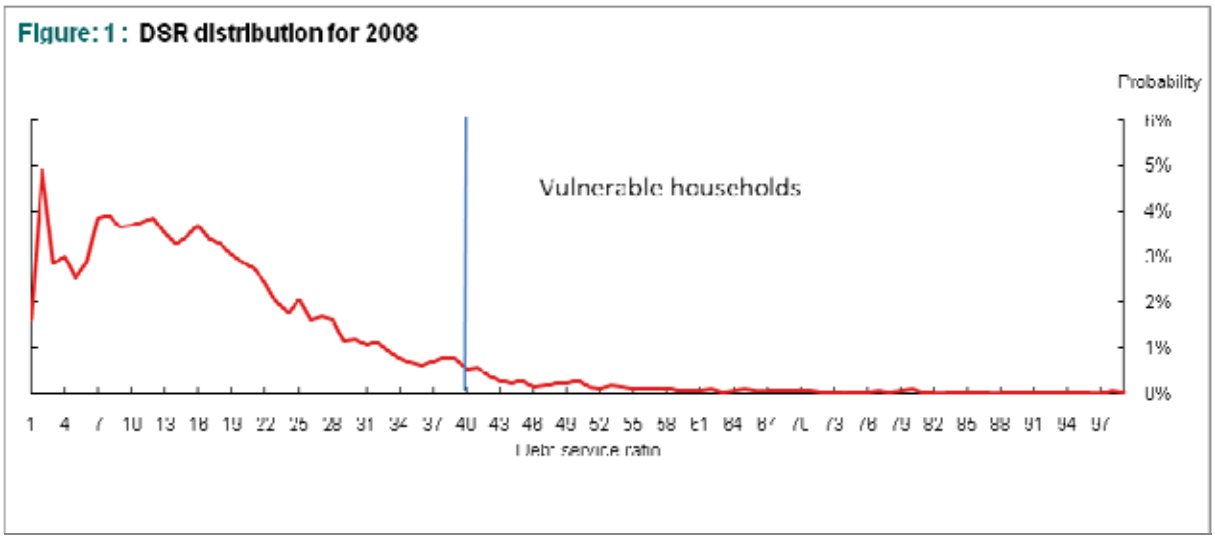


Figure 1 presents the DSR distribution for 2008. As reported in Table 6, in 2008, the proportion of vulnerable households was 5.70% while the proportion of debt owed by these households was 10.63%. Also, 60% of the households that were in the sample had some type of debt (credit card, consumer loans, mortgages), of which 70% had a mortgage.

Table 6

Vulnerable households and debt owed[11]

Period	Proportion of households with a DSR equal to or greater than 40%	Proportion of debt owed by households with a DSR equal to or greater than 40%
2008	5.70%	10.63%

[11] All calculations refer only to households with debt.

The actual DSR distribution for 2008 represents a starting point for the following simulations. The evolution of the distribution over the simulation horizon is determined using an assumed macro scenario and the methodology described in previous sections.

V.2 Interest rates scenario

Since there are eight different interest rate terms across mortgage loans of different maturities, we must assume a specific path for each of these terms. However, because these paths are not determined independently of each other, we use the following formula to generate the mortgage rate for each maturity:

$$i_{yt} = ovn_t + risk\ premium_{yt} + term\ premium_{yt} \quad (11)$$

t: period;

y: maturity term;

i_{yt}: mortgage rate for maturity *y* at period *t;*

ovn_t: overnight rate or policy rate;

$risk\ premium_{yt}$: aggregate risk premium;

$term\ premium_{yt}$: aggregate term premium.

Depending on the characteristics of the assumed stress test, we can suppose any level of risk and term premium in the exercise.

Table 7

Interest rates for fixed term mortgages over the simulation periods (%)

Period	6 months	1 y	2 y	3-4 y	5 y	7 y	10+ y	Overnight rate
1	3.46	3.24	3.24	3.91	4.25	6.24	4.95	0.25
2	3.71	3.49	3.49	4.16	4.50	6.49	5.20	0.50
3	3.96	3.74	3.74	4.41	4.75	6.74	5.45	0.75
4	4.21	3.99	3.99	4.66	5.00	6.99	5.70	1.00
5	4.46	4.24	4.24	4.91	5.25	7.24	5.95	1.25
6	4.71	4.49	4.49	5.16	5.50	7.49	6.20	1.50
7	4.46	4.24	4.24	4.91	5.25	7.24	5.95	1.75
8	5.21	4.99	4.99	5.66	6.00	7.99	6.70	2.50
9	5.46	5.24	5.24	5.91	6.25	8.24	6.95	2.75
10	6.21	5.99	5.99	6.66	7.00	8.99	7.70	3.50
11	6.96	6.74	6.74	7.41	7.75	9.74	8.45	4.25
12	7.71	7.49	7.49	8.16	8.50	10.49	9.20	5.00

Table 7 reports the assumed mortgage rates for maturities available in CFM data. We suppose that over the simulation periods (each period is a quarter), the overnight rate will increase from 25 bps to 500 bps. At the starting point and consistent with what happened during the crisis, both the risk premium and the term premium were at elevated levels (in 2008) while the policy rate was at its effective lower band. Over the course of the

simulations, it is assumed that both the risk premium and the term premium will fall to 350 bps, as economic conditions improve. At the same time, the policy rate will increase to 500 bps in quarter 12. Indeed, different scenarios can be assumed for different components (overnight rate, term and risk premiums) but the assumptions must all be consistent with the macro stress scenario chosen (debt and income growth).

V.3 Assumptions for the debt-to-income ratio

In this scenario, we assume that consumer debt will rise at an average of 8% per year while mortgage debt will increase at 7.5%. Income will rise at an average of 4% over the same horizon. According to these assumptions, debt-to-income will continue to increase. We also assume that interest rates will evolve according to Table 7. Rising interest rates and rapidly increasing indebtedness may be seen as unlikely, since higher interest rates should cause the debt increase to slow over the simulation period. However, the purpose of this illustration is to expose the capabilities of the methodology and to assess the build up of vulnerabilities consistent with a tail event scenario rather than presenting the most likely scenario.

V.4 Simulation results

Table 8

Results of the simulations (%)

	Assuming that debt-to-income ratio is constant and interest rates are increasing (Scenario 1)			**Assuming that both debt-to-income ratio and interest rates are increasing (Scenario 2)**		
	Average DSR	**Proportion of households with a DSR equal to or greater than 40%**	**Proportion of debt owed by households with a DSR equal to or greater than 40%**	**Average DSR**	**Proportion of households with a DSR equal to or greater than 40%**	**Proportion of debt owed by households with a DSR equal to or greater than 40%**
Base year	16.9	5.7	10.6	16.9	5.7	10.6
Q1	16.3	4.9	9.4	17.0	5.7	10.7
Q2	16.3	4.9	9.1	16.4	5.0	9.5
Q3	16.2	4.8	8.9	16.5	5.0	9.4
Q4	16.2	4.8	8.7	16.6	5.1	9.4
Q5	16.2	4.9	8.9	16.7	5.3	9.5
Q6	16.3	4.9	9.1	16.9	5.4	9.6
Q7	16.3	5.0	9.1	17.1	5.7	10.1
Q8	16.5	5.1	9.4	17.2	6.0	10.7
Q9	16.5	5.3	9.6	17.6	6.4	11.1
Q10	16.7	5.4	9.9	17.8	6.6	11.5
Q11	16.9	5.7	10.4	18.2	7.0	12.4
Q12	17.2	6.1	11.0	18.6	7.6	13.4

Table 8 reports vulnerabilities for every period considered in the simulations. Let us first maintain debt-to-income constant. In this scenario, we isolate the specific impact of interest rates on the DSR distribution. With the increase in interest rates as stated in Table 7, the average DSR would increase to 17.2% in twelve quarters from 16.9% at the beginning of the simulations. The initial decrease in the average DSR is due to the impact of lower interest rates for consumer debt and households rolling over their mortgage debt. The proportion of households with a debt equal to or greater than 40% as well as the proportion of debt these households owe respectively increase to 6.1% and 11.0% after twelve quarters, from their respective levels of 5.7% and 10.6% in the base year.

However, if we assume that debt-to-income will continue to grow as described above, the average DSR will increase to 18.6% at the end of the simulation from 16.9% at the starting point and the percentage of vulnerable households as well as the proportion of debt they owe will increase to 7.6% and 13.4% from their respective levels of 5.7% and 10.6% at the start of the simulations.

V.5 Impact of a negative employment shock on the probability of default for households

In this section, we introduce an explicit negative shock to employment at different periods (quarters 1 and 12) and we assess how the risks change over the medium term. The risk depends on the vulnerability levels (Table 8) and the size of the shock. Everything else held constant, the risk increases over time if vulnerability increases.

Given the simulation results for the DSR obtained in the previous section, we calibrate the unemployment shock program by adjusting key assumptions to replicate the default rate on household loans, at the base year. The calibration is done by adjusting the proportion of liquidity that can be used by households to service their debt payments. Recall that liquid funds available to unemployed households will include unemployment benefit (if any), liquid assets (chequing and savings accounts, term deposits, government bonds, GICs, etc.), and a proportion of mutual funds. For example, in the present simulation, the proportion of mutual funds used for payments was adjusted to replicate the level of default[12] on household loans that was observed in 2008 (0.36%), given the unemployment rate of 6.1% and an average unemployment spell equal to approximately 15 weeks.

Once the unemployment program has been calibrated at the starting point, a shock is performed by changing the level of the unemployment rate from 6.1% to 11% and increasing the average duration of unemployment from 15 weeks in 2008 to 25 weeks twelve quarters later, using as input data on payment obligations from the DSR simulations. The results suggest that the default rate, on total loans, would increase from 0.36% at the base year to 1.2% at period 12 of the simulation, should Scenario 2 materialize.

The objective of this section is to obtain default rates on household loans under the stress scenario. Given these default rates, assumptions on loss given default and the level of unsecured debt that the households owe, we calculate the magnitude of the losses to banks on their household portfolio. We then compare the level of these losses to Tier1 capital (or any other measure that is appropriate) and evaluate whether financial institutions remain well capitalized after the shock.

[12] Default is defined as loans for which payments are in arrears for 90 days and more.

VI. Conclusion

In this paper we have presented a framework for using microdata to assess potential risks stemming from household indebtedness. These microdata have been an important complement to aggregate data. At the Bank of Canada, we have been using these data for several years now and reporting the results in our *Financial System Review*.

In this paper we have presented the general concept surrounding the methodology used to exploit the microdata. The examples offered are illustrative of the capabilities that this framework offers. All assumptions used are intended to calibrate the model and may be changed according to various needs and objectives. They should not be seen as a limitation to the method. This framework is in continuous development. For example, future work may introduce more behavioural assumptions for households, consistent with economic theory or economic priors. One important development would be to substitute the random draws for income by a household specific income that depends on its socio-economic characteristics.

Appendix 1:
Building pseudo-panel data

The building of this data set is necessary given the non-panel nature of the data set. To allow us to perform data series analysis, we construct a new data set where each observation consists of a grouping of households belonging to the same characteristic group. For example, we can build two groups of households that relate to the employment status of the households (working or not). The first group will have all the households that have a job. The second group will contain all other households. For each of these two groups, we can determine the amount of credit, income, wealth, etc. This approach will reduce the number of observations in the database into two main observations. If we add the area of residence (inside or outside a region) to the employment status (working or not working), we will then have a grouping of four criteria (two for employment and two for residence). The transformed database will then contain four representative household categories for each year. The most attractive feature of this method is that we can compare the data for each group of representative households across time and compute growth rates and estimate parameters in equations (7) and (8).

This approach has been presented in different papers and according to Biao (2007), Dargay and Vythoulkas (1999) were the first to use it. Subsequently, it was taken up by Dargay (2002), Bourguignon et al. (2004), Navarro (2006), and Biao (2007), among others. While this approach is an interesting complement to the cross section analysis of data, it raises a number of questions and challenges such as the choice of the characteristics that are used to group the data.

For this study, we define clusters of households based on the following criteria:

- Age groups: 18–24 years, 25–34 years, 35–49 years, and 50 years and over.
- Labour market status: households are divided into two categories: those who receive income from a working activity, and those whose income is from other sources, such as students, retirees, unemployed, etc.
- Education: on the one hand are those who completed up to 13 years of schooling, and on the other are those with a university degree.
- Status as owner or tenant.
- Those with a DSR equal to or above 40 and those with a DSR below 40.
- Given that the dynamics of the economy in Alberta have been different compared to the rest of Canada over the last decade, whether the household lives in Alberta or outside Alberta has been added as a criterion.

The combined groups add up to 128 categories. For each household group considered, we compute weighted averages for each category of borrowing (credit cards, secured and unsecured personal lines of credit, car loans, other loans, and mortgages), income, house values, and the DSR.

VII. References

Biao, H. 2007. “The Use of Pseudo Panel Data for Forecasting Car Ownership”, Department of Economics, Birkbeck College, University of London.

Bourguignon, F., Goh, C. and Kim, D. 2004. “Estimating individual vulnerability to poverty with pseudopanel data”, *World Bank Policy Research Working Paper* 3375.

Canada Mortgage and Housing Corporation (CMHC). 2010. *Renovation and Home Purchase Report* (June).

Canadian Association of Accredited Mortgage Professionals (CAAMP). 2010. *Revisiting the Canadian Mortgage Market – Risk Is Small and Contained* (January).

Dargay, J. 2002. “Determinants of car ownership in rural and urban areas: a pseudopanel analysis”, Transportation Research Part E: *Logistics and Transportation Review* Vol. 38, Issue 5 (September), pp. 351–366.

Dargay, J. and Vythoulkas, P. 1999. “Estimation of a Dynamic Car Ownership Model, A Pseudo-Panel Approach”, *Journal of Transport Economics and Policy*, Vol. 33, Part 3 (September), pp. 287–302.

Dey, S., Djoudad, R. and Terajima, Y. 2008. “A Tool for Assessing Financial Vulnerabilities in the Household Sector”, *Bank of Canada Review* (Summer), pp. 45−54.

Dey, S. and Traclet, V. 2008. “An Estimation of the Probability of Delinquency for Canadian Households and Associated Stress Tests”, Bank of Canada Mimeo.

Djoudad, R. 2009. “Simulations du ratio du service de la dette des consommateurs en utilisant des données micro”, *Bank of Canada Working Paper* No. 2009−18, http://www.bankofcanada.ca/en/res/wp/2009/wp09-18.html.

Djoudad, R. 2010. “The Bank of Canada’s Analytic Framework for Assessing the Vulnerability of the Household Sector”, *Financial System Review* (June), pp. 57−62.

Djoudad, R. and Traclet, V. 2007. “Highlighted Issue: Stress Testing the Canadian Household Sector using Microdata”, Bank of Canada *Financial System Review* (December), pp. 26–30.

Navarro, A. I. 2006. “Estimating Income Mobility in Argentina with pseudo-panel data”, Preliminary Version Department of Economics, Universidad de San Andres and Universidad Austral.

Organisation for Economic Co-operation and Development. 2010*. OECD Factbook 2010*, country statistical profiles, http://stats.oecd.org/index.aspx?queryid=23238" \t "_blank".

Zajackzkowski, S. and Zochowski, D. 2007. “Housing loans growth, foreign currency risk and supervisory response: the Polish case”, National Bank of Poland. (Preliminary version as of 7 November 2007.)

Exploring the statistical potential of micro-databases

Isabel Lavrador[1]

1. Introduction

Monetary and financial statistics provide valuable input to the decision-making process by both national central banks and governments and are pivotal in research and analysis on the activity of the different economic and financial agents.

Producing high-quality and timely monetary and financial statistics is a key responsibility of national central banks. Ensuring that these statistics remain fit-for-purpose implies keeping pace with financial innovation, assessing the statistical impact of innovations at the earliest possible stage and making the necessary amendments in a well-timed manner, if possible without overburdening the reporting agents and by making a more efficient use of the data already available. In recent years, new ways of collecting data and compiling statistics have been implemented with a view to meeting the users' growing need for real-time, detailed, coherent, reliable and comparable data.

The financial turmoil of 2007–2009 highlighted potential (and actual) gaps in the statistical framework, at both national and international level. In particular, the crisis revealed important gaps in information for the purposes of financial stability analysis, namely concerning counterpart data. The development of micro-databases and administrative records[2] reporting can make a major contribution to overcoming some of these shortcomings (see also D'Aguiar and Lima, 2009). They permit us to develop knowledge about the activities of economic and financial agents at a more detailed level and allow for the drawing of conclusions that would not be possible should one rely solely on aggregated data. Micro-data, as a set of administrative individual registers, have a huge potential for statistical use.

Banco de Portugal has developed and manages several databases that have proved to be of paramount importance in monitoring and assessing developments in the Portuguese financial system, especially at the present conjuncture. This paper offers a practical example of *Banco de Portugal*'s experience in using micro-databases and item-by-item reporting for statistical purposes, highlighting the advantages of this approach as regards financial innovation, and reducing the data gaps evidenced by the recent financial crisis. Empirical evidence focusing on securities statistics is included.

The remainder of this paper is structured as follows: Section 2 briefly describes the micro-databases used by *Banco de Portugal* in the production of statistics; Section 3 explains the valuable contributions of micro-databases in a financial crisis context; Section 4 provides some empirical evidence concerning micro-databases on securities; Section 5 concludes.

---

[1] Statistics Department, *Banco de Portugal*; imlavrador@portugal.pt.
The analyses, opinions and findings of this paper represent the views of the author; they are not necessarily those of *Banco de Portugal* or the Eurosystem. I gratefully acknowledge Filipa Lima, Luís D'Aguiar and Maria do Carmo Aguiar for their most relevant comments.

[2] In this paper, "administrative records" are taken to be *"information that is routinely collected by organizations, institutions, companies and other agencies in order that the organization can carry out, monitor, archive or evaluate the function or service it provides"* (Calderwood and Lessof, 2006).

2. Description of micro-databases developed and used by *Banco de Portugal*

In the last 10 years, *Banco de Portugal* has been developing and maintaining several databases based on item-by-item reporting, with proven results in reducing or eliminating previous information gaps. In particular, it has been exploring the statistical potential of various sources of information, including the Securities Statistics Integrated System (SSIS) database, the Central Credit Register (CCR), the Central Balance Sheet Office (CBSO) database and prudential supervision information.

For a better understanding of the way *Banco de Portugal* has been using these databases to produce statistics, I will proceed with a brief description of each of them.

2.1 The SSIS database

The SSIS database is an information system created in 1999 and managed by the Statistics Department that stores data on securities issues and portfolios on a security-by-security and investor-by-investor basis.[3] It gathers in a single database detailed data on issues and securities holders, and includes stocks and transactions of securities other than shares (short- and long-term) and shares and other equity (financial derivatives are still not included in this database, despite the pressure on the part of the users to integrate them into the reporting scheme). Both stocks and transactions are collected on a monthly basis. Information is acquired by ISIN code and afterwards is classified according to the European System of National and Regional Accounts (ESA 95) classification of financial instruments.

In the segment on issues, information is collected on securities issued by resident entities in Portugal, either issues taking place in the Portuguese market or in external markets. Data on issues are collected from several sources such as Euronext, the Securities Market Commission (SMC), the General Government, *Interbolsa*, commercial databases, etc. As regards securities portfolios, detailed information is collected on investments by residents in domestic and foreign securities, as well as on the portfolios of non-resident investors in domestic securities. This information is reported by Monetary and Financial Institutions (MFI), dealers, brokers, the SMC, and other resident entities.

On the issues side, the system allows for the collection, validation and production of statistics on securities issued by resident sectors in Portugal and abroad. On the portfolios side, the SSIS database allows for the development of statistics on MFI (MFI's securities portfolios and investment funds statistics), on the balance of payments and international investment position (b.o.p./i.i.p.) (the Portuguese portfolio invested abroad, and the foreign portfolio invested in Portugal), and on financial accounts (for the segments covering securities other than shares and shares and other equity).

The usability of this system is directly related to the data's granularity and consistency as regards financial instruments, counterparties and market concentration.

The development of the SSIS database is being done on a continuous basis, and the foreseeable enhancements include integration with the Centralised Securities Database (CSDB) managed by the European System of Central Banks (ESCB).

[3] In the case of investors belonging to the households' institutional sector, data are aggregated by the investor's country. See Aguiar (2008) and Aguiar *et al*. (2009) for more details.

2.2 The CCR database

The CCR is an administrative database created in 1978 by *Banco de Portugal* to provide credit-related information to the participants (financial institutions) and to help them in their assessment of the risks attached to extending credit. In 1996 the use of the CCR data was extended for other purposes such as statistics, banking supervision and regulation, and economic research and policy. This database is managed by the Statistics Department.

The data reported to this database include, *inter alia*, amounts outstanding of loans granted to individuals and organisations, by type and purpose (interbank market balances are excluded), potential liabilities, type and value of collateral or guarantee securing the loan, securitised loans, syndicated loans, loans used to back mortgage bonds and other (separately identified), and credit defaults. The participants are both suppliers and users of CCR data.

This system has full coverage of the credit provided by financial institutions due to the very low reporting threshold (minimum of €50 per credit balance), and monthly credit balances are reported for each individual borrower by participants, who have the duty of reporting the individual identification of the borrowers, indicating only whether they are individuals or organisations. The more detailed sectoral classification of the borrowers within the scope of the CCR is internally established by *Banco de Portugal*, by the SSIS, thus ensuring the same high quality, consistency and flexibility of standards in sectoral classification.

The CCR database is used in the production of MFI statistics and Other Financial Institutions (OFI) statistics (in the segment on credit liabilities) and of financial accounts statistics (in the segment covering MFI and OFI credit liabilities). Furthermore, it permits further analysis of the credit data and additional breakdowns to existing statistics (such as loans granted by MFI and by OFI), broken down by type, by purpose, by institutional sector, by branch of economic activity, by region and by size), which is a main source for a better assessment of credit developments.

2.3 The CBSO database

The CBSO is a database of economic and financial information on a representative sample of Portuguese non-financial firms, developed since 1999 by the Statistics Department. The information is based on quarterly and annual accounting data of each reporting company. The data composing the CBSO database are reported by Non-Financial Corporations (NFC) under the so-called Simplified Corporate Information (SCI) system, which is a joint electronic submission of accounting, fiscal and statistical information that companies usually have to remit to the *Ministry of Finance,* the *Ministry of Justice*, the *National Statistics Office*, and *Banco de Portugal*. It allows companies to fulfil four reporting obligations through a single submission, entirely paper-free, in one moment in time.

The information available in the CBSO database has several uses related to NFC statistics. Firstly, it makes a valuable contribution to the b.o.p./i.i.p. statistics (in the segment on external trade, trade credits, direct investment, and loans granted by foreign credit institutions), and a key contribution to the financial accounts statistics (in the segment on trade credits, own funds, inter-company loans, pension funds and loans granted by private shareholders). Furthermore, it aims to contribute to a better understanding of the economic and financial situation of Portuguese NFC and provides regulators with data relevant to the pursuit of their duties, including economic analysis and financial stability analysis. The published statistics, the sector tables, and the additional use of international databases – Bank for the Accounts of Companies Harmonised (BACH) and European Sectoral References Database (ESD) – allow the development of several analyses of individual data and comparable aggregate data for the sector of economic activity/company size class, and to compare the financial performances of single firms considering their sector and size. The ratios that are produced are a source of control of the developments in NFC accounts.

2.4 Prudential supervision information

Banco de Portugal is responsible for the prudential supervision of credit institutions, financial companies and payment institutions with a view to ensuring the stability, efficiency and soundness of the financial system. The supervisory function is supported by a micro-database managed by the Banking Supervision Department that includes items from the balance sheet and income statement of each of the institutions supervised by *Banco de Portugal*.

Banco de Portugal has a long-standing tradition of fruitful cooperation between the Statistics Department and the Banking Supervision Department. In particular, the Statistics Department has access to the accounting data submitted for supervisory purposes, which allows the compilation of statistics that, besides complementing the existing ones – including statistics on Non-Monetary Financial Institutions (NMFI) – serve as an additional means to cross check their quality and internal consistency.

3. Valuable contributions of micro-databases in a crisis context

Despite the large amounts of financial data at the disposal of national central banks, the recent financial turmoil highlighted the need for initiatives aimed at improving the availability of information and overcoming possible statistical shortcomings related to the lack of an accurate view of the functioning of the economy. These initiatives should be twofold: they must allow for a better understanding of the past and, more importantly, they must provide statisticians and analysts with real-time inputs to prevent negative situations and to better tackle them beforehand. The use of administrative databases to complement traditional macro statistics, together with new data requirements and the need to minimise the reporting burden for respondents, brought to the fore the issue of further re-using and sharing of micro-data.

In a crisis context, statistical agencies are more exposed to external scrutiny and are ultimately expected to provide convincing answers to the public at large about the different economic and financial issues that need clarification. *Banco de Portugal* is by no means an exception. Since the beginning of the current financial crisis the requests to *Banco de Portugal* for additional information and analysis have been more frequent than usual and more attention has been given to its statistical output. The *Banco de Portugal* use of micro-databases is related not only to statistical purposes but also to the need to monitor and/or to assess market developments, and to trace economic scenarios. In the context of the financial crisis, these databases have proven to be an excellent way to keep track of events that would hardly have been noticed without the availability of more granular data. In practice, micro-databases on securities, credit registers, central balance sheet offices and supervisory information have the potential to make a valuable contribution to complement the data provided by the conventional statistical systems (particularly in relevant and timely statistics that may be used as early warning indicators), and to enhance responsiveness to *ad hoc* information requests from the users. Furthermore, this type of database has lower reporting and maintenance costs, provides high-quality data, is likely to give better coverage of the population, offers greater flexibility to the compilation process, and allows for the derivation of new statistical outputs almost in real time.

Going further into the details provided by micro-databases, the disaggregated data and the concomitant greater flexibility in exploring data and building statistical analysis allow further research in specific areas of knowledge and in-depth understanding of the economy (see also Lane, 2003 and 2007). Moreover, they make it possible to make more informed decisions than the ones based on estimations or forecasts. Economic and political decisions are most of the time taken on the basis of ratios and estimations derived from aggregated data, thus not taking into account important details that can only be seen at an itemised level.

Micro information has the potential to mitigate some of the information gaps so that the decision process can be optimised when the characteristics and frictions of market players are taken into account and permits analysts to calculate marginal, rather than average effects.

The micro-databases developed by *Banco de Portugal* contain detailed data on balance sheet positions of the MFI, OFI, NFC and households sectors, and allow us to analyse leverage, liquidity and market exposures in systemically important institutions with geographical, sectoral and currency breakdowns (including counterpart information). Moreover, with micro-data it is possible to have information on the main players of the Portuguese market, their financial transactions and respective impact on the economy. In particular, the CCR database is an excellent tool for carrying out structural analyses in terms of credit and detailed tests on the concentration of risk of the different economic agents.

In the wake of the financial crisis, central banks have been dedicating an increased interest to the monitoring of economic agents' risk exposures. These are not restricted to one single risk, but rather to several different risks – some of them reflected in rate spreads, others hidden in the activity and only observed with detailed analysis. With micro-data one can assess the impact of plausible but low-probability macro-financial risk scenarios on the solvency of a set of financial institutions. Indeed, by using micro-data one can assess the internal investment policy of the banks for their own portfolio, on behalf of their clients, and of large Portuguese investors, and monitor the dependence of our agents in terms of one country (country risk), the concentration of Portuguese investments in one or more countries in one specific security (debt securities, equity, investment funds shares), or the concentration of investments in one specific company. These analyses allow the central bank to manage the risk inherent to their strategy, to anticipate events on investors' holdings, to trace future problems in their accounts and, ultimately, to take remedial action in time. In practical terms, if one MFI, searching for higher returns, invests a substantial part of its clients' deposits and other funds in offshore centres or troubled economies, there is a high element of risk associated with those investments. With micro-data one can anticipate and monitor the risk of those investors and follow the evolution of those accounts more frequently (e.g. monthly), instead of having an annual aggregate.

Given the strategic importance of this type of data, the Statistics Department of *Banco de Portugal* has developed a very thorough set of procedures to ensure a high level of quality and control over the data. On the compilers side, the quality of the financial statistics, the data control checks, and the identification of inconsistencies are facilitated and enhanced if data are collected on an individual basis. Also, item-by-item reporting enables greater accuracy and better data monitoring. Once the classification of information for statistical purposes is done by the statistical experts, in line with a common methodological framework, and valuation adjustments follow uniform criteria, the data reported by the different agents are coherent and comparable, and allow for cross-checking with other data sources. On the reporting agents' side, despite the high amount of individual registers (possible due to information technology innovations), it is easier for them to report monthly granular data rather than aggregated data over a larger period of time. Once the reporting agents learn the methods of reporting and how to use the information systems to report the data, it is easier and less prone to error to send individual registers than to aggregate data according to several statistical criteria (aggregate reporting usually means a greater burden in terms of details and breakdowns to be reported every time new or additional output requirements emerge).

Another benefit of using item-by-item reporting is the contribution that some specific registers of a single database have as inputs to the development and production of other statistics (for example, registration data are useful in building and maintaining lists of units as the starting points for surveys, and transaction data can be used for new statistical products or even additional details of already existing statistics). The different areas of the Statistics Department follow pre-defined production processes and the integration of the available

databases allows for efficiency gains even in the cross-checking of data between the different areas. Moreover, the different databases follow the same classification standards, which leads to accuracy and higher integration between statistics. In addition, data from one database can be complemented with economic and financial indicators from other databases, which allows for a more complete picture of the whole economy. In this case, attention must be paid to the statistical function of *Banco de Portugal* as an important auxiliary to the supervision function. Furthermore, the SSIS and CCR databases allow us to cross micro-data and even to cross micro-data provided by reporting agents to different departments of the central bank in order to detect inconsistencies and enable a corrective action in time.

A valuable contribution of micro-data extracted from the SSIS and CCR databases is the possibility to construct the so-called “From-whom-to-whom tables”. These are double-entry tables that allow for evaluation of which institutional sectors are financing the economy, in terms of securities and credit. These tables show the holdings of various financial instruments by the different institutional sectors, on both the asset and the liability side. Their major contribution is related to the ability to simulate propagation of local shocks in the system.

Furthermore, an important point not directly related to the essence of the data but, instead, to the reporting institution is the data reported quality index. From a practical point of view, the custodians that reveal constant inconsistencies in the reported data demonstrate fragility not only in data quality but also inside the bank structure. This situation is a signal that the merging of accounts into one singular database and the transmission of data within the functional structure are not working efficiently and can lead to default and missing information from the reporting agent. When this situation occurs the technical team reviews the data sent in more detail. Several contacts are made with the institution to pose questions in order to have the best approximation to the reality and to not affect the global data.

At a global level micro-databases have been enabling the harmonisation of methodologies to compile high-frequency statistics, which is a main goal to facilitate comparison and aggregation of data across countries. In a crisis context this allows us to compile at a very detailed level the euro area statistics with a high degree of confidence. This initiative is paving the way to a global European exchange of data on loans and securities with significant value-added to the statistical function, at a more global level.

4. Empirical evidence derived from micro-databases

In this section I will provide some insight on the empirical results that can be obtained from the combination of the different databases available in the Statistics Department of *Banco de Portugal*.

4.1 Detailed analysis on a company-by-company basis

I start by an illustration at the most granular level. Contrarily to a system that stores aggregated data, micro-databases allow the construction of detailed analysis by each individual company. This analysis may consider, namely: structure of assets and liabilities (in terms of deposits, loans, securities and credit); the interlinks between domestic companies and/or with others domiciled abroad; the diversification/risk exposure of portfolio investments in different companies and countries; and the concentration in terms of sources of funding. Furthermore, it is possible to evaluate the evolution of these items over time.

As such, in addition to the aggregate values of total debt, debt-to-equity ratios and portfolio investments, which can be obtained from the macro-data, the value added from crossing

multiple micro-databases is illustrated in Figure 1, where one can see the layout of a detailed analysis that can be built on a single company basis.

Figure 1

Disaggregated information on financial assets and liabilities, by company

Information on financial assets and liabilities of Company XXX				
	Year N-1, month t-1	Year N-1, month t	Year N, month t-1	Year N, month t
Assets				
Deposits				
Resident				
Non-resident				
Debt securities				
Resident				
Company A				
Company B				
Non-resident				
Company XA				
Company XB				
Shares and other equity				
Resident				
Company C				
Company D				
Non-resident				
Company XC				
Company XD				
Trade credits				
Resident				
Non-resident				
Liabilities				
Loans				
Resident				
Bank A				
Bank B				
Non-resident				
Debt securities				
Resident				
*Company A**				
*Company B**				
Non-resident				
*Company XA**				
*Company XB**				
Shares and other equity				
Resident				
*Company C**				
*Company D**				
Non-resident				
*Company XC**				
*Company XD**				
Trade credits				
Resident				
Non-resident				

On the assets side, one can see not only the portfolio investment strategy the company is following over time but also, and most importantly, in which companies/sectors it is (dis)investing. Foreign direct investment operations can also be clearly identified. Similarly, on the liabilities side, in addition to the financing strategy the companies may have adopted (bank loans, debt or capital) it is possible to identify which entities are indeed financing the Portuguese corporations. For bank loans, we can assess the level of relationship banking established for a given company, in terms of, for example, number of creditors, concentration of banking loans, main creditor. For debt and capital issues, although to a more limited extent, it is also possible to ascertain the identity of the stakeholders for the most relevant operations, who has been (dis)investing in the Portuguese economy through the

non-financial corporations and how the domestic companies relate to each other. Interestingly, the economic relationships between different types of lenders can also be inferred, i.e., whether the main lending bank may hold other relevant positions in debt or capital issued by the company.

This type of table has been very recently developed in response to the growing data requests from the decision makers.

4.2 Understanding the interlinks within an economy

The combination of the different databases available in the Statistics Department of *Banco de Portugal* culminates in the compilation of the financial accounts for the economy as a whole including the different sectors and their interlinks.

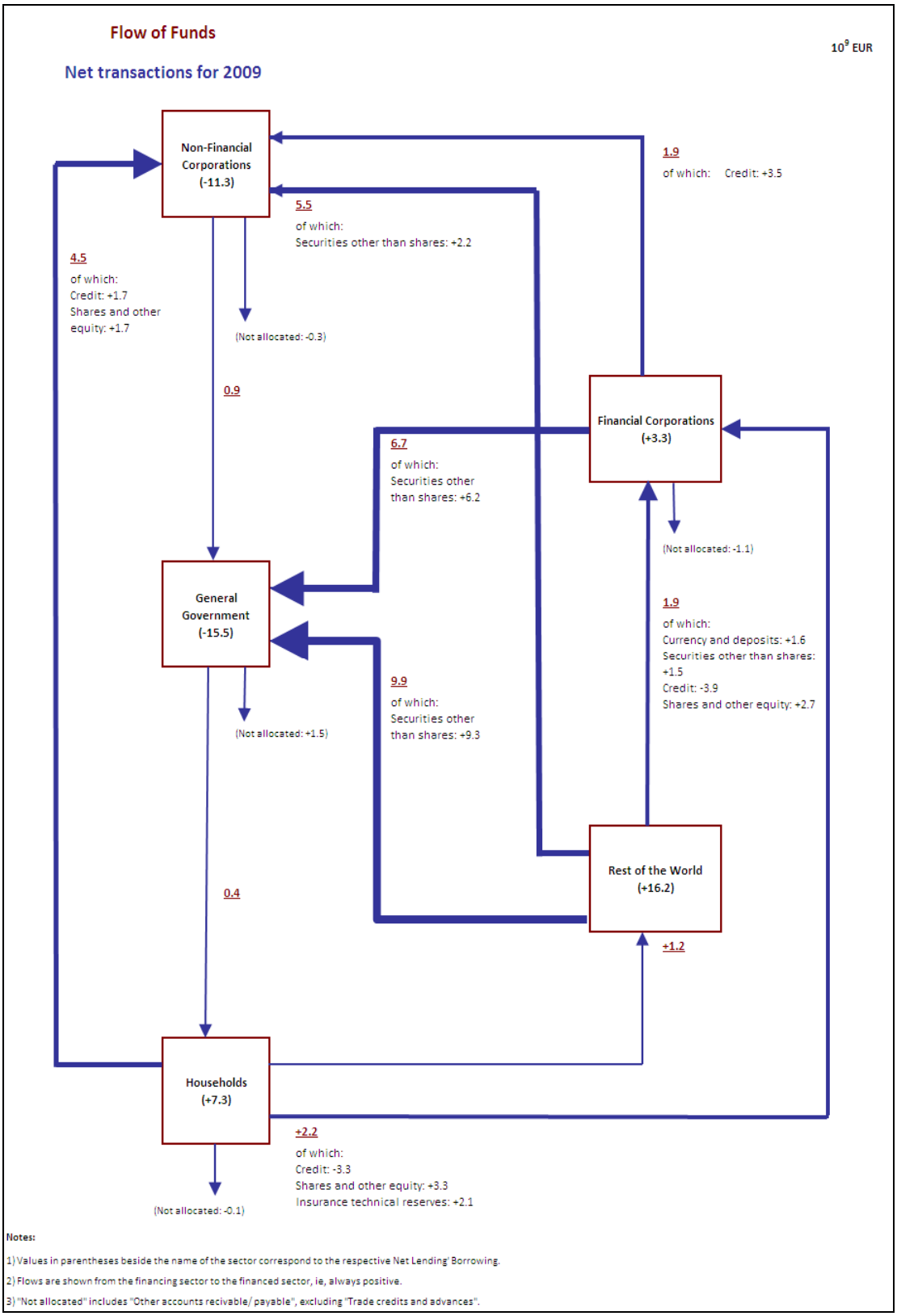
Figure 2 shows the flow of funds for the Portuguese economy, which reveals the net lending/borrowing of each sector vis-à-vis the remaining ones, including the Rest of the World (RoW). The availability of counterpart information at micro level for loans, debt securities and shares and other equity is crucial for the compilation of this exercise.

In 2009, the financing needs of the Portuguese economy amounted to 16.2 billion Euros. The main flows of capital were generated between the RoW and the General Government (GG), Financial Corporations (FC) and GG, and the RoW and NFC. The GG and the NFC were the institutional sectors with more financing needs.

In line with most European countries which had to adopt exceptional measures for the support of the real economy and the financial sector in 2009, the net borrowing of the GG increased dramatically compared to previous years, amounting to 15.5 billion Euros in 2009 (4.9 in 2008). The funds provided to the GG were mainly through the acquisition of securities other than shares by the RoW and the FC, with a total amount of 16.6 billion Euros.

Figure 2

Flow of funds for the Portuguese economy, 2009



The NFC exhibited less financing needs compared to previous years mainly due to a decrease in investment in line with the negative growth of the economy. They were mainly financed by the RoW (5.5 billion Euros) and households (4.5 billion Euros).

In turn, households increased their net lending ability from 3.2 billion Euros in 2008 to 7.3 billion Euros in 2009, as a result of a fall in final consumption and investment and an increase in the savings rate. Households applied their savings in the funding of NFC and FC (mainly), through the acquisition of shares and other equity and insurance technical reserves, partially outweighed by the credit received from the FC to finance part of their expenses.

This type of flow of funds analysis can also be performed at a more detailed level, namely for individual financial instruments such as debt securities and shares and other equity. Making use of counterpart information available from the SSIS one can thus obtain "From-whom-to-whom" tables for these instruments.

In the "From-whom-to-whom" table for securities other than shares (Figure 3), one can observe some evolution in the financing structure of sectors considering the comparison between the first quarter of 2007 and the fourth quarter of 2009. First of all, the outstanding amount of securities other than shares issued by resident sectors reached the highest amount ever, with a growth rate of 76% between the two quarters.

Analysing in more detail the exhibited tables, it is worth emphasising the growth of securities other than shares issued by the MFI. The outstanding amount rocketed after the outbreak of the financial turmoil and an increase of 253% in the amount outstanding of securities other than shares was verified in the last quarter of 2009, comparing with the first quarter of 2007. This increase was accompanied by a change in the funding structure of this sector which was related to head offices resident in Portugal issuing directly rather than through their affiliates abroad. At the end of 2009 the RoW held 57% of this amount compared to 31% in the first quarter of 2007. This increase was compensated by a decrease in the relative weight of debt securities held by households, in part explained by an increase in their risk aversion and preference for more traditional investments like deposits.

Analysing the issues from Other Financial Intermediaries and Financial Auxiliaries (OFIFA), it is worth noting the holdings by MFI. This is mainly related to the acquisition of securitised bonds linked to securitisation operations involving Portuguese banks as a means to have more assets eligible for collateral in the ESCB monetary policy operations.[4]

The GG has also issued a large amount of debt securities, with a growth rate of 33% in the two considered periods, which was mainly acquired by non-residents.

[4] Securitisation operations by Portuguese banks typically involve a financial vehicle that buys the loans through the issuance of securitised bonds (if the vehicle takes the form of a securitisation firm) or securitisation units (if the vehicle takes the form of a securitisation fund). These bonds or units may be directly bought back by the originator or by a third non-resident entity which will eventually be held also by the originator.

Figure 3

"From-whom-to-whom" tables for securities other than shares

Securities other than shares - Stocks in 2007 Q1

10^6 Eur

Holding Sector \ Issuing Sector	NFC		MFI		OFIFA		ICPF		GG		RoW	
NFC	147	0.5%	110	0.5%	119	1.1%	0	0.4%	15	0.0%	1,522	1.6%
MFI	10,046	37.3%	3,044	13.3%	1,126	10.6%	0	0.0%	5,012	5.7%	26,776	28.4%
OFIFA	1,534	5.7%	1,220	5.3%	4	0.0%	0	0.1%	57	0.1%	19,514	20.7%
ICPF	2,909	10.8%	2,705	11.9%	649	6.1%	19	20.2%	3,437	3.9%	36,162	38.3%
GG	51	0.2%	34	0.1%	0	0.0%	0	0.0%	7,253	8.3%	1,872	2.0%
Households	281	1.0%	8,625	37.8%	878	8.2%	66	71.2%	34	0.0%	8,582	9.1%
RoW	11,938	44.4%	7,078	31.0%	7,871	73.9%	7	8.0%	71,854	82.0%	-	-
Total	26,905	100.0%	22,816	100.0%	10,648	100.0%	93	100.0%	87,662	100.0%	94,428	100.0%

Securities other than shares - Stocks in 2009 Q4

10^6 Eur

Holding Sector \ Issuing Sector	NFC		MFI		OFIFA		ICPF		GG		RoW	
NFC	221	0.5%	472	0.6%	280	1.4%	3	1.7%	61	0.1%	1,491	1.2%
MFI	19,317	46.5%	12,392	15.4%	11,033	55.4%	0	0.0%	10,351	8.8%	55,859	46.4%
OFIFA	966	2.3%	2,688	3.3%	178	0.9%	0	0.1%	362	0.3%	10,850	9.0%
ICPF	3,084	7.4%	7,502	9.3%	394	2.0%	112	59.2%	2,988	2.5%	43,395	36.0%
GG	58	0.1%	43	0.1%	0	0.0%	0	0.0%	7,726	6.6%	1,711	1.4%
Households	1,044	2.5%	11,486	14.2%	806	4.0%	73	38.3%	110	0.1%	7,155	5.9%
RoW	16,838	40.5%	46,049	57.1%	7,232	36.3%	1	0.6%	96,239	81.7%	-	-
Total	41,528	100.0%	80,632	100.0%	19,923	100.0%	189	100.0%	117,838	100.0%	120,462	100.0%

In terms of shares and other equity, one can observe a slight increase in some sectors (such as NFC and OFIFA) and a reduction in other sectors, as a result of two different driving forces: the issuance of equity and, at the same time, a decline in equity's prices over this period. This data is summarised in Figure 4.

Figure 4

"From-whom-to-whom" tables for shares and other equity

Shares and other equity - Stocks in 2007 Q1

10^6 Eur

Holding Sector \ Issuing Sector	NFC		MFI		OFIFA		ICPF		RoW	
NFC	133,210	42.3%	6,222	12.7%	6,702	7.4%	490	11.4%	33,428	46.4%
MFI	9,603	3.1%	1,314	2.7%	9,166	10.1%	968	22.5%	9,459	13.1%
OFIFA	13,108	4.2%	8,188	16.7%	5,047	5.5%	1,181	27.4%	9,725	13.5%
ICPF	3,822	1.2%	1,874	3.8%	2,367	2.6%	11	0.3%	9,832	13.7%
GG	5,171	1.6%	13,486	27.5%	3,663	4.0%	0	0.0%	2,865	4.0%
Households	82,285	26.1%	7,478	15.2%	30,316	33.3%	641	14.9%	6,701	9.3%
RoW	67,580	21.5%	10,474	21.4%	33,683	37.0%	1,015	23.6%	-	-
Total	314,779	100.0%	49,036	100.0%	90,944	100.0%	4,305	100.0%	72,011	100.0%

Shares and other equity - Stocks in 2009 Q4

10^6 Eur

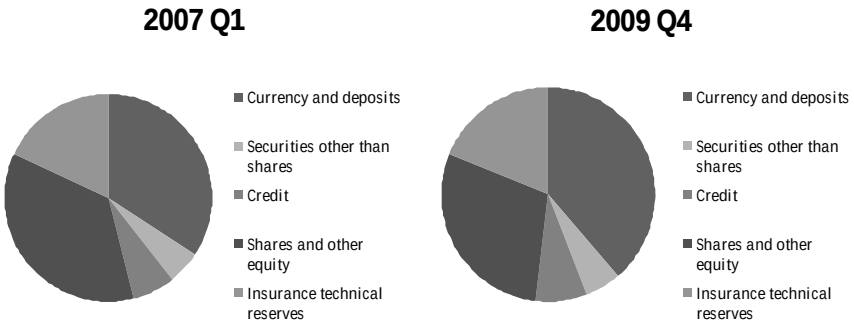
Holding Sector \ Issuing Sector	NFC		MFI		OFIFA		ICPF		RoW	
NFC	149,223	45.1%	5,674	12.5%	7,652	8.3%	261	7.3%	35,896	52.5%
MFI	14,405	4.4%	729	1.6%	8,498	9.2%	944	26.4%	13,331	19.5%
OFIFA	13,752	4.2%	6,795	15.0%	4,303	4.7%	1,087	30.5%	3,897	5.7%
ICPF	2,715	0.8%	537	1.2%	4,752	5.2%	13	0.4%	6,543	9.6%
GG	3,598	1.1%	18,849	41.5%	4,049	4.4%	0	0.0%	3,898	5.7%
Households	81,110	24.5%	6,597	14.5%	17,623	19.1%	217	6.1%	4,829	7.1%
RoW	65,826	19.9%	6,264	13.8%	45,338	49.2%	1,047	29.3%	-	-
Total	330,629	100.0%	45,446	100.0%	92,216	100.0%	3,569	100.0%	68,394	100.0%

Regarding the issues from OFIFA, again one can note the impact of securitisation operations, evidenced in the acquisition of securitisation units by non-residents.

Furthermore, there was a sharp reduction in households' holdings of investment funds shares. The value at end-2009 results from the combination of the households' disinvestment in riskier assets with the decline in the value of these assets in the event of the financial crisis. In fact, analysing in more detail the households' portfolio (Graph 1), it is possible to observe that, while in the beginning of 2007 shares and other equity were households' main asset (36%), at end-2009 the pole position was held by currency and deposits with 39%, 5 p.p. more than in early 2007.

Graph 1

Structure of households' portfolio



5. Final remarks

The experience of *Banco de Portugal* concerning the use of micro-data has revealed many advantages for the production of statistics and assessment of developments in the financing structure of the Portuguese economy. The advantages of this approach exceed largely the burden of managing so much data, considering the benefits from a refined quality control that allows for more reliable statistics and transparent data, higher compilation flexibility, and an enhanced responsiveness to *ad hoc* information requests from the users.

The analyses that can be built up with data extracted from micro-databases, including the "From-whom-to-whom" tables and the flow of funds, make valuable contributions to explorations of how the risk exposures and dependencies across sectors are influenced by developments in assets and liabilities of other sectors. These analyses have revealed that micro-databases can be a future improvement to deal with data gaps, at both national and international level, namely concerning counterpart information. In particular, I consider that the coverage of these databases in terms of the different financial instruments with the various levels of detailed information, namely by individual investor, by country, by the main financers, and by main counterparties, allow for the compilation of valuable statistical outputs which are of key importance for the policy makers. First and foremost, micro-databases allow for the understanding of the different relations established across the different economic agents. Extended to a global scale, with the sharing of similar data across national data producers, the benefits could be spread out worldwide.

References

Aguiar, M., 2008. "*Integrated statistical systems: evolution or revolution?*", Irving Fisher Committee, IFC Bulletin No 28: The IFC's contribution to the 56th ISI Session, Lisbon, August 2007. Available at: http://www.bis.org/ifc/publ/ifcb28zo.pdf

Aguiar, M., Casimiro, P. and Matos, J., 2009. "*The use of security-by-security databases for portfolio investment statistics*", Irving Fisher Committee, IFC Bulletin No 29: Proceedings of the IFC Workshop on "Challenges to improve global comparison of securities statistics", Washington DC, March 2008. Available at: http://www.bis.org/ifc/publ/ifcb29u.pdf.

Banco de Portugal Booklet No 5: *"Central Credit Register*".

Banco de Portugal Supplements to the Statistical Bulletin: 2/2008 *"Securities Statistics – Integrated System Features and Main Results"*; 1/2008 *"Simplified reporting – Inclusion of the Simplified Corporate Information in the Statistics on Non-Financial Corporations from the Central Balance-Sheet Database"*.

Calderwood, L. and Lessof, C., 2006. *"Enhancing longitudinal surveys by linking to administrative data"*, in: Lynn, P. (Ed.), Methodology of Longitudinal Surveys, University of Essex, United Kingdom, pp 55–72. Available at: http://www.iser.essex.ac.uk/ulsc/mols2006/programme/data/papers/Calderwood.pdf

D'Aguiar, L. and Lima, F., 2009. *"Credit risk transfer – dealing with the information gap"*, International Statistical Institute, Special Topics Contributed Paper Meeting No 62: Data Issues Related to the Financial Crisis, Durban, August 2009. Available at: http://www.statssa.gov.za/isi2009/ScientificProgramme/IPMS/1208.pdf.

Lane, J., 2007. *"Optimizing the Use of Micro-data: an Overview of the Issues"*, Journal of Official Statistics Vol 23, No 3, pp 299–317.

Lane, J., 2003. *"The Uses of Micro-data. Keynote speech to Conference of European Statisticians"*, Geneva, June 2003. Available at: http://www.unece.org/stats/documents/ces/2003/crp.2.e.pdf.

Session 3 C

Marrying analytical methods and frameworks with data sources

Chair: Charles Thomas, Board of Governors of the Federal Reserve System

Papers: An ordered probit model of an early warning system for predicting financial crisis in India
Thangjam Rajeshwar Singh, Reserve Bank of India

Price discovery on traded inflation expectations: does the financial crisis matter?
Alexander Schulz and Jelena Stapf, Deutsche Bundesbank

An ordered probit model of an early warning system for predicting financial crisis in India

Thangjam Rajeshwar Singh[1]

1. Introduction

During the last two decades, the world has seen a large number of financial crises in the emerging market economies of Latin America and Asia, with consequences of large costs for both the national and the international financial system. However, the recent financial tsunami that started in the US during August 2007 was triggered by a liquidity shortfall in the overseas banking system, and it affected directly or indirectly almost all the countries of the world after the collapse of Lehman Brothers in September 2008. The consequence cost of this tsunami, according to the International Monetary Fund (IMF) in March 2009, was that world growth would shrink by 0.5 to 1.0 per cent in 2009 in contrast to an expansion of 3.2 per cent in 2008, while the World Bank estimated that global GDP would contract by 1.7 per cent. The IMF also projects that the GDP growth of emerging market economies (EMEs) will decelerate to a range of 1.5 to 2.5 per cent in 2009, down from 6.1 per cent in 2008. Economic activity in India also slowed down during the period owing to the spillover effects of the global crisis. Growth decelerated sharply during the quarter October-December 2008 following the failure of Lehman Brothers in mid-September 2008. The growth rate during the first three quarters (April-December) of 2008-09 slowed down significantly, to 6.9 per cent, from 9.0 per cent in the corresponding period of the previous year (RBI, 2009a). Even though both the public sector and the private sector of Indian banks were financially sound and were not directly exposed to subprime mortgage assets, India experienced the knock-on effects of the global crisis through monetary, financial and real channels. The financial markets, viz, equity markets, money markets, forex markets and credit markets, have all come under pressure mainly because of the so-called ”substitution effect”. As credit lines and credit channels overseas went dry, some of the credit demand earlier met by overseas financing shifted to the domestic credit sector, putting pressure on domestic resources. The reversal of capital flows, which took place as a part of the global deleveraging process, has put pressure on the forex markets. Together, the global credit crunch and deleveraging were reflected at the domestic level in the sharp fluctuation of overnight money market rates in October 2008 and the depreciation of the rupee (Subbarao, 2009a). To avert and reduce such costs and effects of crisis, the prediction of distress/crisis situations has come to the fore for maintaining financial stability in a country as well as in the international financial system.

There are theoretical models of financial crises (currency or banking crises) to examine crisis and bank failure. The macro origin of the financial crisis model mainly relies on three-generation models, viz, first-generation, second-generation, and third-generation models. According to the first-generation models, weak economic fundamentals are more vulnerable to speculative attacks, while the second-generation model does not reject the role of weak fundamentals, but suggests that self-fulfilling expectations appear to be the main cause of crises. These two-generation models are commonly known as currency crisis models. On the

[1] The author is a Research Officer in the Department of Statistics and Information Management (DSIM), Reserve Bank of India. The views expressed in this paper are those of the author and not of the institution to which he belongs.

other hand, the third-generation models combine weaknesses in the economic fundamentals of early-generation models with weaknesses in the banking sectors in the analysis of financial crises. For this reason, the third-generation models are also known as twin crisis, i.e., banking and currency crisis, models, while according to the micro origin, financial crisis may be categorized by different groups of bank failure models, such as random withdrawal models, asymmetric information models, adverse shock/credit channel models and moral hazard models.

As an aftermath of the East Asian crisis in the 1990s, central banks across the globe pursue financial stability as one of their goals. India too pursues it as one of its monetary policy objectives. In India, the financial system is dominated by the banking sector, and commercial banks of the Indian banking system account for more than 90 per cent of the banking system's assets (RBI, 2007). A significant aspect of the banking trend in India is that so far it has never witnessed a banking crisis. However, the continuous liberalization and its greater integration with the global economy have opened up fresh challenges for the Indian banking sector. According to Arestis and Glickman (2002), the primary impact of openness in an emerging economy is to import the drive towards financial innovation, as foreign investors seek out investment opportunities and local households, firms and banks begin to look abroad for finance. Sooner or later, the economy falls into a state of international financial fragility. It then becomes prone to crisis that is domestic in origin, but that has an impact on its external situation, or to crisis that is external in origin, but that has an impact on the domestic situation, and combining the two identifies the crisis (Anastasia, 2007).

In recent years, India's integration with the global economy is being witnessed distinctly by the growth of its merchandise exports plus imports as a proportion of GDP, growing from 21.2 per cent in 1997-98, the year of the Asian crisis, to 34.7 per cent in 2007-08. Meanwhile, India's financial integration with the world, measured in terms of the ratio of total external transactions (gross current account flows plus gross capital flows) to GDP, has more than doubled from 46.8 per cent in 1997-98 to 117.4 per cent in 2007-08 (Subbarao, 2009b). With such a degree of gradual openness and integration, India needs to keep watch to capture the developments in international markets and apprehend the implications for the domestic economic and financial systems. In this emerging scenario of India's integration with the global economy, and in the light of the current global financial crisis, a need is being felt for developing an early warning model, incorporating global and domestic macroeconomic indicators, which may effectively signal future banking vulnerability in India and enable the authorities to take preemptive policy measures and avoid a banking disaster.

An early warning system (EWS) aims at anticipating whether and when an individual country may be affected by a financial crisis by developing a framework that allows a financial crisis to be predicted in a relatively open economy. There are basically three approaches to the development of predicting financial crisis, particularly a banking crisis, viz, the bottom-up approach, the aggregate approach and the macroeconomic approach.[2] In the bottom-up approach, the probability of insolvency is estimated for each individual bank and concern for systemic instability is warranted when the probability of insolvency becomes significant for a large proportion of the country's banking assets (i.e., for the sum of all banks in the country), while in the aggregate approach the model is applied to the aggregate bank data to determine the probability of systemic insolvency. In the third approach, instead of looking at bank balance sheet data for internal sources of unsoundness, it establishes systemic relationships between economy-wide variables and indicators of bank soundness. A number of macroeconomic variables are expected to affect the banking system or reflect its condition. With the above background, an attempt has been made in this paper to develop a

[2] See Lindgren, Garcia and Saal (1996).

model EWS based on the ordered probit approach for monitoring and predicting banking distress or crisis in India[3] using macroeconomic indicators.

The rest of the paper is organized as follows. Section 2 gives a brief description about financial crises and their associated features. Section 3 provides a review of the literature on the methodological development of the early warning system for predicting crisis. Section 4 describes the method of constructing a monthly banking sector fragility index for India. Section 5 deals with the identification of some potential macroeconomic indicators for predicting crisis. In section 6, we give a brief description of the methodology developed for predicting banking crisis in India. Section 7 describes the data and their sources used in developing the EWS model. Section 8 presents the empirical results of the model, and the paper concludes with a summary of observations in section 9.

2. Definition and Features of Financial Crisis

The term financial crisis is applied broadly to a variety of situations in which some financial institutions or assets suddenly lose a large part of their value. In the 19th and early 20th centuries, many financial crises were associated with banking panics, and many recessions coincided with these panics. Other situations that are often called financial crises include stock market crashes and the bursting of financial bubbles, currency crises, and sovereign defaults.[4] Financial crises directly result in a loss of paper wealth;[5] they do not directly result in changes in the real economy. However, they may indirectly do so, notably if a recession or depression follows. A financial crisis is a disturbance in financial markets that disrupts the market's capacity to allocate capital – financial intermediation and hence investments come to a halt (Richard Portes, 1998). Financial crisis may be accompanied by some of the features highlighted below:[6]

i. A demand for reserve money so intense that the demand could not be satisfied for all parties simultaneously in the short run.

ii. A liquidation of credit that has been built up in a boom.

iii. A condition in which borrowers who in other situations were able to borrow without difficulty become unable to borrow on any terms – a credit crunch or credit market collapse.

iv. A forced sale of assets because liability structures are out of line with market-determined asset values, causing further decline in asset values – the bursting of a price "bubble".

v. A sharp reduction in the value of banks' assets, resulting in the apparent or real insolvency of many banks, accompanied by some bank collapses and possibly some runs.

---

[3] India has a well-diversified financial system which is still dominated by bank intermediation. Commercial banks together with cooperative banks account for nearly 70 per cent of the total assets of Indian financial institutions (RBI, 2009b).

[4] See Laeven, Luc and Fabian Valencia (2008).

[5] Paper wealth means wealth as measured by monetary value, as reflected in the price of assets – how much money one's assets could be sold for. Paper wealth is contrasted with real wealth, which refers to one's actual physical assets.

[6] See Sundararajan and Balino (1998).

All of the elements emphasized above could be present in a financial crisis and some may be more important than others in a given situation of crisis.

3. Literature Review on Early Warning Systems for Financial Crisis

The first method used in the development of EWS is the signal approach to predict financial crisis, in particular currency crisis; this was the effort of Kaminsky, Lizondo and Reinhart (1998), who monitored the evolution of several indicators. If any of the macrofinancial variables of a specific country tends to exceed a given threshold during the period preceding a crisis, then this is interpreted as a warning signal indicating that a currency crisis in that specific country may take place within the following months. The threshold is then adjusted to balance type I errors (the model fails to predict crises when they actually take place) and type II errors (the model predicts crises which do not occur). Kaminsky (1999) and Goldstein et al (2000) base their prediction of a crisis occurring in a specific country by monitoring the evolution not only of a single macro-indicator, but also of a composite leading indicator which aggregates different macrovariables, with weights given by the inverse of the signal-to-noise ratio.

The alternative method in the EWS literature is to use limited dependent variable regression models to estimate the probability of a currency crisis. The currency crisis indicator is modeled as a zero-one variable, as in the signal approach, and the prediction of the model is interpreted as the probability of a crisis. More specifically, in line with the probit regression analysis put forward by Frenkel and Rose (1996), Berg et al (1999) use this model specification with the explanatory variables measured in percentile terms. The study of Van Rijckeghem and Weder (2003) uses probit regression to examine the role of a common lender channel in triggering crisis events. They rely on disaggregated data on external debt produced by the Bank for International Settlements (BIS) to construct measures of competition for funds in order to explore the role played by a common lender channel.

Further, Fuertes and Kalotychou (2004) consider not only logit regression but also a nonparametric method based upon K-means clustering to predict crisis events. They find that combinations of forecasts from the different methods generally outperform both the individual and naive forecasts. The empirical analysis reveals that the best combining scheme depends on the decision-makers' preferences regarding the desired trade-off between missed defaults and false alarms.[7]

There are also some studies which have constructed composite leading indicators of currency crisis events using diffusion indices rather than the weighting scheme suggested by Kaminsky (1999) and by Goldstein et al (2000). The studies which rely upon the construction of diffusion indices using principal component analysis were fitted to a large dataset. Mody and Taylor (2003) use the Kalman filter estimation of state space models in order to extract a measure of regional vulnerability in a number of emerging market countries, and to produce in-sample prediction of the currency market turbulence. Another diffusion index is the one constructed by Chauvet and Dong (2004), who develop a factor model with Markov regime-switching dynamics in order to produce in-sample and out-of-sample prediction of nominal exchange rates in a number of East Asian countries.

[7] See also the study of Bussiere and Fratzscher (2002), on the issue of designing the features of their EWS model according to the preferences and the degree of risk aversion of policymakers.

4. Monthly Banking Sector Fragility Index for India

For predicting financial crisis, the period of the crisis needs to be identified and dated. There are two commonly used approaches for identifying the period of banking crisis, viz, the event-based method and the index method. The event-based method of crisis identification recognizes a systemic banking crisis only after the occurrence of certain events such as bank runs, closures, mergers, recapitalization and huge nonperforming assets (NPAs) (Demirguc Kunt and Detragiache, 1998; Kaminsky and Reinhart, 1999; Caprio and Klingibiel, 2003; and IMF, 1998). This method, however, has several limitations. Identification of the crisis when it has become severe enough to trigger certain events can lead to delayed recognition of a crisis (Hagen and Ho, 2003a). Moreover, there is also a certain amount of randomness inherent in the definitions. This method thus does not identify the different degrees of crisis severity. Further, the event-based method does not clearly identify the beginning and end of a crisis. Finally, an event-based study, which usually uses annual data, labels an entire year as one of crisis even though the crisis may have occurred in just a few months of that year. However, the index method used for identification of banking crises, which is built on the lines of the Exchange Market Pressure (EMP) index for dating currency crises, has several advantages over the event-based approach. The index method requires no prior knowledge of events to identify a banking crisis and there is thus a lower probability of recognizing a crisis too late. The most attractive feature of the index method is that it is based on monthly time series, which implies more specific crisis timings. Recently, some economists have developed their own index approach to date banking crises (Hawkins and Klau, 2000; Kibritciouglu, 2002; Hagen and Ho, 2003a, 2003b).

Thus, in order to identify and date the experiences of different states of distress or crisis in the Indian banking sector,[8] we adopt the index method developed in Kibritciouglu (2002). According to Kibritciouglu (2002), a bank is potentially exposed to various types of economic risks, such as liquidity risk, credit risk and exchange rate risk, due to changes in the value of its assets and/or liabilities in the financial markets. Therefore, a bank's net worth,[9] and hence a bank failure, can be associated with excessive risk-taking by the bank managers. A slightly modified version of Kibritciouglu (2002) has been considered in this study in order to recognize the dates during which the banking system in India has experienced a distress/crisis situation. The monthly banking sector fragility index of India was constructed by considering the risk-taking behaviour of commercial banks in terms of its liquidity risk, credit risk and interest rate risk.[10] The variables considered in the construction of this index are aggregate time deposits, nonfood credit, investment in other approved and non-Statutory Liquidity Ratio (non-SLR) securities, foreign currency assets and liabilities and the net reserves of commercial banks[11] in India. The banking fragility index is constructed by taking the weighted average of annual growth in real time deposits (Dep), real nonfood credits (Cred), real investments in approved and non-SLR securities (Inv), real foreign currency

---

[8] In this paper, "the banking sector" means the banking sector of a country, excluding the central bank.

[9] The difference between the assets and liabilities of a bank equal its net worth, which in fact shows the bank's remaining value or equity capital after it has met all of its liabilities. The bank's net worth includes the capital contributed by the bank's shareholders and accumulated profits from doing business as an intermediary in financial markets.

[10] Liquidity risk is the current and prospective risk to earnings or capital arising from a bank's inability to meet its obligations when they come due without incurring unacceptable losses. Credit risk is defined as the possibility of losses associated with diminution in the credit quality of borrowers or counterparties due to the inability of customers or counterparties to meet their obligations, while interest rate risk is the risk in which changes in the market interest rate might adversely affect the bank's financial condition.

[11] According to Kibritciouglu (2002), "bank failure" refers to a situation in which the excessively rising liquidity, credit, interest rate or exchange rate risk pushes the bank to suspend the internal convertibility of its liability.

assets (FCA) and liabilities (FCL) and the real net reserves (Resv) of commercial banks, and weights are the inverse of their standard deviation. The constructed BSF index for India is defined as follows:

$$BSF\text{-}1 = \left[\frac{\left(Dep_t - \mu_{Dep}\right)}{\sigma_{Dep}} + \frac{\left(Cred_t - \mu_{Cred}\right)}{\sigma_{Cred}} + \frac{\left(Inv_t - \mu_{Inv}\right)}{\sigma_{Inv}} + \frac{\left(FCA_t - \mu_{FCA}\right)}{\sigma_{FCA}} + \frac{\left(FCL_t - \mu_{FCL}\right)}{\sigma_{FCL}} + \frac{\left(\mathrm{Re}sv_t - \mu_{\mathrm{Re}sv}\right)}{\sigma_{\mathrm{Re}sv}} \right] \Big/ 6$$

$$BSF-2 = \left[\frac{\left(Cred_t - \mu_{Cred}\right)}{\sigma_{Cred}} + \frac{\left(Inv_t - \mu_{Inv}\right)}{\sigma_{Inv}} + \frac{\left(FCA_t - \mu_{FCA}\right)}{\sigma_{FCA}} + \frac{\left(FCL_t - \mu_{FCL}\right)}{\sigma_{FCL}} + \frac{\left(\mathrm{Re}sv_t - \mu_{\mathrm{Re}sv}\right)}{\sigma_{\mathrm{Re}sv}} \right] \Big/ 5$$

where Dep_t, $Cred_t$, Inv_t, FCA_t, FCL_t and $\mathrm{Re}sv_t$ are the annual growth rate of real deposits, real credit, real investment, real foreign currency assets and liabilities and real reserves of commercial banks.[12] The BSF-2 index has also been constructed to imply and conclude that if the time path of both the indices moves in a similar pattern, then the domestic bank run has not played any prominent role during the fragile period of the banking sector in India.

The dates of the crisis period are identified based on a threshold level. When the value of the BSF indices is greater than 0, it is a no-crisis zone. However, when the value is below 0, it represents a fragile situation. Based on the threshold value φ, which is taken to be the standard deviation[13] of the BSF index, medium- and high-fragility episodes are distinguished as follows:

Medium Fragility (MF): $-\varphi \leq BSF < 0$

High Fragility (HF): $BSF < -\varphi$

In this paper, continuously alternating phases of medium and high fragility before full recovery from the distress situation is considered as a systemic banking crisis. Isolated phases of MF not associated with HF do not constitute a systemic banking crisis. A banking system is considered to have fully recovered from crisis when the value of the BSF index is equal to zero.

The constructed BSF indices for India are presented in Figure 1 with identified dates of high fragility shown by the shaded region. From the figure, it is observed that the movement patterns of both the indices (BSF-1 and BSF-2) are similar. Hence, we may say that the bank run does not contribute much to the experience of distress conditions in the banking sector of India. This might have been due to coverage of deposit insurance.[14] The threshold values considered for the BSF-1 and BSF-2 indices in identifying the dates of distress/crisis in India are 0.43 and 0.39, respectively.

---

[12] The real time series of deposits, credit, investment, foreign currency assets and liabilities and reserves are obtained by deflating the corresponding time series with the wholesale price index (base: 1993-94). The annual growth rate (same month-month a year ago) has been taken to remove any seasonality variation and also to indicate that the difficulties in the banking sector are signaled by longer-term variations in the indicators and not by short-term fluctuations.

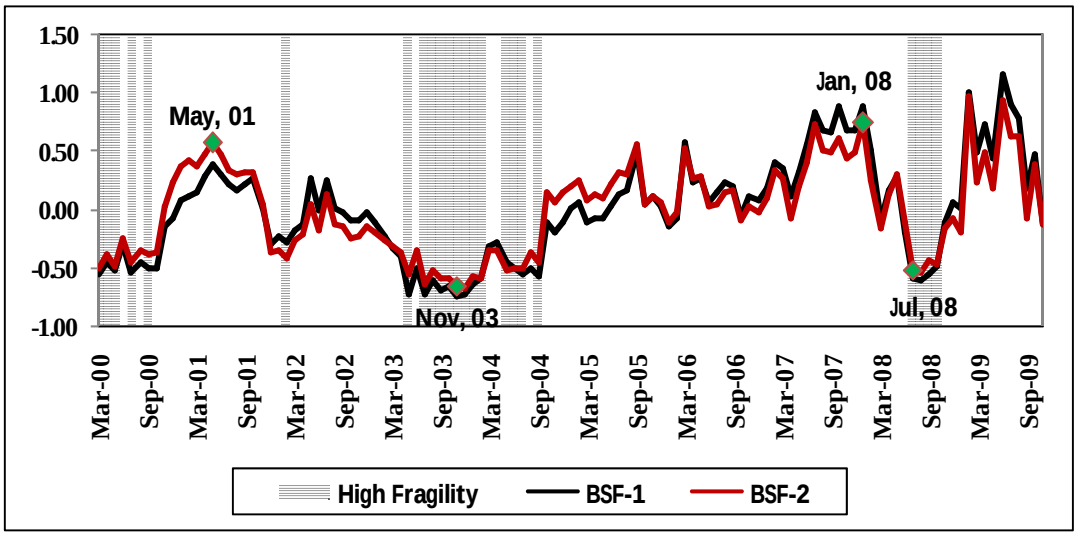
[13] In Kibritciouglu (2002), the threshold value is taken to be 0.5 for classifying medium- and high-fragility periods.

[14] The deposit insurance provided by the Deposit Insurance and Credit Guarantee Corporation (DICGC) provides a safety net for the depositors. Deposit insurance in India is mandatory for all banks (commercial/cooperative/RRBs/LABs) and covers all deposits (up to a limit of rupees one lakh), except those of foreign governments, central/state governments, interbank deposits, deposits received abroad and those specifically exempted by DICGC with the prior approval of the Reserve Bank (RBI, 2010).

Figure 1

Banking Sector Fragility (BSF) Index for India (Mar-00 to Nov-09)

(The high-fragility period is indicated by the shaded region.)



Source: Author's computation.

Table 1: Medium- and High-Fragility Periods in the Indian Banking Sector

BSF-1		BSF-2	
Medium	**High**	**Medium**	**High**
-------	Mar 00 - Oct 00	-------	Mar 00 - Jul 00
		Aug 00	Sep 00
		Oct 00	-------
Dec 01 - Apr 02	-------	Dec 01 - Jan 02	Feb 02
		Mar 02 - Apr 02	-------
Jun 02	-------	Jun 02	-------
Sep 02 - Apr 03	May 03 - Feb 04	Aug 02 - Apr 03	May 03
		Jun 03	Jul 03 - Feb 04
Mar 04 - Apr 04	May 04 - Sep 04	Mar 04 - Apr 04	May 04 - Jul 04
Oct 04 - Dec 04	-------	Aug 04	Sep 04
Mar 05 - May 05	-------	-------	-------
Jan 06 - Feb 06	-------	Jan 06 - Feb 06	-------
Oct 06	-------	Oct 06	-------
-------	-------	Dec 06	-------
-------	-------	Apr 07	-------
Mar 08	-------	Mar 08	-------
Jun 08	July 08 - Oct 08	Jun 08	Jul 08 - Oct 08
Nov 08	-------	Nov 08	-------
-------	-------	Jan 09	-------
-------	-------	Sep 09	-------
Nov 09	-------	Nov 09	-------

Source: Author's computation.

The constructed BSF index reveals that the banking sector in India experienced 19 phases of medium fragility and 8 phases of high fragility (including the recent global crisis period) during the study period. The dates of medium- and high-fragility situations experienced by the banking sector of India are presented in Table 1. Based on the dates of the fragile period, we may classify the periods March-October 2000, December 2001-June 2002, August 2002-September 2004 and June-November 2008 as systemic banking crises.

5. Some Potential Macroeconomic Indicators for Predicting Banking Crisis in India

In the early 1990s, the banking system in India was saddled with huge NPAs, largely due to the socially directed credit programs pursued by the government. Several measures were initiated and asset qualities were largely improved in due course. Based on the available literature and empirical evidence on the financial crisis, some of the potential indicators for predicting financial crisis are described as follows.

Based on the EWS framework of Kaminsky (1999), the first procedure for selecting useful indicators applied in the EWS is to identify economic symptoms which usually come to the surface prior to financial crises. Past experiences in some of the crisis-hit economies show that both banking and currency crises are linked to overborrowing cycles. In some cases, the substantial credit growth could be fueled by financial liberalization and elimination of capital and financial account restrictions, which, however, are not quantifiable. The mirroring indicators include the M3 multiplier.

Banking and currency crises can be preceded by bank runs. As depositors massively withdraw their deposits, the likelihood of bank default increases. The phenomenon has a destabilizing effect, and the mirroring indicator is bank deposits, which correspondingly exhibit dramatic negative movements during a bank panic. But as indicated earlier, bank runs do not contribute much to the banking distress/crisis in India.

Current account problems are considered as one of the symptoms of financial crisis. Those problems could be reflected in the performances of external trade, the terms of trade and the real exchange rate. Real exchange rate overvaluation and a weak external sector are potential factors for currency crisis. A loss of competitiveness and weak external markets could lead to recession, business failure, and deterioration in loan quality.

Capital account problems become more severe in the context of enlarging foreign debt and increasing capital flight, which raise concern about debt unsustainability. The vulnerability of a country to external shocks is more likely to increase if foreign debt is predominantly concentrated in short maturities. The selected indicators in this area include foreign exchange reserves and the ratio of M3 to foreign exchange reserves.

Reflecting the external positions of the banking sector, the ratio of foreign currency assets to foreign currency liabilities could be applied in an EWS to highlight the risk of currency mismatch in view of international exposure.

While considering the liquidity position of the banking sector, we may also consider the ratio of bank credit to the commercial sector to aggregate deposits of residents, as it would depict the growth prospects of the corporate sector in the economy.

A severe slowdown in economic growth or recession, as well as the bursting of asset price bubbles, could precede financial crises. Kaminsky (1999) argues that high real interest rates could be a sign of a liquidity crunch, which leads to an economic slowdown and banking fragility. The mirroring indicators include output, real domestic interest rates, and stock prices.

Banking crises may be preceded by a wide range of economic problems. To design an effective EWS and identify future banking crises, a broad variety of macroeconomic indicators representing different sectors of the economy may be chosen.

6. Description of Methodology

Based on the proxy series for crisis (BSF index), which identifies different phases of banking sector distress in India, we use an ordered probit model, which is a limited dependent variable model, to predict these different phases of banking distress. In limited dependent variable models, the dependent variable is categorized as 0, 1 and 2, corresponding to banking distress/crisis situations of no distress, medium fragility and high fragility, respectively, in the Indian banking sector. The explanatory variables are not transformed into dummy variables but are included in a linear fashion. The probability that crisis will occur is assumed to be a function of the vector of explanatory variables. The model is based on the latent regression utility function $y^* = x'\beta + \varepsilon$, where ε follows a normal distribution and utility function y^* is unobserved, but what is observed is their classified category y. The observed y is determined by using y^*, which is provided as follows:

$$y = \begin{cases} 0, & if \ \ y^* \le \gamma_1 \\ 1, & if \ \ \gamma_1 < y^* \le \gamma_2 \\ 2, & if \ \ y^* > \gamma_2 \end{cases}$$

where γ_1 and γ_2 are the classifying threshold values.

The ordered probit equation takes the form $y = x'\beta + \varepsilon$, with probabilities of classifying different categories given as

$$\Pr(y = 0 \mid x, \beta) = F((\gamma_1 - x'\beta))$$
$$\Pr(y = 1 \mid x, \beta) = F((\gamma_2 - x'\beta)) - F(\gamma_1 - x'\beta)$$
$$\Pr(y = 2 \mid x, \beta) = 1 - F(\gamma_2 - x'\beta)$$

where y is the crisis dummy series, x is a set of explanatory variables, $\beta_.$ is a vector of free parameters to be estimated and F is the normal cumulative distribution function which ensures that the predicted outcome of the model always lies between 0 and 1. The z-statistics reveal the significance of the estimated individual coefficients in the model by testing the null hypothesis $H_0 : \beta_i = 0$, that is, β_i, the estimated coefficient of the ith variable, is zero. If H_0 is rejected as a result of the z-statistic, we conclude that the variable affects the crisis dummy significantly.

The direction of the effect of a change in x_j depends on the sign of the β_j coefficient. The coefficients estimated by these models cannot be interpreted as the marginal effect of the independent variable on the dependent variable, as β_j is weighted by the factor f, i.e., the normal density function, which depends on all the regressors. However, a fair amount of interpretation can be readily provided to assess the effect of explanatory variables on the probability of getting the specified state of crisis by considering the marginal effect, which is defined as

$$\partial \Pr(y=0/x'\beta)/\partial x = -\beta f(\gamma_1 - x'\beta)$$
$$\partial \Pr(y=1/x'\beta)/\partial x = -\beta\left[f(\gamma_2 - x'\beta) - f(\gamma_1 - x'\beta)\right]$$
$$\partial \Pr(y=2/x'\beta)/\partial x = \beta f(\gamma_2 - x'\beta)$$

Thus, the sign of β_j shows the direction of change in the probability of falling in the lowest endpoint ranking, i.e., $\Pr(y=0)$, when x_j changes. $\Pr(y=0)$ changes in the opposite direction of the sign of β_j, while $\Pr(y=2)$ changes in the same direction as the sign of β_j. Hence, a positive coefficient in the model may be interpreted as meaning that the corresponding variable has the potential to raise the predictive probability of high fragility, i.e., $\Pr(y=2)$.

There are several diagnostic tests for ordered probit models; one of the measures of goodness of fit for nonlinear estimators is the pseudo-R^2 statistic, which is defined as

$$\text{pseudo-}R^2 = 1 - \frac{\log L}{\log L_0}$$

where $\log L$ is the average of the log-likelihood (LL) function without any restriction and $\log L_0$ represents the maximized value of the LL function under the restricted case that all the slope coefficients except the intercept are restricted to 0. The value of pseudo-R^2 always lies between 0 and 1.

The likelihood ratio (LR) statistic is used to test the joint null hypothesis that all the coefficients except the intercept are 0, i.e., $H_0 : \beta_1 = \beta_2 = \cdots = \beta_i = 0$

$$LR = -2(\log L_0 - \log L)$$

This statistic used is to test the overall significance of the model. Under the null hypothesis, the LR statistic is asymptotically distributed as a χ^2 variable with a degree of freedom equal to the number of restrictions under test.

7. Description of Data and Sources

Since the Indian financial system is dominated by the banking sector and commercial banks account for more than 90 per cent of the banking system's assets, we have constructed the BSF index to date the experience of distress/crisis in the banking sector using the monthly data related to commercial banks in India. The variables considered for constructing the BSF index are time deposits of residents, nonfood credit, investments of banks in approved and non-SLR securities, foreign currency assets and liabilities (which include nonresident foreign currency repatriable fixed deposits and overseas foreign currency borrowings), and net bank reserves (which include balances with the RBI, cash in hand, and loans and advances from the bank) of commercial banks. These variables are deflated by the WPI index (base year 1993-94). The indicators used for predicting the banking sector distress/crisis in India covered the real sector, the financial and banking sector, and the external sector of India. The variables considered are the yield on 91-day treasury bills, the weighted average call money rate, the stock price index, aggregate deposits of residents, bank credit to the commercial sector, the M3 money supply, reserve money, foreign exchange reserves, exports, imports, the real effective exchange rate, inflation and output (measured by the Index of Industrial Production, base year 1993-94). The indicators used in this study were based on the availability of their data during the period from March 1999 to November 2009

at a monthly frequency. All these data are taken from the ”Handbook of Statistics on the Indian Economy” and various issues of Reserve Bank of India, Monthly Bulletin (i.e., the September 2009, October 2009, November 2009, December 2009, January 2010 and February 2010 issues).

8. Empirical Results

The indicators are transformed so that they are stationary and free from seasonal effects. Except for interest rates and the deviation of the real effective exchange rate (REER) from the trend,[15] all other variables in a given month were defined as the percentage change in the level of the variable with respect to its value a year earlier. The probabilities estimated by the ordered probit model can give a fair idea about the possible onset of different phases of a distress situation (including the phases of both high- and medium-fragility conditions) in the banking system. An increasing trend in the estimated probabilities of each category/state of the distress condition signals the possibility of distress/crisis in the banking sector.

The time horizon within which the indicator is expected to give a signal anticipating a banking sector distress or crisis situation is called the ”signaling horizon” and is taken a priori as 6 months in this study, considering the policy prospect of the 6 months ahead forecast.

Based on the available data at a monthly frequency, an ordered probit model is being developed to predict the different phases of banking sector distress/crisis in India within a time horizon of 6 months. The optimum model is obtained after an exploration through the model goodness-of-fit criteria, viz, the Akaike information Criterion (AIC)[16] and the pseudo-R^2 statistic, where the optimum model is chosen with the minimum AIC and maximum pseudo-R^2 statistic. The optimum model with significant coefficients at a 5 per cent level of significance is obtained at AIC and pseudo-R^2 values of 0.64 and 0.87, respectively. The estimated ordered probit model of the leading indicators with their lags is presented in Table 2. All the indicators except the REER deviation are found to be significant at a 5 per cent level of significance. From the model, it is seen that an increase in the ratio of foreign currency assets to foreign currency liabilities (FCA-FCL ratio), imports, the M3 multiplier, the call money rate, the real interest rate (91-day treasury bills), the stock price index and inflation increase the probability of high fragility in the banking sector, while a decrease in the ratio of the money supply (M3) to forex reserves, output, exports, forex and the ratio between credit to the commercial sector and domestic deposits also increase the probability of high fragility in the banking sector.

It is observed that the model predicted about 104 data points of different categories of banking crisis out of the total 111 data point series. The model could correctly predict about 97 per cent of no-distress situations, 90 per cent of medium-fragility situations, and about 89 per cent of the high-fragility conditions of the Indian banking sector. The overall predictive power of the model in classifying the different states of the crisis, viz, no distress, medium fragility and high fragility in India, is about 94 per cent. The predictive performance of the model in classifying different phases of the crisis is presented in Table 3.

---

[15] The deviation of the REER from its trend was estimated using the Hodrick-Prescott filter.

[16] The AIC is given by $AIC = -2l/T + 2k/T$, where l is the log-likelihood function with k parameters estimated using T observations.

Table 2: Estimated Ordered Probit Model for Predicting Banking Crisis in India (6-Month Signal Window)[17]

Variable	Coefficient	Std. Error	Z-Statistic	Prob.
FOREX RESERVES	-2.22	0.98	-2.26	0.0237
FOREX RESERVES (-5)	3.47	1.55	2.24	0.0249
FCA/FCL RATIO (-6)	57.31	25.78	2.22	0.0262
EXPORT (-2)	-0.47	0.22	-2.08	0.0373
EXPORT (-4)	-0.27	0.11	-2.39	0.0170
IMPORT (-4)	0.15	0.07	2.30	0.0213
M3/FOREX RESERVE RATIO	-32.00	14.34	-2.23	0.0256
M3 MULTIPLIER	62.83	29.09	2.16	0.0307
M3 MULTIPLIER (-1)	15.36	7.26	2.12	0.0344
CREDIT/DEPOSIT RATIO[18]	-1404.54	617.70	-2.27	0.0230
CREDIT/DEPOSIT RATIO (-2)	711.55	312.14	2.28	0.0226
OUTPUT (-2)	-4.10	1.71	-2.40	0.0164
CALL MONEY RATE	10.23	4.58	2.23	0.0255
CALL MONEY RATE (-1)	2.58	1.31	1.97	0.0484
REAL YIELD 91TB (-1)	14.73	6.71	2.20	0.0280
STOCK PRICE INDEX	0.38	0.17	2.16	0.0306
STOCK PRICE INDEX (-1)	0.20	0.09	2.22	0.0263
INFLATION	11.91	5.35	2.23	0.0260
INFLATION (-5)	-5.51	2.38	-2.31	0.0207
Limit Points				
LIMIT-1(γ_1)	-139.73			
LIMIT-2(γ_2)	-104.73			
Pseudo R-squared	0.87			
Akaike Info. Criterion	0.64			
LR statistic	190.25			
Prob. (LR statistic)	0.0000			

Source: Author's computation.

Table 3: Prediction Performance of the Ordered Probit Model

Dep. Value	Obs.	Correct	Incorrect	% Correct	% Incorrect
0	61	59	2	96.72	3.28
1	31	28	3	90.32	9.68
2	19	17	2	89.47	10.53
Total	**111**	**104**	**7**	**93.69**	**6.31**

Source: Author's computation.

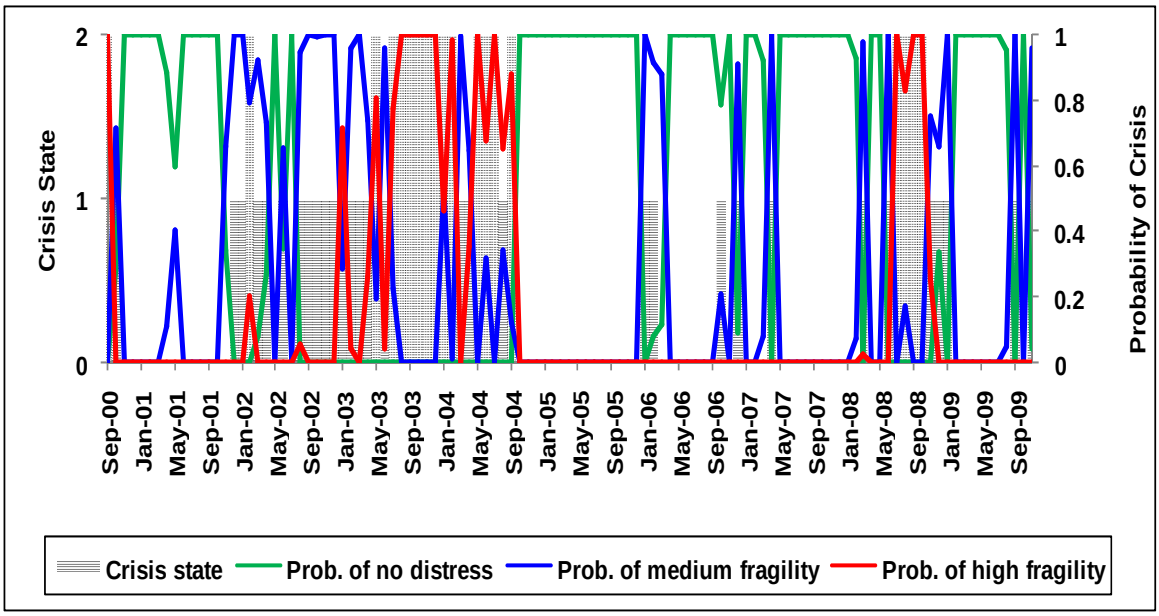
[17] The deviation of the REER from its trend is found to be insignificant at a 5 per cent level of significance and hence it is not included in the estimated model.

[18] "Credit" and "deposits" are, respectively, credit to the commercial sector by banks and aggregate deposits of residents in India.

One of the significant aspects of the proposed model is that it could also predict the recent global financial crisis prior to 6 months quite accurately. The probabilities of the 6 months ahead in-sample prediction of different phases of the banking sector crisis by the model is presented in Figure 2. From the figures, it can be observed that the model has been able to forecast the probability of various phases of the banking crisis quite accurately. It is also seen that during the period of medium and high fragility in the banking sector, the probability of no distress during the period forecasted by the model is very low. Similarly, during the nonfragile period, the forecasted probabilities of a fragile state are found to be reasonably quite low.

Figure 2

The in-sample forecast of different states of banking crisis in India

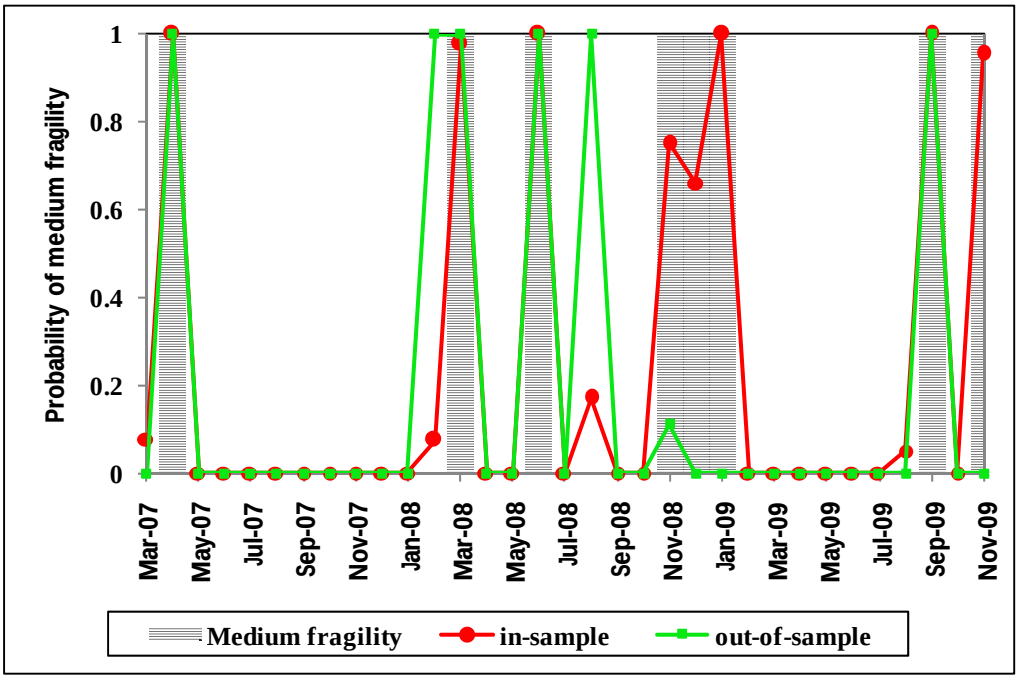


Source: Author's computation.

However, a good forecasting performance of a model within the sample does not guarantee that the model will do well in forecasting out of sample too. So, to evaluate the forecasting performance of the model, an out-of-sample forecast test of the model was performed. The model was estimated utilizing the data from the beginning of the sample (March 2000) to March 2007, and then this model was used to forecast the post-model-building period. All the coefficients of the variables estimated in the model for the period from March 2000 to March 2007 were also found to be significant at a 5 per cent level of significance. Thus, the out-of-sample performance of the constructed model is judged through the predicted probabilities of different phases of crisis generated in the post-model-building period. The in-sample and out-of-sample forecast probabilities for periods of medium and high fragility in the banking sector are presented in Figures 3 and 4, respectively. From the figure, it could be seen that most of the fragile period (both medium and high) was predicted with high probability by the model, except for the period from November 2008 to January 2009 and November 2009, in the case of medium fragility, and August 2008 for high fragility. However, it is seen in Figure 4 that November 2008, which the model fails to classify as a medium-fragility period, has been classified by the model as a period of high fragility. Thus, the model could provide useful information about the possible onset of distress in the banking sector.

Figure 3

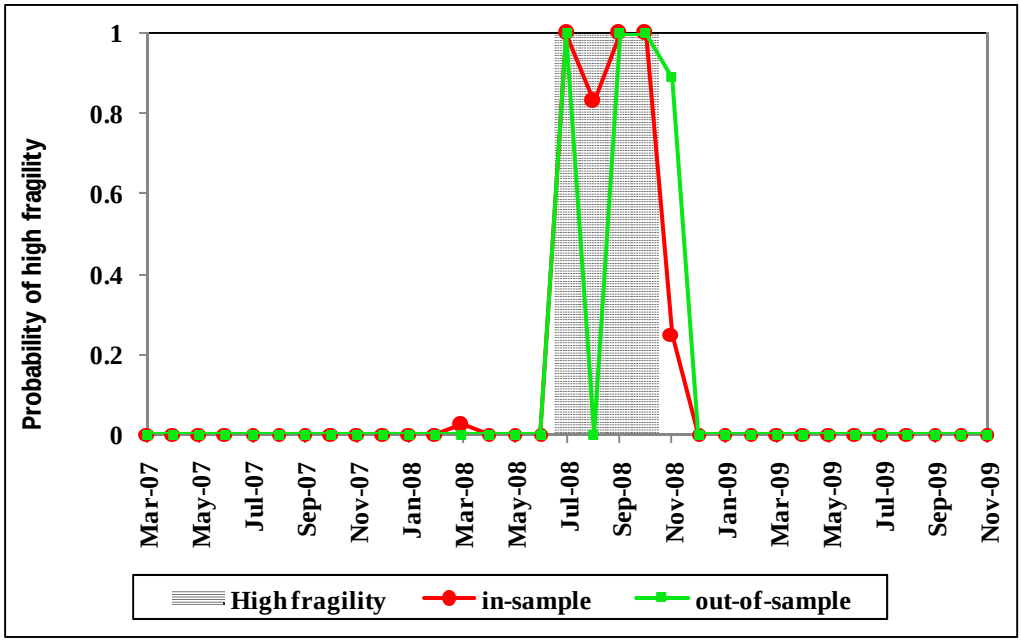
In-sample and out-of-sample probabilities of medium fragility



Source: Author's computation.

Figure 4

In-sample and out-of-sample probabilities of high fragility



Source: Author's computation.

9. Conclusions

In the face of the recent global financial crisis, monitoring and predicting such an event using the early warning system have become essential, as it causes huge losses at both the national and international levels. The early warning system (EWS) aims at anticipating whether and when an individual country may be affected by a financial crisis by developing a framework that allows a financial crisis to be predicted in a relatively open economy.

In order to identify and date the different states of distress situations in the banking sector of India, a banking sector fragility (BSF) index has been developed. Based on the BSF index, we have identified and dated 19 medium- and 8 high-fragility situations in the Indian banking sector. These phases of distress in the banking sector are identified based on some chosen threshold level and are categorized into three states as no distress, medium fragility and high fragility. The ordered probit model is being developed and used to predict these different phases of banking crisis in India. The signaling window for predicting the crisis is taken to be 6 months in this study. This model would help the policymaker to take corrective action to avert the onset of a potential distress/crisis situation by generating signals about an impending distress/crisis situation. The model indicates that increases in the ratio of foreign currency assets to foreign currency liabilities (FCA-FCL ratio), imports, the M3 multiplier, the call money rate and the real interest rate (91-day treasury bills), a rise in the stock price index and high inflation raise the probability of high fragility in the banking sector, while decreases in the M3 forex reserve ratio, output, exports, forex and the ratio between credit to the commercial sector and domestic deposits also increase the probability of high fragility occurring in the banking sector.

The model could predict about 104 data points of different categories of banking crisis out of the total 111 data point series. The model could correctly predict about 97 per cent of no-distress situations, 90 per cent of medium-fragility and about 89 per cent of high-fragility conditions in the Indian banking sector. Thus, the model could classify about 94 per cent of different phases of the fragile periods. The model developed in this study also captured the felt effect of the recent global financial crisis in India. The proposed model could be used to monitor developments in the banking sector of India, as indicators used in this model are available with lags of about two months. While calibrating the model, it is also observed that the ordered probit model could generate reliable out-of-sample probabilities for different phases of fragile conditions in India.

In this paper, banking crisis prediction is based on the BSF index. However, newer crises may emerge from newer characteristics. Thus, the proposed early warning model has to be updated continuously, as the global and domestic macroeconomic conditions are dynamic and keep changing. The EWS devised in this paper to forecast different phases of banking distress/crisis in India is just a preliminary step in the direction of exploring alternative methods of predicting banking crises.

References

Allen, F. and D. Gale (2007), “Understanding Financial Crises”, Oxford University Press, 2007.

Anastasia, N. (2007), “Fragile Finance: Debt Speculation and Crisis in the Age of Global Credit”, Pelgrave Macmillan Publication, 2007.

Arestis, Philip and Murray Glickman (2002), “Financial Crisis in Southeast Asia: Dispelling Illusion the Minskyan Way”, Cambridge Journal of Economics, Vol. 26, No. 2, pp. 237-260.

Berg, Andrew and Catherine Patillo (1999), “Are Currency Crises Predictable? A Test”, IMF Staff Papers, Vol. 46, No. 2.

Bussiere, Matthieu and Marcel Fratzscher (2002), “Towards a new early warning system of financial crises”, Working Paper Series 145, European Central Bank.

Caprio, Gerard and Daniela Klingibiel (2003), “Episodes of Systemic and Borderline Financial Crises”, World Bank, January 2003.

Chauvet, Marcelle and Dong Fang (2004), “Leading indicators of country risk and currency crises: the Asian experience”, Economic Review, Federal Reserve Bank of Atlanta, issue Q 1, pp. 25-37.

Demirguc-Kunt, Asli and Enrica Detragiache (1998), “The Determinants of Banking Crises in Developing and Developed Countries”, IMF Staff Papers, Vol. 45, No. 1.

Demirguc-Kunt, Asli and Enrica Detragiache (2000), “Monitoring Banking Sector Fragility: a Multivariate Logit Approach”, World Bank Economic Review, Oxford University Press, 14(2), 287-307.

Duttagupta, Rupa and Paul Cashin (2008), “The Anatomy of Banking Crisis”, IMF Working Paper, No. 93

Frankel, Jeffrey and Andrew Rose (1996), “Currency Crashes in Emerging Markets: An Empirical Treatment”, International Finance Discussion Papers, No. 534, Board of Governors of the Federal Reserve System.

Fuertes, Ana-Maria and Elena Kalotychou (2004), “Elements in the Design of an Early Warning System for Sovereign Default”, *Computing in Economics and Finance 2004* 231, Society for Computational Economics.

Fuertes, Ana-Maria and Elena Kalotychou (2006), “Early warning systems for sovereign debt crises: The role of heterogeneity”, Computational Statistics & Data Analysis, Elsevier, Vol. 51(2), pp. 1420-1441, November.

Gavin, Michael and Ricardo Hausman (1996), “The Roots of Banking Crises: The Macroeconomic Context”, in Banking Crises in Latin America, Washington, DC: Inter-American Development Bank, pp. 27-63.

Glick, Reuven and Michael M. Hutchinson (2001), “Banking and Currency Crises: How Common are Twins” in Glick, Reuven, Ramon Moreno and Mark M. Spiegel (eds), Financial Crises in Emerging Markets, 467 pages, Cambridge University Press, Cambridge.

Goldstein, M., Graciela Laura Kaminsky and Carmen M. Reinhart (2000), “Assessing Financial Vulnerability: An Early Warning System for Emerging Markets”, 134 pages, published by Peterson Institute, 2000.

Hagen, Jurgen von and Tai-Kuang Ho (2003a), “Twin Crises: A Re-examination of Empirical Links”, presented at the 6th Annual Conference on Global Economic Analysis, The Hague, The Netherlands.

Hagen, Jurgen von and Tai-Kuang Ho (2003b), “Money Market Pressure and the Determinants of Banking Crisis”, pp. 1-35.

Hardy, Daniel C. and Ceyla Pazarbasioglu (1999), “ Determinants and Leading Indicators of Banking Crises: Further Evidence”, Washington DC, IMF Staff Papers, Vol. 46, No. 3, pp. 1-12.

Hawkins, John and M. Klau (2000), “Measuring Potential Vulnerabilities in Emerging Market Economies”, BIS Working Papers, No. 91, October, pp. 1-46.

International Monetary Fund (IMF) (1998), “Financial Crises: Characteristics and Indicators of Vulnerability”, World Economic Outlook, Chapter IV, pp. 74-97.

Kaminsky, Graciela, Saul Lizondo and Carmen M. Reinhart (1998), "Leading Indicators of Currency Crises," International Monetary Fund Staff Papers, 45(1), pp. 1-48.

Kaminsky, Graciela L and Carmen M. Reinhart (1999), “The Twin Crises: The Causes of Banking and Balance-of-Payments Problems”, American Economic Review 89 (3), pp. 473-500.

Kaminsky, Graciela L (1999), “Currency and Banking Crises: The Early Warnings of Distress”, IMF Working Paper, 99/178, pp. 1-38.

Kibritciouglu, Aykut (2002), “Excessive Risk-Taking, Banking Sector Fragility and Banking Crises”, University of Illinois at Urbana Champaign, Research Working Paper No. 62-0114, pp. 1-48.

Laeven, Luc and Fabian Valencia (2008), “Systemic Banking Crises: a New Database”, pp. 1-78, IMF Working Paper No. 08/224.

Lindgran, C. J., G. Garcia and M. I. Saal (1996), “Bank Soundness and Macroeconomic Policy”, International Monetary Fund (IMF) publication, 1996.

Mody, Ashoka and Mark P. Taylor (2003), “Common Vulnerabilities”, Centre for Economic Policy Research (CEPR) Discussion Papers 3759.

Portes, Richard (1998), “An Analysis of Financial Crisis: Lessons for the International Financial System”, IMF Conference Chicago, 8-10 October 1998.

Reserve Bank of India (RBI) (2007), “Manual on Financial and Banking Statistics”, March 2007.

Reserve Bank of India (RBI) (2009a), “Annual Policy Statement for the Year 2009-10”, Reserve Bank of India, Monthly Bulletin, May 2009.

Reserve Bank of India (RBI) (2009b), “Report on Trend and Progress of Banking in India 2008-09”, October 2009.

Reserve Bank of India (RBI) (2010), “Financial Stability Report”, March 2010.

Subbarao, D (2009a), “Mitigating Spillovers and Contagion: Lessons from the Global Financial Crisis”, Reserve Bank of India, Monthly Bulletin, January 2009.

Subbarao, D (2009b), “Impact of the Global Financial Crisis on India Collateral Damage and Response”, Reserve Bank of India, Monthly Bulletin, March 2009.

Sundararajan, V. and Tomas J. T. Balino (1998), “Banking Crises: Cases and Issues”, International Monetary Fund (IMF) publication.

Van Rijckeghem, Caroline and Beatrice Weder (1999), “Sources of Contagion: Finance or Trade?”, International Monetary Fund Working Paper No. 146.

Price discovery on traded inflation expectations: does the financial crisis matter?

Alexander Schulz and Jelena Stapf[1]

1. Introduction

For a central bank to fulfil its price stability mandate, the accurate assessment of inflation expectations is of crucial importance. Market participants gauging long-term investments have similar concerns about inflation. Traditionally, inflation expectations have been derived from models or through surveys of market participants' opinions. In the mid to late 1990s financial markets started to trade claims on inflation actively. Analyzing this source of information has become standard by now. However, there are two main categories in which inflation claims are traded: inflation-linked bonds and inflation swaps. Which market can process information about inflation more quickly and with more impact on long-run equilibrium prices? Is it the size of the respective market that drives the lead in processing inflation information via BEIR? Has the financial crisis changed the price discovery process and biased it more towards one instrument? These are the key questions posed by this paper.

A huge body of literature exists on how to extract inflation expectations from financial market data. However, as far as we know, price discovery for BEIR has not previously been analysed on an intraday basis. This paper fills the gap.

Information shares of BEIR are large for central government bonds especially with longer maturities. The larger size of the inflation-indexed bond market in the United States compared to the euro area bias the price discovery process even more towards the bond market. Whereas, in times of financial crisis, heightened risk aversion generally obstructs trades on financial markets, contributions to price formation have concentrated more on government bonds, presumably the safest financial instrument.

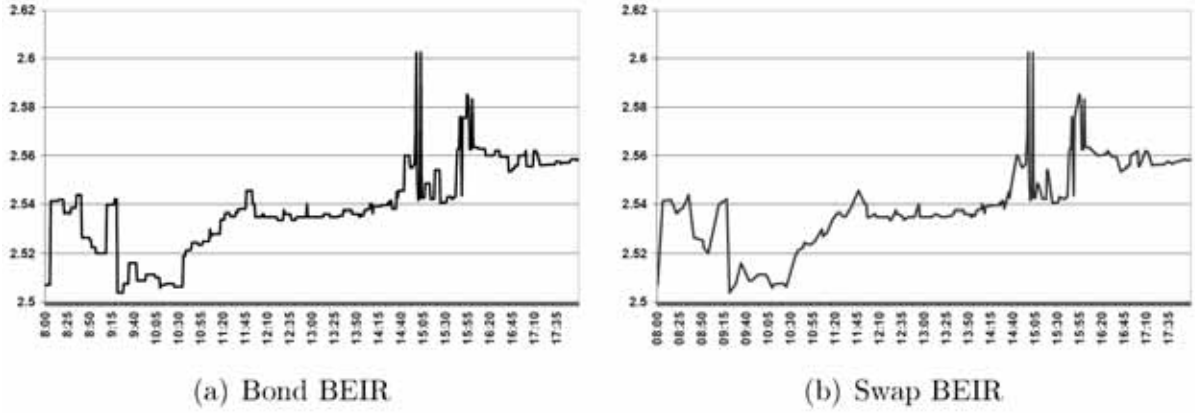
We make use of the approximate arbitrage relationship that exists between bond BEIR and swap BEIR. Graph 1 shows that these instruments do indeed react on news concerning actual and future inflation rates and serves as a first illustration of the close relationship between them. Whereas in practice inflation swaps and nominal and real government bonds are different instruments and therefore differ in prices, the inflation information embedded in these instruments is the same. By means of arbitrage this restricts large price deviations between both instruments. The classical price discovery measures as developed by Hasbrouck (1995) and Gonzalo and Granger (1995) have been applied to the same instrument, eg a share trading in different local markets. We follow the approach used by Blanco, Brennan and Marsh (2005) and explore price discovery of the same cash flows, in our case BEIR, traded with different instruments on different markets.

---

[1] Authors: Alexander Schulz, Deutsche Bundesbank, email: alexander.schulz@bundesbank.de and Jelena Stapf, Deutsche Bundesbank, email: jelena.stapf@bundesbank.de. We thank Christoph Fischer, Joachim Grammig, Joseph Haubrich, Thomas Laubach, Franziska Peter, Stefan Reitz as well as seminar participants at the Annual Congress of the EEA in Barcelona 2009, the International Conference on Macroeconomic Analysis and International Finance in Crete 2009 and Deutsche Bundesbank for helpful comments. All remaining errors are ours. The opinions expressed in this paper do not necessarily reflect the opinions of the Deutsche Bundesbank or its staff.

Graph 1

Yield of inflation-indexed bond with maturity 2012 and four-year inflation swap rate on 5 June 2008



President Trichet's remarks in the ECB press conference starting at 2.30 pm were widely regarded as the turn in the euro interest rate cycle.

We measure the contribution of each market's price innovation to a common efficient price. We use a high-frequency dataset of the respective bonds and swaps at one-minute intervals. Our sample periods range from May to December 2008. The considered period contains both rising and declining inflation expectations, a turning point of monetary policy and the spread of a severe financial crisis.

The euro area index-linked bond market is rather partitioned, with different credit ratings of issuers and two relevant inflation indices. Thus liquidity is dispersed. Against this backdrop, the euro inflation swap market developed very well recently ((Hurd and Relleen (2006), Deacon, Derry, and Mirfendereski (2004)). On the other side of the Atlantic, the United States maintains a well established issuance programme for Treasury Inflation Protected Securities (TIPS) and exhibits only a small inflation swap market. Therefore, we expect the swap market to lead price discovery in the euro area and the bond market in the United States. However, these priors do not stand fully up to empirical evidence. In the euro area for shorter maturities up to five years, new information comes from both markets, whereas for horizons of seven years and above the bond market increasingly leads the price discovery process. In the United States, the bond market dominates the price discovery process for all maturities. Only for the shortest time horizon, one third of price innovations comes from the swap market. Especially with longer maturities central government bonds are the benchmark for hedging inflation risk and for pricing inflation expectations in both currency areas.

The severe financial crisis that broke out in autumn 2008 drove a wedge between bond BEIR and swap BEIR in both currencies. Price discovery ceased to take place on the swap market. Disruptions coming from the short end of the market even separated price formation in both segments for maturities of up to six years in the United States. Thus even though the swap curve exhibits at times a smoother pattern than its bond derived equivalent it is not adequate to exclude bonds from the inflation expectations analysis.

The remainder of the paper is organised as follows: the next section introduces the respective markets where inflation expectations trade. It also shows how arbitrage guarantees price proximity. Section 3 contains a description of our dataset. In Section 4 we explain the econometric method used and Section 5 shows the results of our analysis of price discovery for euro area and US data. The last section concludes.

2. Two markets for trading inflation expectations

Inflation has become a standard commodity on financial markets or, to put it differently, a well accepted index to which financial claims can be linked. In the following we briefly describe the two most relevant markets for inflation-indexed claims: bonds and swaps.

2.1 The inflation-indexed bond market

The United Kingdom pioneered the use of inflation-protected bonds. Inflation-linked gilts (gilt-edged securities) were first sold in 1981.[2] But only the start of the US TIPS programme in 1997 led the way for several other countries. Today, the US market is the largest for inflation-protected bonds. The amount outstanding is $516 billion, which is more than 9% of overall Treasury notes, bonds and bills issuance.[3] TIPS are linked to the US city average all-items consumer price index for all urban consumers (CPI-U). Within the euro area, France, Greece, Italy and Germany have indexed bonds outstanding. France is by far the most active issuer here, sponsoring two programmes linked to the national CPI (ex-tobacco, first issue in 1998) and the euro area harmonised index of consumer prices (HICP, again ex-tobacco – HICPxT, first issue in 2001), respectively. The combined amount outstanding is €137 billion. Germany issued linkers in 2006 and has built up a volume outstanding of €22 billion. While German and French bonds enjoy a AAA rating, Italian government paper (€81 billion outstanding, start in 2003) and Greek government bonds (€15 billion outstanding, 2003) are lower-rated. They trade at a spread to German and French bonds.

We infer inflation compensation by subtracting real yields derived from inflation-linked bonds from nominal bond yields using the Fisher equation.[4] Yet bond yields not only incorporate inflation and real yields or growth expectations. Investors require in addition compensation for unexpected future inflation rate changes in nominal bonds and for illiquidity, default risk and other risk in nominal and inflation-protected bonds. Hence, the BEIR comprises everything that is not uniformly priced or not compensated on both nominal and inflation-linked bond markets (see Figure 1). To begin with, the BEIR contains inflation expectations among financial market participants. Secondly, an inflation risk premium reflects the compensation that nominal bond holders require for unexpected inflation rate changes whereas the inflation-indexed bond holder is not exposed to that risk. Liquidity might be different on the two markets. Nominal bond markets are larger in volume and might therefore be more liquid. To get exposure to a BEIR one can either go long a nominal bond and short an inflation-linked bond or vice versa. The cost of carry for both bonds is different and therefore has implications for the level of the BEIR. Repo specialness, delivery options for futures and other institutional features might drive bond yields on both markets further apart.[5] Since we use pairwise government bonds from the same issuer, default risk is not an issue here.

---

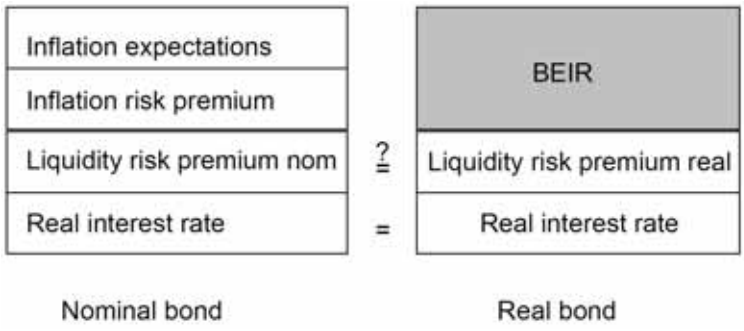
2 See Campbell and Shiller (1996) for an overview of early linkers, including issues from emerging markets.

3 As of January 2009. Relative to its outstanding marketable debt the UK is still the largest issuer, with a share of 28%.

4 See Section 4 for a more formal representation.

5 A repo or repurchase transaction is a standard technique for funding purchases of financial instruments, which are themselves used as collateral. See Buraschi and Menini (2002) for a discussion of specialness.

Figure 1



The BEIR derived from nominal and real bonds contains inflation expectations as well as the inflation risk premium and the difference of the respective bonds' liquidity premia.

2.2 The inflation swap market

Markets for inflation-linked derivatives have grown quickly in recent years. Their development has been complementary to those of inflation-indexed bonds. The most important segment of the inflation derivatives market are inflation swaps. These are traded in the over-the-counter market (OTC) by financial institutions, fund managers and corporate treasurers. The inflation swap is a bilateral contract which requires one party to the contract (the inflation receiver) to make predetermined fixed-rate payments in exchange for floating-rate payments linked to inflation from a second party (the inflation payer). The basic building block of inflation swap structures is the zero coupon inflation swap, where payments are exchanged only on maturity. Typical maturities range from one year to more than 30 years.

Euro zero coupon swaps are in general linked to the same index as most bonds in the associated market. They pay the initially published non-seasonally adjusted euro zone HICPxT; possible later revisions have no effect. The inflation index is subject to a lag of three months. This ensures that both swap parties know the reference price level at the start of the contract. Unlike inflation-linked bonds the reference price level for each day is not interpolated between two adjacent months but changes at the end of the month. This involves jumps at the day of the change of the month especially for shorter maturities but has the advantage that a swap can be traded and unwound in the same month without incurring future inflation risk (an interpolated swap would retain some inflation risk). US zero coupon swaps are linked to the non-seasonally adjusted CPI-U and have an interpolated reference price level for each day as base as well as an indexation lag of three months. This closely aligns the swap market with the US bond market.

Although a modest amount of inflation-linked trades has taken place in continental Europe since the early 1990s, euro inflation swap volumes did not start to boom before the early 2000s. The issuance of bonds linked to the euro zone HICPxT from the French and Italian government in 2001 and 2003 respectively supported the proliferation of the euro swap market. In 2007 the monthly notional amount traded was estimated at a two-digit number of billion euros. Euro inflation swaps were regarded as one of the fastest-growing OTC derivative contracts. In contrast to the euro area, the inflation swap market in the United States developed while the inflation-linked bond market had already been in existence for some years. In 2004, when TIPS issuance picked up, USCPI swaps also became more popular. Yet an estimated trading volume of $11 billion in 2007 is small compared to that of the inflation-indexed bond market (Peat and Segregeti (2008)).

Inflation swaps explicitly target changes in the price level. Thus the swap BEIR is simply the quoted fixed rate agents are willing to pay in order to receive the cumulative rate of realised

inflation during the life of a zero coupon swap. The swap BEIR depends on expected inflation over the life of the swap as well as on various risk premia. Again, these premia comprise compensation for unexpected inflation rate changes and liquidity.[6]

Compared to bonds, inflation swaps are a new instrument, which suggests an illiquid market. However, market reports indicate that the trading volume of swaps clearly exceeds those of indexed bonds, which is of course partly due to the fact that entering a swap does not involve funding costs. That notwithstanding, market intelligence suggests that there is a lack of inflation payers, which results in inflation paid via swaps having a higher price than via bonds (Armann, Benaben and Lambert (2005) and ECB (2006b)).

The swap BEIR may involve in addition a premium for counterparty risk. Payments are typically exchanged between two private corporations, mostly banks and broker firms but also hedge funds, insurers and non-financial corporations. Therefore the degree of creditworthiness attached to these payments is typically lower than that of bonds issued by governments. Since the market trades mostly zero coupon swaps with payments only exchanged on maturity, the counterparty risk especially for long-term swaps could be prohibitively high. Collateralisation tackles that problem and has become increasingly popular among OTC derivatives users during the last years. The International Swaps and Derivatives Association (ISDA) states that 66% of fixed income OTC derivatives were collateralised in 2008 compared with 48% in 2003 (ISDA (2005 and 2008)). However, a special kind of counterparty risk remains even for fully collateralised swaps: the default-to-replacement risk. This risk came to the attention of a broader audience with the collapse of the investment bank Lehman Brothers in September 2008 and contains two related risks. Firstly, collateral is valued at the margin. This means that in case of default the creditor who seeks a replacement has only a marginal price impact. Yet when Lehman collapsed a huge number of swaps needed to be replaced at the same time. This obviously had more than a marginal impact. A shift in risk aversion might put additional stress on prices. Furthermore, especially in a one-sided market it will take some time to close open positions. This exposes the creditor to general market risk (eg a monetary policy shock that could move inflation expectations) on top of the direct effect of the default. Again, this risk occurring after the default is not covered by collateral.

2.3 Pricing and arbitrage

There exists a huge body of literature on how to extract inflation expectations from financial market data. The literature is largely driven by staff members of investment banks and central banks. Whereas the former are more concerned with pricing and valuation of inflation-indexed bonds and derivatives for trading reasons (Peat and Segregeti (2008) and Kerkhof (2005)) the latter focus more on pure long-term inflation expectations as an indicator of the credibility of their monetary policy (ECB (2006a), Hurd and Relleen (2006), Wright (2008) and Kim and Wright (2005)). Over the last 15 years especially the search for measures of inflation risk premia, liquidity and other risks that cloud inflation expectations has proliferated. However, the price discovery process on traded inflation expectations has been ignored so far.

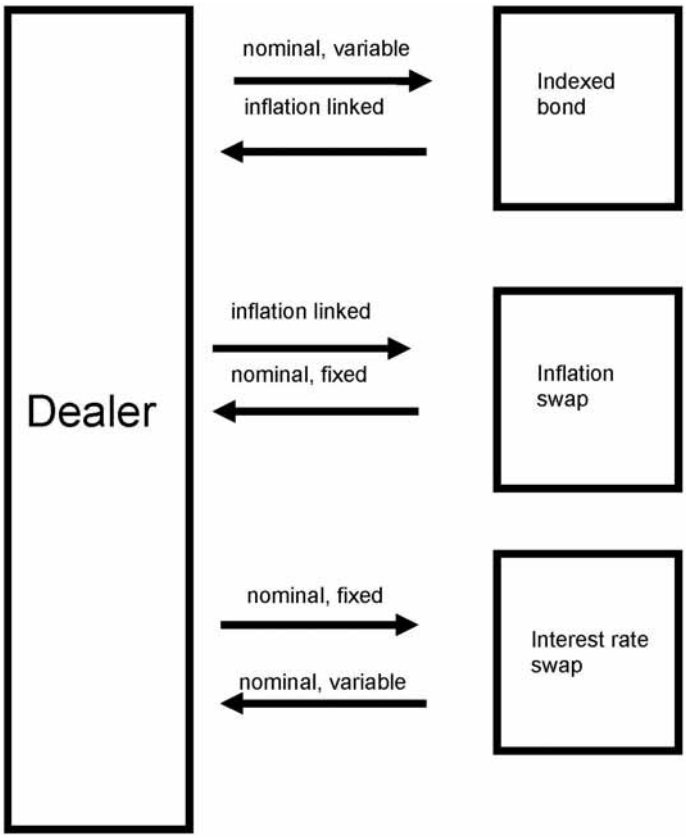
Following Blanco, Brennan, and Marsh (2005) and Doetz (2007), we assume that if different instruments spanning the same economic concept or payments, eg credit risk in their case and BEIR in our case, arbitrage will tie the prices of these instruments together. Otherwise the same claim, credit protection in their case and inflation protection in our case, could be bought more cheaply on one market than on the other. Given that we compare the prices of

[6] Liu, Longstaff and Mandell (2006) deal comprehensively with liquidity and default risk in interest rate swaps; as far as we know, no similar study exists for inflation swaps.

related but not identical instruments, we conform with the literature in speaking of an approximate arbitrage relationship. Yet we also take into account the finding that derivative markets have shifted trading away from spot markets – mostly due to lower funding costs – and are increasingly recognised as taking the lead in price formation, especially in financial crisis conditions (Upper and Werner (2007)).

Figure 2

Stylised trading strategy linking inflation-indexed bonds and inflation swaps



Dealer buys inflation-indexed bonds, funds the purchase with a repo and sells inflation protection into the swap market. The nominal swap closes the position.

In practice, an asset swap is the instrument that links bond and swap prices. An asset swap exchanges a fixed investment, such as a bond with coupon payments, for a floating investment, such as Euribor plus a spread. While nominal asset swaps have been established for some time, real or inflation-linked asset swaps have become popular only during the last five years. As in a standard asset swap, the proceeds of a bond are exchanged against a floating rate interest payment, except that the proceeds are not fixed but inflation-linked. Thus, a dealer might buy an indexed bond via a repo, provide an inflation-indexed cash flow to the market via an inflation swap and hedge its position with a standard interest rate swap (Figure 2).[7] The fact is that the financing constraints of dealers,

[7] See Armann, Benaben and Lambert (2005) p 94, and Deacon, Derry, and Mirfendereski (2004), Chapter 9, for a lucid treatment.

maturity mismatches stemming from the low number of available indexed bonds and other transaction costs will hamper arbitrage. Differences in market liquidity both within the bond market and between bond and swap market as well as variations in credit exposure impede price equality. Regulatory barriers preventing investors to engage in derivative instruments or shorten bonds further affect the balance of prices. Thus a constant spread between the two break-even rates can and does prevail. However, markets prove to be sufficiently liquid to keep up the arbitrage relationship between bond and swap BEIR in most cases.

3. Data

Our dataset consists of real and nominal bonds, as well as inflation swaps. To avoid a credit bias, we concentrate on French and German bonds that all have a AAA rating in the euro area. Furthermore, we focus on the HICPxT as a reference for both inflation swaps and bonds; hence we remove bonds linked to the French national CPI from our sample.[8] The US sample contains TIPS with residual maturities from two to 10 years as well as Treasury Notes and inflation swaps with equal maturities. We use two sample periods ranging from May/June to August and from September to December 2008 which we label Summer and Autumn 2008 respectively.

All bonds are capital-indexed, ie their notional is inflated with the change of the price index. Coupon and redemption payments are made on the adjusted notional. There is some protection against severe and persistent deflation, as redemption is never below the initial notional. In addition, we restrict the euro area sample to bonds with maturities of up to 12 years, as these are tenors for which inflation swaps are actively traded.[9] Altogether, we keep six linkers in our sample covering maturities of two, four, five, seven, eight and 12 years. We select six adequate nominal bonds to compute the BEIR (see Table A-1 in the Appendix for a list of bonds used). The United States operates the world's most active issuing programme; thus we are able to investigate the term structure of bond BEIRs from two to 10 years for whole-year tenors (see Tables A-2 and A-3 in the Appendix).[10] Inflation swaps with corresponding tenors form the alternative market.

We obtained bid and ask prices for bonds as well as for swaps, all on one-minute intervals. Furthermore we received the number of quote changes (ticks) in each minute. This gives us an indication of the market's liquidity. As we do not have transaction data, we use the midpoint of bid and ask quotes as the hypothetical transaction price.[11] For the euro area, we use quotes between 8 am and 6 pm as hardly any trading takes place in the interim time. The Summer and Autumn datasets range from 5 May to 8 August 2008 and from 2 September to 8 December 2008 respectively. Each set spans 70 trading days. Given the adjustments described above, 439,000 swap midpoints remain in our sample as well as about 315,000 observations of nominal bond prices and 185,000 of indexed bonds (see Table A-4 in the Appendix). Claims on US inflation are traded between 9 am and midnight European Central Time. We obtained data for the Summer sample from 12 June 2008 to 13 August 2008 and for the Autumn period from 3 September 2008 to 9 December 2008. This makes a total of approximately 520,000 quotes for the nine nominal bonds, 324,000 for

[8] France as a pioneer issuer of inflation-linked debt in the euro area has set the standard for linking claims on an index excluding tobacco products, thus providing a control for manipulated prices to some degree.

[9] As reported on Bloomberg. For longer horizons, eg the French bond expiring in 2040, we would need to interpolate between infrequently traded 30- and 40-year inflation swap rates, which is prone to errors.

[10] All bonds except for the five-year tenors are off-the-run.

[11] Intervals with only either a bid or an ask entry are eliminated.

the inflation-indexed bonds and 858,000 quotes for the matching inflation swaps (see Table A-5 in the Appendix). Prices are carried forward until a new quote is available. All data is taken from Bloomberg.

Bond prices are transformed into yields. We use the yield-to-maturity or redemption yield concept to calculate bond yields from our price data. The bond yields are therefore systematically slightly undervalued compared to the zero coupon yields from our inflation swap data.[12] The prices for the bond data reflect a decreasing time to maturity whereas the inflation swaps are quoted daily in whole year tenors. To establish comparability we adjust the yields of the bond to whole year tenors as well. We use daily estimates of term structures of nominal and real bonds to increase (decrease) the yields of our bonds from the remaining time to maturity to whole year tenors.

Furthermore, we need to correct real bond yields for seasonality effects. These occur because bonds are linked to non-seasonally adjusted inflation indices and yields can be biased especially for shorter maturities.[13] For example, in the euro area consumer prices are typically low in January (high in April). January (April) is indeed the reference month for inflation compensation of German (French) bonds. Investors buying bonds at any other time during the year adjust the price according to the higher (lower) actual non-seasonally adjusted inflation rates and therefore under- (over)estimate the bond yield and the BEIR respectively. We correct for seasonality via daily seasonal factors extrapolated from monthly seasonally adjusted and non-seasonally adjusted CPI data.[14] The same adjustments are performed on US data. Yet due to the semiannual coupon payments of US bonds the issue of seasonality is less virulent.

The respective competitive market comprises six inflation swaps for the euro area and nine for the US with tenors equivalent to the bond BEIR. Since we consider only swaps with full-year tenors we need to correct for neither maturity nor seasonality.

4. Price discovery: Measurement method

If both the swap and the bond market price inflation expectation plus risk premia equally, bond BEIR and swap BEIR of the same maturity should be identical. Subject to the arbitrage imperfections noted above the difference between the two measures – here called the basis – should be non-zero. Nevertheless a positive (negative) mean of the basis would imply that there are irrevocable costs attached to the investment that makes the hedging of inflation exposure more costly (more attractive) in one market.

The basis for a given tenor, *t*, is defined as:

$$basis_t = swapBEIR_t - bondBEIR_t, \quad (1)$$

where:

$$bondBEIR_t = \left[\left(\frac{1+y_t^n}{1+y_t^r} - 1\right) * 100\right], \quad (2)$$

and y_t^n and y_t^r are the yields of the nominal respectively real bond.

---

[12] Calculating true zero coupon yields for our high-frequency bond price data is nearly impossible, as necessary interpolations are prone to contaminate the marginal price change of a single bond.

[13] Only on coupon dates is there no bias as inflation is paid out. For an explanation and visualisation of seasonality in CPI, see, for example, Peat and Segregeti (2008) p 183.

[14] See Eijsing, Garcia, and Werner (2007) for further explanations of the adjustment method.

In the BEIR, implicit inflation expectations are traded in the swap and the bond market. Price discovery is the process by which prices embed new information in either one or both of the two markets. Arbitrage implies that prices cannot deviate too far. In econometric terms, prices are cointegrated I(1) variables which means that the price series have one or more common stochastic factors. If we assume that there is one cointegration relation only and therefore one common factor, we can thus term this factor the implicit efficient price. It is this price driven by new information which is the source of the permanent movement in the prices of both markets. The price discovery can be analysed with two alternative concepts: Hasbrouck's information shares (Hasbrouck (1995)) and Gonzalo and Granger's contributions to the common factor (Gonzalo and Granger (1995)).[15] Hasbrouck defines price discovery in terms of the variance of all innovations in a vector error correction model (VECM) to the common factor. Gonzalo Granger involves only permanent shocks where each market's contribution to the common factor is defined to be a function of only the error correction coefficient in a VECM. Hasbrouck information shares use contemporaneous correlations between price innovations in both markets as much as the variance of these innovations whereas Gonzalo Granger does not. In the following we compute both measures.

If the two prices are $I(1)$, cointegrated and have the r^{th} order vector autoregression representation:

$$p_t = \Theta_1 p_{t-1} + \cdots + \Theta_r p_{t-r} + \varepsilon_t, \tag{3}$$

where $p_t = (p_{1,t}, p_{2,t})'$. It follows that the returns:

$$\Delta p_t = \begin{bmatrix} p_{1,t} - p_{1,t-1} \\ p_{2,t} - p_{2,t-1} \end{bmatrix}, \tag{4}$$

evolve according to the Engle and Granger (1987) representation theorem in a bivariate equilibrium correction process

$$\Delta p_t = \alpha z_{t-1} + A_1 \Delta p_{t-1} + \cdots + A_r \Delta p_{t-r-1} + \varepsilon_t, \tag{5}$$

where z_{t-1} is the error correction term and ε_t is a zero-mean vector of serially uncorrelated innovations. z_t is a vector of differences in prices between markets and because swap BEIR are not directly comparable to bond BEIR includes coefficient β_2, that adjusts for daily changes in the basis and a constant c:

$$z_{t-1} = [p_{1,t-1} - \beta_2 p_{2,t-1} - c], \tag{6}$$

$$z_{t-1} = \beta' p_{t-1}.$$

Following the Stock and Watson (1988) permanent-transitory decomposition, Hasbrouck (1995) transforms equation (3) into a vector moving average (VMA) representation and its integrated form:

$$p_t = \Psi(1) \sum_{s=1}^{t} \varepsilon_s + \Psi^*(L)\varepsilon_t, \tag{7}$$

where $\Psi^*(L)$ is a matrixpolynomial in the lag operator, L. $\Psi(1)$ represents the permanent effect of the shockvector on all the cointegrated security prices, with $\Psi(1)\varepsilon_t$ being the long-

[15] See Hasbrouck (1995), Baillie, Bootha, Tse and Zabotinac (2002), Mizrach and Neely (2005) or Grammig and Peter (2008) for derivations and a discussion of both measures.

run impact of an innovation in t. Under the assumption of a single common factor, the long-run multipliers $\Psi(1)$ can be provided in the error correction framework as Baillie, Bootha, Tse and Zabotinac (2002) show:

$$\Psi(1) = \beta_\perp \pi \alpha'_\perp, \tag{8}$$

$$\Psi(1) = \pi \begin{bmatrix} \gamma_1 & \gamma_2 \\ \gamma_1 & \gamma_2 \end{bmatrix}.$$

Since we assumed a single common factor π is a scalar and $\beta_\perp$ and $\alpha_\perp$ are the orthogonal complements of the original parameter vectors in (5) and (6).

Because the prices are cointegrated, each error term must have the same long-run impact on prices. This means that all the rows in (8) are identical. If the covariance matrix Ω of the residuals ε_t is diagonal, ie the contemporaneous correlation of the residuals is zero, the information share of market 1 is defined by:

$$S_1 = \frac{\gamma_1^2 \sigma_1^2}{\gamma_1^2 \sigma_1^2 + \gamma_2^2 \sigma_2^2}. \tag{9}$$

If there is correlation between the error terms, ie $\rho \neq 0,$ Hasbrouck (1995) suggests a Choleski factorisation of the covariance matrix such that $\Omega = MM',$ where M is a lower triangular matrix.[16] The Hasbrouck information shares for market 1 and 2 are then defined as:

$$H_1 = \frac{(\gamma_1 m_{11} + \gamma_2 m_{12})^2}{(\gamma_1 m_{11} + \gamma_2 m_{12})^2 + (\gamma_2 m_{22})^2}, \tag{10}$$

$$H_2 = \frac{(\gamma_2 m_{22})^2}{(\gamma_1 m_{11} + \gamma_2 m_{12})^2 + (\gamma_2 m_{22})^2}. \tag{11}$$

That is market 1 information share is the proportion of the variance in the common factor that is attributable to shocks in market 1. The factorisation imposes a greater information share on the first price (unless m_{12} = 0). Therefore upper (lower) bounds of information shares are calculated when market 1 is first (second) in the ordering of the variables for the factorisation. In the following we calculate midpoints of the upper and lower bounds of the Hasbrouck shares induced by the different orderings of the variables.

An alternative measure for price discovery is based on the Gonzalo and Granger (1995) decomposition of the price vector into a permanent, g_t , and a transitory, f_t, component:

$$p_t = \theta_1 g_t + \theta_2 f_t, \tag{12}$$

where the permanent component is a linear combination of the prices in the two different markets, $g_t = \Gamma p_t,$ ie Γ is the common factor coefficient vector. The additional identifying restriction that f_t does not Granger-cause g_t implies that $\theta_1 = \beta_\perp \alpha'_\perp = (\gamma_1, \gamma_2)'.$ The weights given to price discovery are then defined as:

$$GG_1 = \frac{\gamma_1}{\gamma_1 + \gamma_2}. \tag{13}$$

---

[16] The covariance matrix is $\Omega = \begin{bmatrix} \sigma_1^2 & \rho\sigma_1\sigma_2 \\ \rho\sigma_1\sigma_2 & \sigma_2^2 \end{bmatrix}$ and the lower triangular matrix is $M = \begin{bmatrix} m_{11} & 0 \\ m_{12} & m_{22} \end{bmatrix} = \begin{bmatrix} \sigma_1 & 0 \\ \rho\sigma_2 & \sigma_2(1-\rho^2)^{1/2} \end{bmatrix}$

5. Price discovery in the euro area and the United States

We first address the problem implied by the short time horizon of our dataset. In the remainder of this section, we lay out price discovery, first in the comparatively calm period of the Summer and subsequently in the crisis phase of Autumn 2008. Price discovery with forward rates is presented in the last subsection.

Since our datasets each span only 70 trading days – and only 45 for the United States – the use of cointegration techniques that target long-run equilibria might appear inappropriate. Yet we are investigating an (near) arbitrage relationship on a financial market, where corrections to deviations from equilibrium could be effected instantaneously or, in our case, every minute. Therefore we expect the half-life of deviations to be short-lived. Indeed, the average half-life of a deviation across all maturities and both markets is around 3½ hours in the euro area and 7½ hours in the United States in Summer 2008. If we set the length of our dataset in relation to this average half-life, as is proposed by Hakkio and Rush (1991), we get a ratio of 190 or 94 respectively. Studies testing for purchasing power parity where cointegration is routinely applied featuring half-lives of three to five years (Rogoff (1996)). They would need more than 300 years of data to match a ratio of 100. However, the half-life of deviations increases to more than 40 hours for euro area data and over 120 hours in the United States in our extreme crisis sample in Autumn 2008. This implies a ratio of the length of the dataset to the average half-life of 16 or 6 respectively and gives a first hint that trades and the adjustment to a common efficient price were distinctly slower during the financial crisis period.

5.1 Summer 2008: The baseline scenario

Data for the difference between swaps and bonds, ie the basis, show that this is significantly positive (see Graph 2 and Table 1). For all maturities – except the shortest in the United States – the basis is meaningfully greater than zero, implying that the BEIR derived from swaps lies uniformly over the bond BEIR. One part of this difference stems from our use of yields to maturity for bonds versus zero coupon yields for swaps. If the yield curve does not run completely flat, as is the case in our sample, yields to maturity are lower than zero coupon yields. The difference can be up to 8 basis points as shown by a zero coupon dataset with daily frequency for both BEIR. Nevertheless a significant and positive basis persists although it is on average smaller than that of our high-frequency dataset. This is in line with previous literature assessing the higher swap yield to liquidity considerations and other risk premia (Armann, Benaben and Lambert (2005), Campbell, Shiller and Viceira (2009) and Deacon, Derry and Mirfendereski (2004)).

Graph 2

Basis for tenor seven years

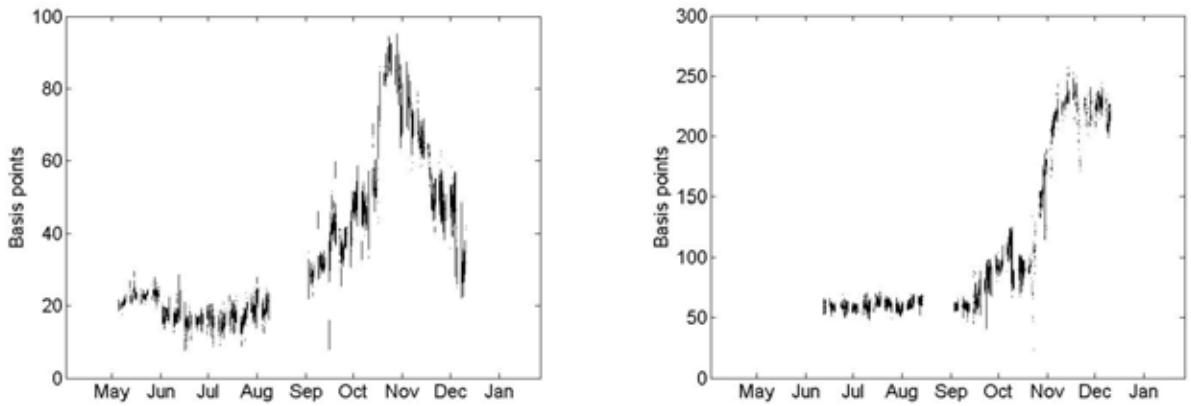


Table 1

Average of difference between swap BEIR and bond BEIR

Euro area		
	Summer 08	*Autumn 08*
	Basis points	
2-year swap-bond BEIR	37.9	45.2
4-year swap-bond BEIR	30.7	49.2
5-year swap-bond BEIR	36.7	68.5
7-year swap-bond BEIR	23.4	55.8
8-year swap-bond BEIR	24.2	61.5
12-year swap-bond BEIR	19.8	53.9
United States		
	Summer 08	*Autumn 08*
	Basis points	
2-year swap-bond BEIR	-3.1	125.9
3-year swap-bond BEIR	14.8	147.5
4-year swap-bond BEIR	25.0	115.6
5-year swap-bond BEIR	32.3	76.6
6-year swap-bond BEIR	64.9	147.0
7-year swap-bond BEIR	66.2	129.7
8-year swap-bond BEIR	53.2	105.4
9-year swap-bond BEIR	48.9	92.2
10-year swap-bond BEIR	45.5	94.9

We performed unit root tests for all time series and could not reject the null at conventional test sizes using the Augmented Dickey Fuller test. We determined the lag order of the unrestricted vector auto regression following the Schwarz information criterion. Since the criterion required at most 15 lags, ie 15 minutes, we suspected that overnight returns did not play a prominent role in our estimations. This would, however, be the case if market prices jumped a lot between market close and opening on the next day.[17] Yet swaps and bonds are hardly traded outside the peak trading hours ranging from 8 am to 6 pm in the euro area and from 9 am to midnight in the United States, which we fully cover in our sample.

We report Johansen trace statistics for the determination of the number of cointegration vectors in Tables A-8 and A-9 in the Appendix. The pairs of all swap and bond BEIR for all maturities exhibit one cointegration relation and therefore one common trend. As previously discussed, markets price BEIR entirely equally only if the unity cointegration vector [1,−1] applies. Yet swap BEIR nearly always exhibit higher liquidity and risk premia than bond BEIR. To cover this difference, we included a constant in our cointegration vector. In the euro area only shorter maturities, two and four years, comply with the restriction of a common price up to a constant amount. For the United States, this is the case for two, seven, and

[17] Re-estimation of the VECM and the Hasbrouck information shares with the overnight returns substituted with the mean return of the following day showed virtually no influence on the parameters. We thank Franziska Peter and Joachim Grammig for performing the estimation using their Gauss procedures.

eight years. For other (longer) maturities, at least one market exhibits time-varying non-transient factors in its price that might be due to non-stationary liquidity differentials in both markets.[18]

The Hasbrouck information share midpoints show that for tenors of 2–5 years price discovery on inflation expectations is nearly evenly split in the euro area (see Table 2).[19] Yet the bond market leads as shares are still significantly different from equality.[20] This changes at longer maturities. Almost no price discovery takes place in the swap market for eight-year BEIR. This result is confirmed by the Gonzalo Granger contributions to the common factor which are reported in the same table.[21] In contrast to what we see in price discovery studies featuring derivatives and their underlyings (Upper and Werner (2007)) it is not the derivative market that dominates price formation in our study.

Table 2

Contributions to price discovery in the euro area

	Hasbrouck inform. shares		*Gonzalo Granger*	
	Summer 08	*Autumn 08*	*Summer 08*	*Autumn 08*
2-year swap BEIR	0.46	0.09	0.29	0.09
2-year bond BEIR	0.54	0.91	0.71	0.91
4-year swap BEIR	0.44	0.05	0.32	0.08
4-year bond BEIR	0.56	0.95	0.68	0.92
5-year swap BEIR	0.44	0.06	0.28	0.08
5-year bond BEIR	0.56	0.94	0.72	0.92
7-year swap BEIR	0.30	0.05	0.22	0.07
7-year bond BEIR	0.70	0.95	0.78	0.93
8-year swap BEIR	0.09	0.04	0.08	0.05
8-year bond BEIR	0.91	0.96	0.92	0.95
12-year swap BEIR	0.34	0.02	0.28	0.04
12-year bond BEIR	0.66	0.98	0.72	0.96

Note: Midpoints of Hasbrouck information shares are reported. Lower and upper bounds can be found in Table A-10 in the Appendix. Where appropriate, according to the results in Table A-8, the restriction of a unity vector is imposed.

[18] Since not all time series showed linear trends we did not include them in our cointegration analysis. Nevertheless, once included the results did not change qualitatively

[19] See Table A-10 in the Appendix for upper and lower bounds of the Hasbrouck information share measure.

[20] Wald tests on the equality of the ratio of adjustment coefficients or the ratio of the γ respectively are rejected at conventional test sizes.

[21] As discussed before, the divergence of both measures is greater when either the correlation of the residuals or their variances differ significantly.

Table 3

Contributions to price discovery in the US

	Hasbrouck inform. shares		*Gonzalo Granger*	
	Summer 08	*Autumn 08*	*Summer 08*	*Autumn 08*
2-year swap BEIR	0.27		0.14	
2-year bond BEIR	0.73		0.86	
3-year swap BEIR	0.12		0.06	
3-year bond BEIR	0.88		0.94	
4-year swap BEIR	0.13		0.06	
4-year bond BEIR	0.87		0.94	
5-year swap BEIR	0.11	0.07	0.04	0.04
5-year bond BEIR	0.89	0.93	0.96	0.96
6-year swap BEIR	0.18		0.10	
6-year bond BEIR	0.92		0.90	
7-year swap BEIR	0.09	0.08	0.02	0.03
7-year bond BEIR	0.91	0.92	0.98	0.97
8-year swap BEIR	0.04	0.04	0.00	0.03
8-year bond BEIR	0.96	0.96	1.00	0.97
9-year swap BEIR	0.04	0.03	0.02	0.04
9-year bond BEIR	0.96	0.97	0.98	0.96
10-year swap BEIR	0.04	0.04	0.01	0.02
10-year bond BEIR	0.96	0.96	0.99	0.98

Note: Hasbrouck midpoints, lower and upper bounds can be found in Table A-11 in the Appendix. Blank spaces indicate no cointegration relation. Where appropriate according to the results in Table A-9 the restriction of a unity vector is imposed.

One interpretation of that result is that especially for longer maturities protection against unexpected inflation rate deviations is virtually only provided by central governments. There is a supply and a demand side to that argument. On the demand side, investors seek long-term protection against inflation and want to keep counterparty risk to a minimum. This cannot be completely eliminated by posting collateral. The valuation underlying the exchange of collateral is a marginal calculation. However, if a large market participant fails, all its counterparties need to hedge their positions. This results in a more than marginal shift in demand or supply and, hence a price movement that is not covered by the collateral posted. Note that this argument draws neither on variations in risk-aversion nor on transaction costs. Nevertheless, transaction costs may be relevant as even in a highly developed system it takes some time to negotiate new contracts. After the default of Lehman Brothers some banks needed several weeks to find counterparties to hedge all their open swap positions. Any price movement during this time is naturally not covered by collateral. This remaining counterparty or default-to-replacement risk may lead market participants to prefer risk-free government bonds. On the supply side it is reasonable to assume that the banking sector's aggregate supply of inflation-indexed claims is zero. This is because banks typically only intermediate between different clients. Yet inflation supply comes from the private sector, too. Especially for the UK it is well documented that public private partnerships are selling

inflation into the market.[22] However, these privately supplied cash flows are very untransparent compared to indexed government bonds. Hence financial institutions, brokers and corporate treasurers that act as inflation-takers on the swap market have a reason to be cagey when taking inflation risk in their books that is priced differently to the government bond market.

We motivated our use of an US dataset with the different structure of markets for tradable inflation expectations in the euro area and the United States. The prior of a larger and more liquid inflation-linked bond market over a less established inflation swap market can be recovered in the results for the United States. Hasbrouck information share midpoints and Gonzalo Granger contributions show a clear lead of the bond market in our baseline scenario (see Table 3). Only for the shortest maturity does the swap market contribute less than one third to the price discovery process. Most likely the volume of the respective market does play a role in determining where price discovery takes place.

5.2 Price discovery in times of extreme financial crisis

In Autumn 2008 a fully-fledged financial crisis propagated through the financial system and the real economy. It left inter alia the United States and the euro area in a recession at the year-end. The turmoil in the financial markets was accompanied by larger amplitudes for price changes of financial instruments. The increased variability showed up in both the bond and the swap markets (see Tables A-6 and A-7 in the Appendix). Standard deviations for bond and swap prices nearly quadrupled in the euro area and blew up tenfold in the US. Furthermore, the price distribution exhibited a significantly lower kurtosis, eg prices were more scattered away from the mean. The higher variability was more contained for longer maturities as it was primarily the short-term markets that were persistently disrupted during the financial crisis. The mean of BEIR decreased considerably for all maturities and it even went negative for some tenors. Again the development was more pronounced in the United States. The mean of the BEIR decreased far more in the United States from partly over 3 percentage points to negative values of partly over 1 percentage point for short to medium maturities. The lower inflation expectations incorporated in the BEIR were in line with an upcoming negative economic outlook and falling energy and commodity prices which brought down actual inflation rates and inflation expectations in surveys. Nevertheless it was partly driven by the liquidity drain stemming from the withdrawal of risky assets and the search for highest-quality collateral which most affected nominal government bonds. The liquidity differential between nominal and real government bonds widened considerably and bond BEIR fell accordingly.

The crisis involved a significant increase of risk aversion on the part of investors and consequently affected various financial instruments and markets differently. The difference between swap and bond BEIR, the basis, increased considerably after September 2008 (see Table 1). The wedge between the swap and the bond market in the United States broadened up to the point where one would expect that neither market would any longer exhibit a cointegration relationship. At that stage, default-to-replacement risk had become manifest for all market participants.

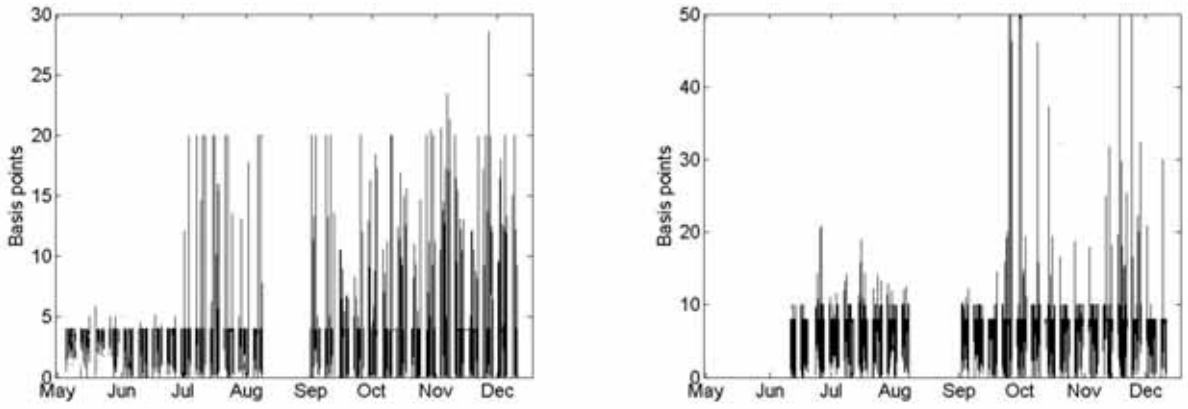
Still, the question remains as to why the elevated basis was not arbitraged away. Three factors might have hampered the smoothing-out of price differences: increased transaction costs, liquidity-constrained dealers and interest rate uncertainty. First, trades have become more costly due to increased bid/ask spreads. The increase was pronounced with inflation

[22] This could be traffic infrastructure projects or hospitals. Many are regulated to adjust their prices by the inflation rate or a share of their contract payments is directly inflation-linked, typically the remuneration for operating expenses. See Grath and Windle (2006).

swaps in particular (see Graph 3). Even though the mean of the overall tight bid/ask spread was higher by only half a basis point in our crisis sample, variation picked up dramatically. A bid/ask spread of 20 basis points, which was not unusual in November and December for some trading hours, made relative value trades prohibitively costly. Furthermore, spreads went up for bond trading as well. On the bond market the spread increase was more pronounced for inflation-linked than for nominal bonds.[23] While the absolute rise of the spread was small in numbers it was twice as high for the inflation-indexed as for the nominal bond market. Accordingly, trading volumes of inflation-linked bonds on electronic platforms declined, in the case of the European MTS system by more than 60%. For the TIPS market, it was reported that the spread more than doubled amid a reluctance to trade (Madar, Rodrigues and Steinberg (2009)). This development amplified the liquidity differential between real and nominal bonds. Bond BEIR, the difference between nominal and real bonds, went down further. Second, some of the most active traders, eg banks and hedge funds, faced liquidity and financing constraints. With a diminishing capital basis caused by huge write-offs, banks were forced to reduce both portfolio holdings and capital allocated to their trading desks. Hedge funds, a standard class of arbitrageurs, faced significant withdrawals from their customers after reporting poor performance. Furthermore, banks were less willing to finance highly leveraged operations. Thus, banks, hedge funds and other dealers were hindered from investing in cheap bonds and reselling the inflation-linked cash flow in a disturbed swap market. Third, increased interest rate uncertainty might also have hampered gap-offsetting trades. This is because it became more probable that rates would alter significantly during the transaction time needed to initiate, calculate, fund and execute an arbitrage deal. Yet it was not just demand that dried up considerably. The supply side suffered comparably since fewer people were willing to pay inflation or long-end rates.

Graph 3

Bid/ask spread for seven-year inflation swaps



(a) Euro area (b) US

Not surprisingly the disturbances affected the pricing of different financial market instruments differently.[24] Price discovery changed significantly; in fact, it almost shut down on the swap

[23] Data from Bloomberg show that, for one big trader, spreads on linkers quadrupled whereas the ones for nominal government bonds only doubled in the Autumn as compared with the first half of the year.

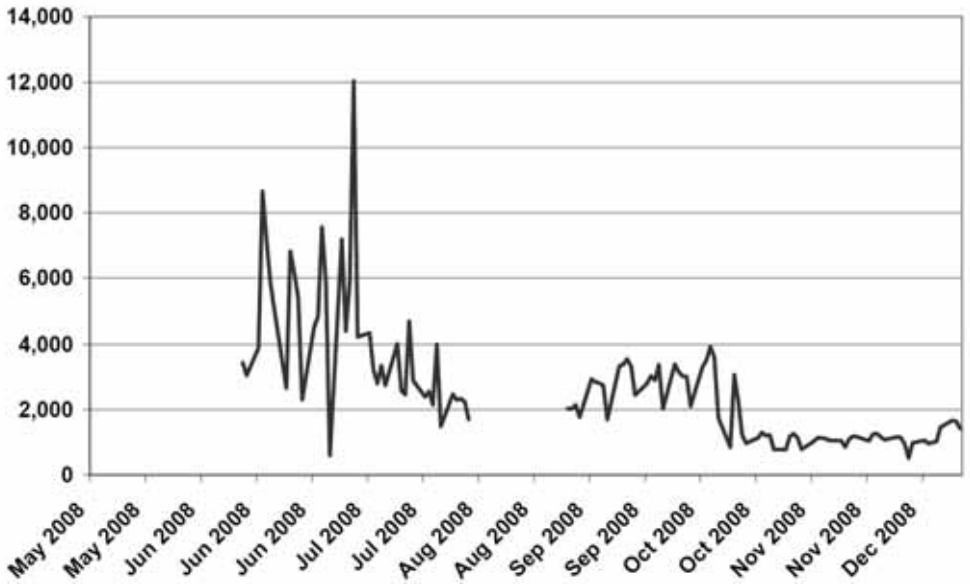
[24] We performed unit root tests for all series. The number of lags recommended by the Schwarz information criterion did not exceed 15 or 22 lags where a number of intermediate lags were excluded. Johanson trace statistics for the number of cointegration vectors are reported in Table A-8 in the Appendix.

market from September to December 2008 in the euro area (see Table 2).[25] In the shortest maturity segment just under one tenth of information relevant for pricing was first processed in the swap market. For all other maturities, pricing virtually only occurred on the bond market. Likelihood ratio tests of the variables for the cointegration vector showed weak exogeneity for bond BEIR with maturities above two years. This adds to the interpretation that in the crisis period the swap market has become nearly an appendix to the government bond market when it comes to price inflation expectations.

What happened in the United States in the autumn of 2008 can be depicted as the collapse of an integrated market for traded inflation expectations. Technically we were not able to find a cointegration relation between the swap and the bond market for maturities of two, three, four, and six years (see Table A-9 in the Appendix). Economically speaking, arbitrage did not prevent markets from developing in completely different directions. The first explanation for this is the increase in transaction costs due to liquidity and financial constraints. This led to a downturn in trades and, for the inflation swap market, even the daily number of quotes decreased dramatically for shorter maturities (see Graph 4). Secondly, a feature that can be seen as unique for the United States is that the pronounced deflationary expectations hampered relative value trades in BEIR. Inflation-linked bonds safeguard investors against deflationary deductions, which are above the coupon payments since the principal is always repaid at 100% or more. This feature only becomes relevant in the case of extreme deflation since the embedded option is far out of the money in normal times. However, in the extreme crisis period of autumn 2008, it is not unreasonable to believe that investors actually assigned a positive value to this option. Furthermore, the liquidity differential between nominal and real US bonds also widened substantially and therefore led to lower bond BEIR.

Graph 4

US inflation swaps: number of daily quotes, tenor two years



For maturities of five years, seven years and above we still found a cointegration relation and the information shares showed a complete concentration of the price discovery on the

[25] Wald tests on the equality of the information shares or the ratio of the γ for the summer and autumn period respectively are rejected for both currency areas.

government bond market. Thus, the declining confidence of investors hindered the trade of financial claims not only in the short-term money market segment but in longer-term markets as well. Only the safest instrument, government bonds, still seemed to be acceptable to investors.

5.3 Price discovery with forward rates

The swap and the bond market are affected by idiosyncratic liquidity and market risk and market-specific demand factors. Therefore it might be helpful to look at cointegration and price discovery for BEIR forward rates derived from BEIR spot rates. As long as the market-specific factors influence all maturities to the same extent, they cancel out when computing forward rates. We calculated five-year forwards starting in two years and starting in five or seven years for both markets and both periods. The series turned out to be stationary in the euro area in the Summer sample, so that no cointegration analysis was executed. For the Autumn period, we calculated Hasbrouck information shares and Gonzalo-Granger contributions to the common factor. For the five-year forward starting in two years, both measures were slightly higher than those for the five-year spot rate in the euro area. Nevertheless the swap market accounted for less than one fifth of price discovery. This is far lower than the information shares computed using the spot rate in the Summer period. This corroborates our interpretation that the crisis infected the short-term segment of the market differently from long-end rates. Furthermore, it shows that apart from idiosyncratic factors prevailing on both markets, the government bond market clearly dominates price discovery for traded long-term inflation expectations.

Forward BEIR from US data showed that price discovery was even in the baseline scenario quantitatively more concentrated on the bond market. For the crisis sample we found a cointegration relationship among the five-year forward bond and swap BEIR starting in two and five years.[26] This might imply that what broke the cointegration relation is contained in liquidity differentials across maturities of the same market.

6. Conclusions

We analyse the price discovery for BEIR by using a high-frequency dataset for inflation-indexed as well as nominal government bonds and inflation swaps. News affecting inflation expectations incorporated in the BEIR are processed slightly more quickly on bond markets for maturities up to five years in the euro area. For longer maturities, bond markets increasingly lead the price discovery process. These results are somewhat dependent on the structure, ie the volume and liquidity of the respective markets. It is in the United States, where the TIPS market is large in absolute volume and compared to overall Treasury issuance, that the bond market clearly determines price formation over all time horizons. This is consistent with the notion that even full collateralisation does not completely eliminate counterparty risk. The default-to-replacement risk remains: collateral is valued at the margin and does not cover the time to re-enter positions after the default of a contract party.

During the autumn of 2008, the growing turmoil in the financial markets seriously disturbed pricing in financial markets worldwide. Price discovery ceased to take place in the swap market. This illustrates the severe dysfunction of the normally smooth working derivative market especially for short to medium maturities. Widening bid/ask spreads – more

[26] As a caveat, note that unit root tests with forward swap rates are rejected in the majority of cases which is not surprising as forward rates are calculated as differences of spot rates.

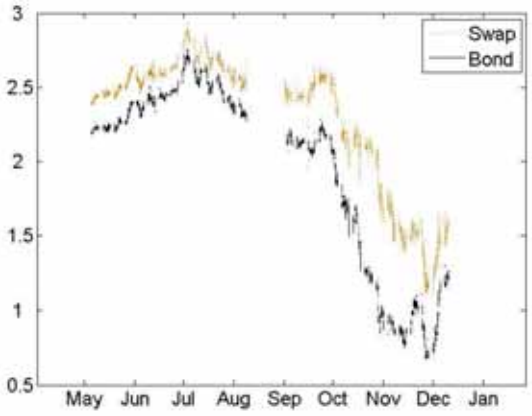
pronounced with derivatives – hampered arbitrage between the bond and the swap market. BEIR were therefore more driven apart than during our baseline sample in Summer 2008. Disruptions coming from the short end of the market even led to a collapse of the integration of the two US markets. Whereas heightened risk aversion generally obstructed trades in financial markets, contributions to price formation concentrated much more on the safest financial instrument, government bonds. Thus, even though in times of severe financial stress swap curves often displayed a much smoother picture, bond BEIR must not be omitted from economic analysis.

In general, BEIR are priced higher on the swap market. We assign this mostly to liquidity and risk premia. Furthermore, the difference between instruments on both markets is not constant but displays time variation. We propose the default-to-replacement risk as one of the features driving this time variability. Embedded put options in inflation-linked bonds, which safeguard against a loss in an extreme deflationary setting, are another explanation for time-variable swap and bond BEIR differences. Since idiosyncratic liquidity and risk premia are difficult to quantify, a promising starting point for further research might be to relate changes in the liquidity premia to aggregate liquidity conditions following Adrian and Shin (2008).

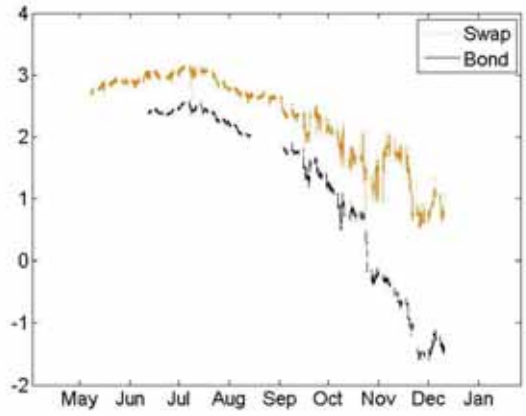
Appendix

Figure A-1

Break-even inflation rate from bonds and swaps for tenor of seven years



(a) Euro area



(b) US

Table A-1

List of euro area bonds

Tenor	ISIN	Coupon	Type	First Issue	Maturity
2 years	FR0108664055	1.25	real	20 Apr 2006	25 Jul 2010
	FR0107674006	2.50	nominal	16 Jun 2005	12 Jul 2010
4 years	FR0000188013	3.00	real	25 Jul 2001	25 Jul 2012
	FR0000188328	5.00	nominal	25 Apr 2001	25 Apr 2012
5 years	DE0001030518	2.25	real	24 Oct 2007	15 Apr 2013
	DE0001135234	3.75	nominal	04 Jul 2003	04 Jul 2013
7 years	FR0010135525	1.60	real	25 Jul 2004	25 Jul 2015
	FR0010163543	3.50	nominal	25 Apr 2004	25 Apr 2015
8 years	DE0001030500	1.50	real	08 Mar 2006	15 Apr 2016
	DE0001135291	3.50	nominal	23 Nov 2005	04 Jan 2016
12 years	FR0010050559	2.25	real	25 Jul 2003	25 Jul 2020
	FR0010192997	3.75	nominal	04 May 2005	25 Apr 2021

Notes: Real bonds indexed to the harmonised euro area HICP ex-tobacco.

Indexation month for French paper is April, for German January.

Table A-2

List of US nominal bonds

Tenor	ISIN	Coupon	First Issue	Maturity
2 years	US912828CX62	3.375	10/15/2004	10/15/2009
3 years	US912828FD71	4.875	5/1/2006	4/30/2011
4 years	US912828GQ75	4.5	4/30/2007	4/30/2012
5 years	US912828HY90	3.125	4/30/2008	4/30/2013
6 years	US912828CT50	4.25	8/16/2004	8/15/2014
7 years	US912828EE63	4.25	8/15/2005	8/15/2015
8 years	US912828FQ84	4.875	8/15/2006	8/15/2016
9 years	US912828HA15	4.75	8/15/2007	8/15/2017
10 years	US912828HR40	3.5	2/15/2008	2/15/2018

Notes: US bonds pay interest semiannually.

Table A-3

List of US inflation-indexed bonds (TIPS)

Tenor	ISIN	Coupon	First Issue	Maturity
2 years	US912828CZ11	0.875	10/29/2004	4/15/2010
3 years	US912828FB16	2.375	4/28/2006	4/15/2011
4 years	US912828GN45	2.0	4/30/2007	4/15/2012
5 years	US912828HW35	0.625	4/30/2008	4/15/2013
6 years	US912828CP39	2.0	7/15/2004	7/15/2014
7 years	US912828EA42	1.875	7/15/2005	7/15/2015
8 years	US912828FL97	2.5	7/17/2006	7/15/2016
9 years	US912828GX27	2.625	7/16/2007	7/15/2017
10 years	US912828HN36	1.625	1/15/2008	1/15/2018

Notes: TIPS are indexed to the CPI-U and pay interest semiannually.

Table A-4

Number of observations by instrument: euro area

tenor	nominal bond	real bond	inflation swap
2 years	32,655	27,488	72,002
4 years	49,024	45,241	73,410
5 years	57,452	18,733	73,312
7 years	56,934	42,337	73,850
8 years	63,017	12,617	73,942
12 years	55,782	38,973	72,213
total	314,864	185,389	438,729

Notes: Number of bid/ask pairs. 5 May to 8 December 2008.

Table A-5

Number of observations by instrument: United States

tenor	nominal bond	real bond	inflation swap
2 years	26,798	17,831	95,349
3 years	46,858	25,651	94,599
4 years	55,833	29,308	95,463
5 years	58,825	37,561	91,589
6 years	64,525	36,599	98,166
7 years	62,793	35,823	94,420
8 years	66,964	43,040	98,673
9 years	69,090	47,661	90,027
10 years	68,935	51,196	99,973
total	520,621	324,670	858,259

Notes: Number of bid/ask pairs. 12 June to 9 December 2008.

Table A-6

Descriptive statistics of break-even inflation rates in the euro area

	Pre-crisis/ Summer 08			*Crisis/ Autumn 08*		
	Mean	*Std.dev.*	*Kurtosis*	*Mean*	*Std.dev.*	*Kurtosis*
2-year bond BEIR	2.35	0.24	2.54	0.91	0.90	1.40
4-year bond BEIR	2,34	0.17	2.58	1.17	0.75	1.36
5-year bond BEIR	2.25	0.16	2.53	1.11	0.71	1.31
7-year bond BEIR	2.36	0.13	2.34	1.41	0.53	1.38
8-year bond BEIR	2.34	0.12	2.58	1.43	0.53	1.41
12-year bond BEIR	2.39	0.11	2.41	1.70	0.40	1.67
2-year swap BEIR	2.73	0.23	2.56	1.36	0.82	1.43
4-year swap BEIR	2.65	0.16	2.69	1.67	0.67	1.52
5-year swap BEIR	2.62	0.14	2.61	1.79	0.59	1.55
7-year swap BEIR	2.59	0.11	2.67	1.98	0.45	1.60
8-year swap BEIR	2.58	0.10	2.61	2.05	0.39	1.62
12-year swap BEIR	2.59	0.09	2.06	2.24	0.28	1.85

Table A-7

Descriptive statistics of break-even inflation rates in the United States

	Pre-crisis/ Summer 08			*Crisis/ Autumn 08*		
	Mean	*Std.dev.*	*Kurtosis*	*Mean*	*Std.dev.*	*Kurtosis*
2-year bond BEIR	3.07	0.26	1.74	-1.75	2.77	1.51
3-year bond BEIR	2.87	0.20	1.68	-1.22	2.11	1.48
4-year bond BEIR	2.75	0.20	1.68	-0.26	1.46	1.48
5-year bond BEIR	2.67	0.19	1.76	0.49	0.95	1.51
6-year bond BEIR	2.33	0.17	1.98	-0.05	1,23	1.56
7-year bond BEIR	2.30	0.15	2.56	0.26	1.08	1.60
8-year bond BEIR	2.40	0.14	2.55	0.62	0.97	1.66
9-year bond BEIR	2.43	0.11	2.54	0.90	0.75	1.80
10-year bond BEIR	2.47	0.12	3.00	1.01	0.60	1.97
2-year swap BEIR	3.04	0.33	1.96	-0.49	1.64	1.58
3-year swap BEIR	3.03	0.30	1.90	0.25	1.27	1.64
4-year swap BEIR	3.00	0.26	1.88	0.89	0.90	1.92
5-year swap BEIR	3.00	0.22	1.96	1.26	0.77	2.34
6-year swap BEIR	2.98	0.20	2.02	1.41	0.66	2.06
7-year swap BEIR	2.96	0.17	2.07	1.56	0.58	2.03
8-year swap BEIR	2.93	0.14	2.22	1.67	0.53	2.15
9-year swap BEIR	2.92	0.12	2.44	1.82	0.46	2.29
10-year swap BEIR	2.93	0.10	2.36	1.96	0.38	2.38

Table A-8

Long-run relation between swap BEIR and bond BEIR in the euro area

	Pre-crisis/ Summer 08		
	# coint. vectors (cv)		*Restriction on cv*
	None	*At most 1*	*(1,-1,c)*
2-year swap-bond BEIR	66.91***	2.59	1.18
4-year swap-bond BEIR	111.07***	3.05	2.85*
5-year swap-bond BEIR	97.61***	2.66	22.43***
7-year swap-bond BEIR	166.85***	3.41	67.49***
8-year swap-bond BEIR	187.65***	3.31	66.10***
12-year swap-bond BEIR	61.64***	5.23	16.65***
	Crisis/ Autumn 08		
	# coint. vectors (cv)		*Restriction on cv*
	None	*At most 1*	*(1,-1,c)*
2-year swap-bond BEIR	151.93***	2.93	60.71***
4-year swap-bond BEIR	44.94***	3.09	11.39***
5-year swap-bond BEIR	23.88***	3.47	7.46***
7-year swap-bond BEIR	23.27***	2.97	5.19**
8-year swap-bond BEIR	35.19***	3.36	19.33***
12-year swap-bond BEIR	46.67***	3.13	30.17***

Rejections of the null at the 10%, 5%, or 1% level is indicated by a superscript *,**, or *** respectively.

Table A-9

Long-run relation between swap BEIR and bond BEIR in the United States

	Pre-crisis/ Summer 08		
	# coint. vectors (cv)		*Restriction on cv*
	None	*At most 1*	*(1,-1,c)*
2-year swap-bond BEIR	34.23***	0.73	1.98
3-year swap-bond BEIR	87.77***	0.96	16.53***
4-year swap-bond BEIR	90.90***	0.75	29.07***
5-year swap-bond BEIR	122.79***	0.94	26.83***
6-year swap-bond BEIR	179.55***	1.07	71.53***
7-year swap-bond BEIR	139.04***	1.61	44.11***
8-year swap-bond BEIR	122.31***	2.15	0.04
9-year swap-bond BEIR	128.65***	1.56	0.48
10-year swap-bond BEIR	145.78***	2.10	19.13***
	Crisis/ Autumn 08		
	# coint. vectors (cv)		*Restriction on cv*
	None	*At most 1*	*(1,-1,c)*
2-year swap-bond BEIR	119.73***	12.05***	
3-year swap-bond BEIR	181.45***	31.88***	
4-year swap-bond BEIR	54.65***	9.21**	
5-year swap-bond BEIR	25.30***	7.34	4.40**
6-year swap-bond BEIR	52.28***	10.76**	
7-year swap-bond BEIR	61.18***	6.94	44.68***
8-year swap-bond BEIR	56.14***	7.71	40.39***
9-year swap-bond BEIR	41.20***	7.28	22.89***
10-year swap-bond BEIR	41.89***	2.70	24.92***

Rejections of the null at the 10%, 5%, or 1% level is indicated by a superscript *,**, or *** respectively.

Table A-10

Bounds on Hasbrouck information shares in the euro area

	Summer		*Autumn*	
	Lower	*Upper*	*Lower*	*Upper*
2-year swap BEIR	0.44	0.47	0.08	0.11
2-year bond BEIR	0.53	0.56	0.89	0.92
4-year swap BEIR	0.42	0.47	0.03	0.07
4-year bond BEIR	0.54	0.58	0.93	0.97
5-year swap BEIR	0.41	0.46	0.04	0.08
5-year bond BEIR	0.54	0.59	0.92	0.96
7-year swap BEIR	0.27	0.32	0.03	0.06
7-year bond BEIR	0.68	0.73	0.93	0.97
8-year swap BEIR	0.08	0.10	0.03	0.06
8-year bond BEIR	0.90	0.92	0.94	0.98
12-year swap BEIR	0.29	0.30	0.01	0.03
12-year bond BEIR	0.63	0.70	0.97	0.99

Note: Where appropriate, according to the results in Table A-8, the restriction of a unity vector is imposed.

Table A-11

Bounds on Hasbrouck information shares in the United States

	Summer		*Autumn*	
	Lower	*Upper*	*Lower*	*Upper*
2-year swap BEIR	0.27	0.27		
2-year bond BEIR	0.73	0.73		
3-year swap BEIR	0.44	0.47	0.08	0.11
3-year bond BEIR	0.11	0.12		
4-year swap BEIR	0.88	0.89		
4-year bond BEIR	0.13	0.13		
5-year swap BEIR	0.86	0.87	0.03	0.04
5-year bond BEIR	0.10	0.11	0.96	0.97
6-year swap BEIR	0.18	0.19		
6-year bond BEIR	0.81	0.82		
7-year swap BEIR	0.09	0.09	0.02	0.02
7-year bond BEIR	0.91	0.91	0.98	0.98
8-year swap BEIR	0.04	0.04	0.00	0.00
8-year bond BEIR	0.96	0.96	1.00	1.00
9-year swap BEIR	0.04	0.04	0.01	0.02
9-year bond BEIR	0.96	0.96	0.98	0.99
10-year swap BEIR	0.04	0.04	0.00	0.01
10-year bond BEIR	0.96	0.96	1.00	0.99

Note: Where appropriate, according to the results in Table A-9, the restriction of a unity vector is imposed.

References

Adrian, T and H Shin (2008): "Financial intermediary leverage and value-at-risk", *Federal Reserve Bank of New York Staff Reports*, no 338.

Armann, V, B Benaben and B Lambert (2005): "Inflation flows and investment strategies", in *Inflation-linked products – A guide for investors and asset & liability managers*, B Benaben (ed), pp 65–116, Riskbooks.

Baillie, R, G Bootha, Y Tse and T Zabotinac (2002): "Price discovery and common factor models", *Journal of Financial Markets*, 5, pp 309–21.

Blanco, R, S Brennan and I Marsh (2005): "An empirical analysis of the dynamic relation between investment-grade bonds and credit default swaps", *Journal of Finance*, vol 60, no 5, pp 2255–81.

Buraschi, A and D Menini (2002): "Liquidity risk and specialness", *Journal of Financial Economics*, vol 64, 243–84.

Campbell, J and R Shiller (1996): "A scorecard for indexed government debt", in *National Bureau of Economic Research Macroeconomics Annual*, B Bernanke and J Rotermberg (eds), pp 155–97, MIT Press.

Campbell, J, R Shiller and L Viceira (2009): "Understanding inflation-indexed bond markets", *NBER Working Paper*, no 15014.

Deacon, M, A Derry and D Mirfendereski (2004): *Inflation-indexed securities*, John Wiley, second edition.

Doetz, N (2007): "Time-varying contributions by the corporate bond and CDS markets to credit risk price discovery", *Deutsche Bundesbank Discussion Paper Series 2: Banking and Financial Studies*, no 8.

Eijsing, J, J Garcia and T. Werner (2007): "The term structure of euro area break-even inflation rates – the impact of seasonality", *ECB Working Paper Series*, no 830.

Engle, R and C Granger (1987): "Cointegration, and error correction: representation, estimation, and testing", *Econometrica*, vol 55, pp 987–1007.

European Central Bank (2006a): "Measures of inflation expectations in the euro area", *ECB Monthly Bulletin*, July, pp 59–68.

——— (2006b): "MOC Monitoring Working Group: Treasury inflation-protected bonds and inflation swaps as tools to monitor inflation expectations", mimeo.

Gonzalo, J and C Granger (1995): "Estimation of common long memory components in cointegrated systems", *Journal of Business & Economic Statistics*, vol 13, pp 27–36.

Grammig, J and F Peter (2008): "International price discovery in the presence of market microstructure effects", mimeo, Tübingen University.

Grath, G and R Windle (2006): "Recent developments in sterling inflation-linked markets", *Bank of England Quarterly Bulletin*, vol 46, no 4, pp 24–34.

Hakkio, C and M Rush (1991): "Cointegration: how short is the long run?", *Journal of International Money and Finance*, vol 10, pp 571–81.

Hasbrouck, J (1995): "One security, many markets: determining the contributions to price discovery", *Journal of Finance*, vol 50, pp 1175–99.

Hurd, M and J Relleen (2006): "New information from inflation swaps and index-linked bonds", *Bank of England Quarterly Bulletin*, vol 46, no 1, pp 386–96.

International Swaps and Derivatives Association (2005): *2005 ISDA Collateral guidelines*.

——— (2008): *ISDA Margin survey 2008*.

Kerkhof, J (2005): “Inflation derivatives explained”, Lehman Brothers.

Kim, D and J Wright (2005): “An arbitrage-free three-factor term structure model and the recent behavior of long-term yields and distant-horizon forward rates”, *Federal Reserve Board Discussion Paper*, no 33.

Liu, J, F Longstaff and R Mandell (2006): “The market price of risk in interest rate swaps: the roles of default and liquidity risks”, *Journal of Business*, vol 79, no 5, pp 2337–59.

Madar, L, A Rodrigues and M Steinberg (2009): “The impact of news on the term structure of break-even inflation”, available at Social Science Research Network (SSRN): http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1343687.

Mizrach, B and C Neely (2005): “Information shares in the U.S. treasury market”, *Federal Reserve Bank of St Louis Working Paper*, no 2005-07E.

Peat, T and R Segregeti (2008): “Inflation derivatives. A user guide,” Barclays Capital, Inc.

Rogoff, K (1996): “The purchasing power parity puzzle”, *Journal of Economic Literature*, vol 34, pp 647–68.

Stock, J and M Watson (1988): “Variable trends in economic time series”, *Journal of Economic Perspectives*, vol 2, no 3, pp 147–74.

Upper, C and T Werner (2007): “The tail wags the dog: time-varying information shares in the Bund market”, *BIS Working Papers*, no 224.

Wright, J (2008): “Term premiums and inflation uncertainty: empirical evidence from an international panel dataset”, *Finance and Economics Discussion Series paper*, no 2008-25, Board of Governors of the Federal Reserve System.

Session 4 A

The use of surveys to remedy data gaps

Chair: Alberto Karlen, Central Bank of Argentina

Papers:

Business outlook of small, medium and large scale enterprises: implications for monetary policy in Nigeria
Sani I Doguwa, Olorunsola E Olowofeso and Sunday N Essien, Central Bank of Nigeria

The use of surveys to measure sentiment and expected behaviour of key sectors in the financial system and the economy: evidence from the business survey conducted by the Central Bank of Lebanon
Sana Souaid Jad, Central Bank of Lebanon

Inflation forecasts from the Bank of Italy-Sole 24 Ore survey of expectations of inflation and growth
Raffaele Tartaglia-Polcini, Bank of Italy

Business outlook of small, medium and large scale enterprises: implications for monetary policy in Nigeria

Sani I Doguwa[1], Olorunsola E Olowofeso[2] and Sunday N Essien[3]

1. Introduction

The Small and Medium Enterprises (SME) sub-sector plays a very important role in economic growth and is considered as the backbone of industrial development. Apart from providing opportunities for employment generation, SMEs help to offer effective means of curtailing rural-urban migration and also help in strengthening industrial inter-linkages and integration. However, the SMEs in Nigeria have not optimally performed as expected and thus are yet to play the expected vital role in economic development. This worrisome situation prompted the government to embark on various initiatives to promote this sub-sector of the economy. The roles of government and the Central Bank of Nigeria in unlocking credit facilities to the real sector of the economy are also of vital importance in boosting the SMEs. Some of the schemes recently initiated by the CBN include: the 500 billion naira power/manufacturing facility; approval of the ₦200 billion facility for the Small and Medium Enterprises Credit Guarantee Scheme. The scheme is aimed at promoting access to credit by manufacturers and SMEs in Nigeria. The main objectives of the scheme are to: fast-track the development of the SME/manufacturing sector of the Nigerian economy by providing guarantees; set the pace for industrialization of the Nigerian economy; increase the access to credit by promoters of SMEs and manufacturers; and generate employment.

In spite of government efforts in Nigeria to promote small, medium and large scale enterprises, the SMEs have performed rather below expectations. Different people, organizations, and operators have advanced various reasons as to why SMEs have not been able to live up to their expectations, judging by performances of these industries. Most of the reasons are purely judgmental and not empirically tested. However, since 2008 the Central Bank of Nigeria has conducted periodic impressionistic surveys to gauge the impulse of operators in the various business segments of the economy. Among such surveys are: Business Expectations, Inflation Attitudes and Consumer Expectations Surveys. These surveys, which are usually carried out on a quarterly basis, help to shape informed opinion on the performance of the different segments of the economy. They seek to obtain the business sentiments of key business operators as well as consumers. The questions asked relate to the perception of the operators on their expectations on selected key policy variables, such as interest rates, the exchange rate, consumer prices, etc. The outcomes of these surveys provide useful input to policymakers to formulate appropriate monetary policy in order to address major concerns expressed by the operators. They help to complement, to a large extent, other macroeconomic fundamentals in fashioning the policy direction during any given period of time.

---

[1] Statistics Department, Central Bank of Nigeria, Abuja, sidoguwa@cbn.gov.ng.

[2] Statistics Department, Central Bank of Nigeria, Abuja, oeolowofeso@cbn.gov.ng.

[3] Statistics Department, Central Bank of Nigeria, Abuja, snessien@cbn.gov.ng.

The views expressed in this paper are personal to the authors and not necessarily shared by the Central Bank of Nigeria.

The paper attempts to empirically evaluate the business conditions in Nigeria by making use of returns obtained from the Business Expectations Survey conducted on business enterprises in the small, medium and large enterprise categories. Indicators on the current perception and outlook of entrepreneurs are obtained so as to guide decision making and economic management. It also facilitates proper assessment of the characteristics of small, medium and large scale enterprises as well as the prevailing factors that make them not perform profitably. The major constraints that they face which contribute to their poor performance and thus hamper their effective contributions to the country's economic development are also highlighted.

2. Literature Review

In the last two decades, tremendous studies have been carried out on the roles/efforts of small, medium and large enterprises in boosting economic development. The contributions of SMEs as well as the large scale enterprises to industrial development, technological innovations and export promotion are well recognized. Apart from their roles in terms of their contribution to employment and economic growth, there is wide recognition in past studies that examined and described the roles, challenges and barriers faced by Nigerian SMEs. Ekpenyong and Nyong (1992) examined the characteristics of SMEs with reference to educational background of the operators, their training and experience before embarking on the business, the type of business they operate, and the size of the enterprise as well as their sources of funds (formal or informal institutions). They discovered that much of the initial financing for SMEs came from personal savings of the operators themselves and from formal financial institutions while additional financing came mainly from informal sources.

Other sources include Wan (2003), Stuti (2005) and Hall (2002). Wan (2003) had equally highlighted the challenges confronting SMEs as lack of financing, low productivity, lack of managerial capabilities, access to management and technology, and heavy regulatory burdens, among many others. Lafleche (2007) carried out an assessment of Canada's Business Outlook Survey and the results have proven useful in understanding macroeconomic phenomena from a macroeconomic perspective. In a recent development, the Monetary Policy Committee (MPC) of the Central Bank of Nigeria highlighted the major constraints on the domestic economy to include the infrastructure gap, lack of access to finance, lack of skills, unfavorable trade policy and a poor investment climate which it said could retard growth. The MPC therefore stressed the need for government to deepen and pursue macroeconomic, structural and institutional reforms that are very critical to the growth of the economy.

Most macroeconomists today adhere to the Rational Expectations Macroeconomic Equilibrium model which is based on the ideas of rational expectations by economic agents. Policymakers are assumed to have a set of goals and conception of how the economy works, and the private sector is expected to understand to a reasonable extent the policymakers' views. If the policymakers and private market participants do not have views that converge, no stable equilibrium is possible because expectations as to the behavior of others will be constantly changing. In this setting, market behavior depends centrally on expectations concerning monetary policy and the effects of monetary policy on the economy, including effects on inflation, employment, and financial stability. A stable equilibrium requires that markets behave as policymakers expect and that policymakers behave as markets expect. This inter-relationship forms the basis for the nexus between business outlook and monetary policy considerations.

3. Methodology

The study covered the six geo-political zones of Nigeria as shown in the map below. The map and Table 1 show the sampled states and the sample size of the study.

Fig 1

Map of Nigeria showing Different States of the Federation

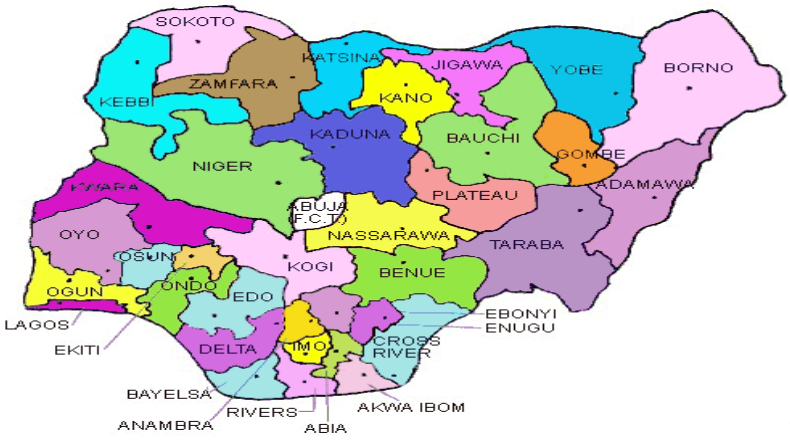


Table 1

The States Covered and Sample Size

Geo-political zone	State	Sample frame size
North Central	Plateau, Benue, Kwara, Niger	150
North East	Bauchi, Borno	150
North West	Kaduna, Kano, Katsina	150
South East	Imo, Enugu, Anambra, Abia	200
South South	Rivers, Delta	150
South West	Lagos, Ondo, Oyo	300
Total		1100

The respondents are stratified into the six geo-political zones, with the establishments classified by type and size. The respondents are mostly business leaders, business owners themselves and corporate executives. The small (1–49), medium (50–199) and large (200 and above) scale enterprises considered comprise of one-man business, partnership, cooperative, family business, private limited company and public limited company. For purposes of consistency and continuity, the same sets of businesses are covered in most cases, during each round of the survey.

The data used for this study are obtained from the survey data of the Business Expectations Survey (BES) of leading firms (small, medium and large) drawn from business establishment updated frames of the Central Bank of Nigeria (CBN) and the National Bureau of Statistics (NBS) carried out by the CBN quarterly. The sectors covered include Industry, Construction, Wholesale and Retail Trade, Financial Intermediation, Hotels and Restaurants, Renting and Business Activities and Community and Social Services. The statistics staff of the Central Bank of Nigeria in the branch offices collect the data from the six geo-political zones by using a well structured questionnaire.

The data collected were analyzed using the Statistical Packages for Social Sciences (SPSS). At the end of the survey, three (and in some cases five) global percentages are computed for each question. These are percentage of positive responses (P), percentage of negative responses (N) and percentage of responses that remained the same (E).

The classical Diffusion Index (DI) used in the analysis is defined as:

$$DI = P–N$$

However, for each five-option question the DI is computed as:

$$DI = (SP+0.5P) – (SN+0.5N)$$

Where

SP = proportion (in per cent) of strongly positive responses

SN = proportion (in per cent) of strongly negative responses

A positive index indicates a favorable view, except for the average inflation rate index and the average borrowing rate index, where a positive index indicates a rise in inflation and borrowing rates.

4. Results and Discussions

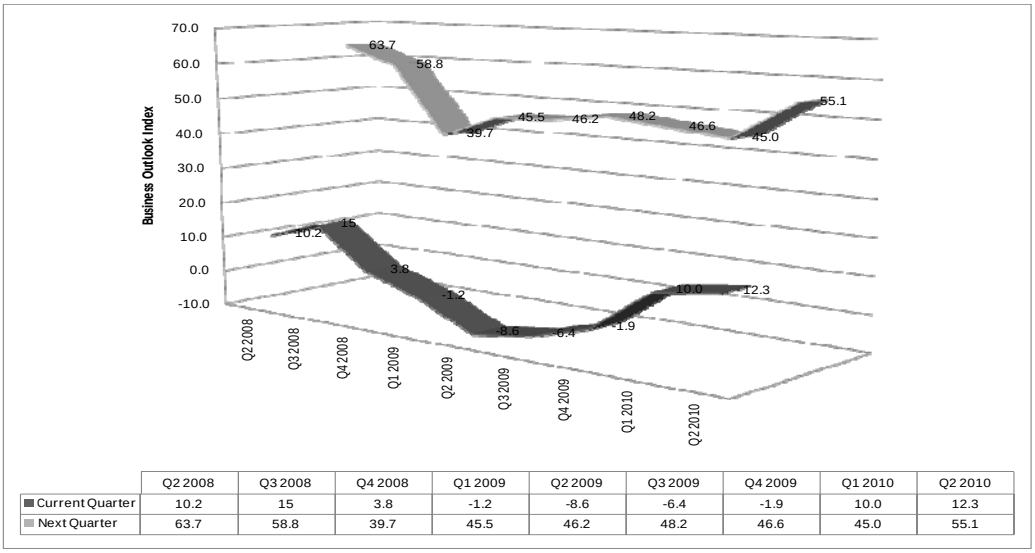
The result of the analysis carried out for all the survey data from Q2 2008 to Q2 2010 provides advance indication of change in the overall business activity in the economy and in the various measures of activity of the companies' own operations as well as selected economic indicators. Table 2 presents the BES results for the Nigerian Federation overall. Other tables for the six geo-political zones are not presented here for the purpose of brevity, but are available on request.

4.1 Overall Business Outlook

In Q2 2010, a breakdown of responses received by type of business showed that 16.3 per cent are importers, 13.5 per cent are those with dual roles (both importers and exporters), and 4.4 per cent are exporters. About 65.7 per cent of respondents indicated "neither importer nor exporter" category.

Fig 2

National Overall Business Outlook Index (BOI)



	Q2 2008	Q3 2008	Q4 2008	Q1 2009	Q2 2009	Q3 2009	Q4 2009	Q1 2010	Q2 2010
Current Quarter	10.2	15	3.8	-1.2	-8.6	-6.4	-1.9	10.0	12.3
Next Quarter	63.7	58.8	39.7	45.5	46.2	48.2	46.6	45.0	55.1

As shown in Fig 2, the survey results indicate that confidence in the performance of the economy has improved significantly as business respondents with a positive outlook in the second quarter of 2010 outnumbered those with a negative outlook, as the overall confidence index (BOI) or diffusion index was positive at 12.3 points. This index was 2.3 and 20.9 points higher than the levels recorded in the preceding quarter, and the corresponding quarter a year ago. The positive index, indicating expectation of an upturn in business activity, is attributable to the positive outlook particularly of “neither importer nor exporter” (16.3 points), “exporter” (12.1 points) and “importer” firms (11.5 points). Similarly, respondents are more upbeat in their expectations for the next quarter as the confidence index is expected to increase significantly to 55.1 points up from 12.3 points in Q2 2010. The higher index recorded for the next quarter could be attributed to the positive outlook exhibited particularly by respondent firms in the importer category (62.3 points) and exporter firms (60.6 points).

Table 2

Business Expectations Survey Results

BUSINESS EXPECTATIONS SURVEY

National

Year	2008			2009				2010	
Quarter	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
1. Overall Business Outlook on the Macroeconomy									
Confidence Index: All Sectors									
Current Quarter									
National	10.2	15.0	3.8	-1.2	-8.6	-6.4	-1.9	10.0	12.3
Next Quarter									
National	63.7	58.8	39.7	45.5	46.2	48.2	46.6	45.0	55.1
2. Business Outlook Index on the Macroeconomy by Sector: Current Quarter									
Industrial Sector	21.7	14.9	-7.0	-11.9	-19.0	-13.1	-6.5	10.3	16.9
Construction Sector	5.2	43.8	12.9	5.3	-17.4	-16.7	6.7	17.1	7.8
Wholesale and Retail Trade	-12.3	16.1	6.7	-1.6	-4.2	3.7	-8.6	1.7	8.5
Services Sector of which:	14.7	11.6	-4.9	3.4	0.0	-1.1	5.9	11.9	4.4
Financial Intermediation	44.4	36.4	-21.1	-15.8	-16.7	-30.8	-11.1	42.3	40.0
Hotels and Restaurants	8.5	16.3	12.3	0.0	-1.4	-6.3	17.0	11.4	10.9
Renting and Business Activities	34.0	-16.1	34.4	18.2	-25.0	-3.1	-4.5	8.0	25.0
Community and Social Services	78.6	-24.1	25.4	11.1	4.2	-9.1	-12.9	4.3	17.4
3. Business Outlook Index on the Macroeconomy by Sector: Next Quarter									
Industrial Sector	68.1	58.8	37.6	42.4	45.1	45.1	50.4	48.5	57.6
Construction Sector	63.6	79.5	65.6	65.8	56.5	31.3	53.3	39.0	45.1
Wholesale and Retail Trade	77.2	57.8	40.6	48.9	50.7	46.3	34.9	34.5	56.0
Services Sector of which:	54.7	50.0	31.7	33.9	37.2	55.6	39.9	35.8	47.1
Financial Intermediation	55.6	72.7	36.8	26.3	50.0	23.1	27.8	73.1	53.3
Hotels and Restaurants	72.0	62.6	47.4	58.3	57.5	63.5	68.2	59.5	61.8
Renting and Business Activities	88.7	51.6	59.4	39.4	25.0	50.0	50.0	56.0	57.1
Community and Social Services	93.3	55.2	29.3	51.4	37.5	45.5	58.1	56.5	60.9
4. Business Confidence Index on Own Operations by Sector: Current Quarter									
Industrial Sector	21.3	12.8	-2.7	4.1	1.5	-4.0	-10.2	4.2	7.0
Construction Sector	66.2	20.8	-12.5	0.0	4.3	-2.1	-20.0	-2.4	0.0
Wholesale and Retail Trade	29.7	3.8	9.4	1.6	8.5	10.6	-2.7	-1.1	7.1
Services Sector	-4.6	16.4	15.9	6.7	5.1	7.8	9.2	-12.7	-2.9
5. Business Outlook Index on Own Operations : Current Quarter									
Volume of Business Activity Index	21.5	24.2	15.1	6.9	10.7	3.6	3.5	4.6	16.4
Volume of Total Order Book Index	-2.3	22.7	12.3	9.5	6.3	2.2	2.7	1.2	11.8
Credit Access Index	3.0	-0.5	-6.9	-9.3	-6.8	-7.2	-18.0	-20.7	-8.8
Financial Condition Index	18.6	12.7	7.9	4.4	4.6	1.0	-2.1	-0.3	8.1
Average Capacity Utilization	77.4	21.3	19.4	11.7	15.2	10.4	7.8	13.0	17.5
6. Business Outlook Index on Own Operations : Next Quarter									
Volume of Business Activity Index	46.2	74.8	57.2	67.2	67.7	62.0	64.4	55.6	71.9
Employment Outlook Index	70.6	44.6	39.6	31.2	39.9	36.5	32.0	31.3	40.1
7. Employment Outlook Index on Own Operations by Sector: Next Quarter									
Industrial Sector	51.7	40.1	37.4	18.2	34.6	29.7	31.2	34.7	29.6
Construction Sector	39.8	56.2	59.4	47.4	21.7	25.0	53.3	43.9	58.8
Wholesale and Retail Trade	29.6	47.8	80.6	24.7	45.5	40.1	28.0	19.2	44.7
Services Sector	52.6	45.3	73.1	41.3	43.0	46.9	35.5	33.6	44.1
8. Business with Expansion Plans (in per cent): Next Quarter									
Industrial Sector	75.6	70.0	61.5	61.1	57.1	55.9	52.9	63.0	35.8
Construction Sector	69.7	68.5	59.4	68.4	39.1	62.5	70.0	58.5	52.9
Wholesale and Retail Trade	43.9	67.2	60.6	61.9	64.3	63.1	59.1	67.2	50.4
Services Sector of which:	75.4	72.1	67.5	66.4	71.1	68.9	63.2	58.2	52.9
Financial Intermediation	77.8	63.6	73.7	78.9	58.3	69.2	61.1	61.5	73.3
Hotels and Restaurants	82.9	69.7	63.2	66.7	54.1	66.7	62.5	67.1	41.8
Renting and Business Activities	64.2	71.0	71.9	87.9	100.0	84.4	77.3	52.0	57.1
Community and Social Services	86.7	51.7	72.9	56.9	50.0	70.5	51.6	52.2	21.7

Source: Authors' Calculation.

Table 2

Business Expectations Survey Results (Continued)

BUSINESS EXPECTATIONS SURVEY

National

Year	2008			2009				2010	
Quarter	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
9. Business Constraints: Current Quarter									
High Interest Rate	58.1	57.2	55.4	56.4	63.8	54.8	59.1	64.2	62.8
Unclear Economic Laws	36.1	35.2	35.4	35.2	41.7	34.9	37.1	45.6	45.8
Lack of Equipment	16.3	5.0	13.6	17.1	18.2	18.1	18.1	31.2	25.2
Insufficient Demand	9.9	2.6	13.9	19.8	22.6	19.0	23.0	23.3	30.4
Access to Credit	26.5	18.7	23.0	23.2	31.4	34.0	39.8	39.2	36.7
Financial Problems	42.1	41.6	41.2	45.4	48.8	46.7	51.1	60.0	51.9
Competition	34.2	32.7	38.1	34.4	39.8	31.1	32.3	29.1	41.9
Labor Problems	-14.3	-16.6	-8.5	-8.1	0.8	-0.2	-1.3	5.8	6.2
Lack of Materials Input	5.4	-2.9	10.2	11.2	11.6	8.7	9.3	20.6	18.7
Unfavourable Political Climate	17.6	13.9	23.7	28.7	29.3	-11.3	32.0	36.6	33.2
Unfavourable Economic Climate	43.4	37.5	42.0	45.5	49.1	42.6	48.5	48.1	47.5
Insufficient Power Supply	68.5	68.5	60.8	58.0	71.0	66.2	70.5	77.2	72.7
10. Business Expectation Index on Selected Economic Indicators: Current Quarter									
N/$ Exchange Rate	14.8	17.8	-5.4	-6.3	12.4	-6.2	-3.1	3.3	-2.4
Inflation Rate	24.7	22.2	23.0	18	24.8	25.1	16.2	8.7	8.5
Borrowing Rate	-3.5	-2.9	12.0	-2.5	-3.5	4.3	-2.9	-14.0	3.1
11. Business Expectation Index on Selected Economic Indicators: Next Quarter									
N/$ Exchange Rate	28.6	24.9	3.5	5.5	8.1	16.4	11.3	10.8	25.2
Inflation Rate	-3.5	-2.9	12.0	6.6	-14.2	6.5	7.7	-11.0	3.9
Borrowing Rate	-0.5	-1.4	-2.0	-3.3	-5.6	1.3	-7.5	-20.3	-2.6
12. Business Outlook index on the Macroeconomy by Type of Business: Current Quarter									
Importer	3.9	14.9	7.7	11.1	-22.0	11.5	-2.8	6.5	11.5
Exporter	42.9	43.8	-14.3	10.3	25.0	-15.2	-4.0	20.6	12.1
Both Importer and Exporter	6.8	16.1	15.1	4.5	-1.5	-22.3	-12.0	-3.9	-5.9
Neither Importer nor exporter	11.1	7.7	-2.3	-10.2	-8.6	-8.3	0.4	13.4	16.3
13. Business Outlook index on the Macroeconomy by Type of Business: Next Quarter									
Importer	64.1	63.2	35.4	44.7	28.9	44.2	29.2	25.4	62.3
Exporter	85.2	61.3	35.0	57.1	78.3	51.1	72.0	47.1	60.6
Both Importer and Exporter	56.2	60.1	39.7	43.9	45.6	42.0	51.8	26.5	42.6
Neither Importer nor exporter	65.1	57.7	40.8	45.2	48.6	51.7	52.1	56.1	55.6
14. Business Outlook index on the Macroeconomy by Size of Business: Current Quarter									
Small (<50)	5.4	13.6	6.7	1.7	-8.9	-4.9	63.6	13.8	13.2
Medium (50 and <200)	17.9	19.1	-9.6	-9.7	-11.6	-2.5	58.4	-7.1	10.2
Large (200 and Up)	23.5	19.2	6.8	-8.1	0.0	-26.0	55.8	20.0	10.8
15. Business Outlook index on the Macroeconomy by Size of Business: Next Quarter									
Small (<50)	65.7	59.1	40.9	47.8	48.1	50.3	47.8	46.9	55.5
Medium (50 and <200)	64.6	59.1	40.0	42.4	40.8	46.3	50.4	38.8	53.9
Large (200 and Up)	52.4	60.3	29.3	36.1	45.8	36.5	34.7	45.6	54.1
16. Percentage Distribution of Respondent Firms by Type of Business									
Importer	17.7	18.3	28.3	29.6	15.0	23.2	26.4	22.0	16.3
Exporter	3.2	3.5	3.0	4.0	4.0	4.7	3.1	4.4	4.4
Both Importer and Exporter	17.6	16.2	10.6	9.0	11.2	14.2	10.3	13.3	13.5
Neither Importer nor exporter	61.5	62.0	58.0	57.4	69.8	57.9	60.2	60.2	65.7
17. Percentage Distribution of Respondent Firms by Employment Size									
Small (<50)	69.1	71.9	73.3	71.5	70.3	73.5	71.3	66.1	72.8
Medium (50 and <200)	18.7	19.3	18.1	19.9	20.0	16.6	16.5	22.2	17.1
Large (200 and Up)	11.9	8.7	8.6	8.5	9.7	9.8	12.2	11.7	9.9
No Response	0.3	0.1	0	0.1	0	0.1	0.0	0.0	0.0
18. Distribution of Respondent Firms by Sector									
Sample Size (N)	**1075**	**1075**	**1050**	**1024**	**850**	**1100**	**1100**	**1100**	**1100**
Response Rate(%)	80.6	83.3	81.5	71.2	71.3	89.1	73.1	69.7	67.9
All Sectors	**866**	**896**	**856**	**729**	**606**	**980**	**804**	**767**	**747**
Industrial Sector	240	338	187	194	205	350	276	262	243
Construction Sector	77	73	32	38	23	48	30	41	51
Wholesale and Retail Trade	180	186	180	182	143	217	186	177	141
Services Sector of which:	369	299	290	119	235	365	312	287	312
Financial Intermediation	18	11	19	19	12	13	18	26	15
Hotels and Restaurants	82	99	57	72	74	96	88	79	110
Renting and Business Activities	53	31	32	33	4	32	22	25	28
Community and Social Services	15	29	59	72	24	44	31	23	23

Source: Authors' Calculation.

The business confidence of “neither importer nor exporter” firms in Q2 2010 improved significantly to 16.3 index points. This index was 2.9 and 24.9 points above the levels achieved in the preceding quarter and the corresponding period a year ago. Apart from “dual importer and exporter” firms, which are pessimistic in the current quarter with a lower index of –5.9, “exporter” and “importer” firms are optimistic with 12.1 and 11.5 index points, respectively. The importer expectation was an improvement over the levels achieved in the preceding quarter and the corresponding quarter a year earlier. “Importer” and “exporter” firms are expected to be more upbeat in the next quarter as their confidence index figures are expected to increase to 62.3 and 60.6 index points up from 11.5 and 12.1 index points, respectively in Q2 2010.

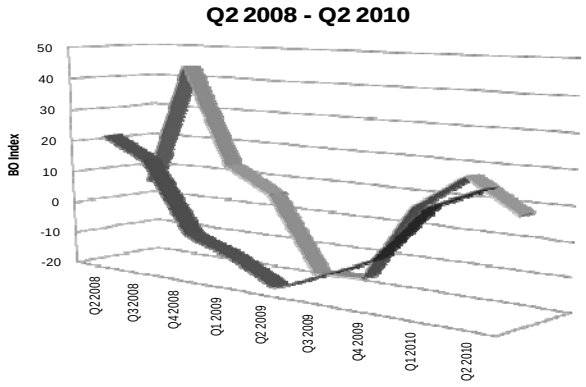
The survey results, by employment size, showed that small firms (with 50 employees or fewer) are the most upbeat about the economy, in both Q2 2010 and the next quarter, with the index values of 13.2 and 55.5 points, respectively. However, medium-sized firms (with more than 50 and fewer than 200 employees) are less optimistic about the economy in Q2 2010 as reflected in their diffusion index of 10.2 points. In contrast, both the medium and large firms are optimistic about the economy in the next quarter.

4.2 Sectoral Outlook

Fig 3(a,b) shows the plot of the sectoral outlook indices by sectors. All sectors posted positive indices indicating that the number of firms that were confident about business conditions in the second quarter of 2010 outnumbered those with negative views. The industrial and wholesale/retail trade sectors posted the highest indices at 16.9 and 8.5 points, respectively. The business outlook of the construction and services sectors also remained positive at 7.8 and 4.4 index points, respectively. By the next quarter of 2010, it was expected that the sectoral outlook would likely improve with all indices on the uptrend.

Fig 3 (a)

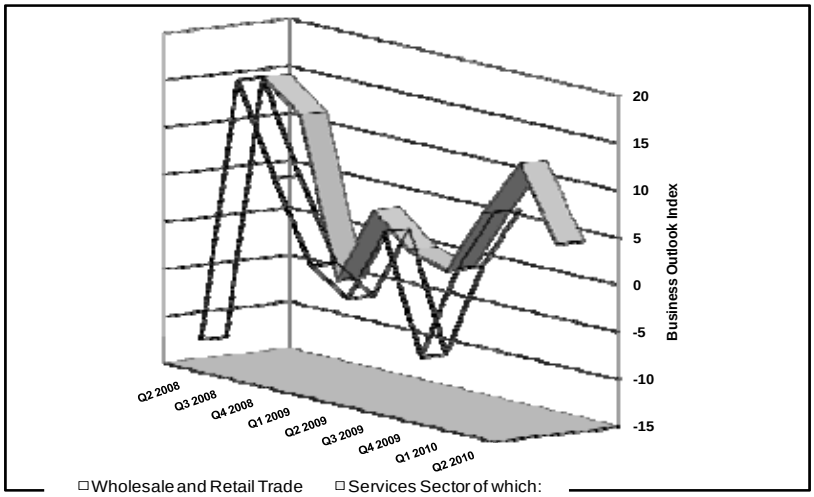
Current Quarter Business Outlook Index by Sector



	Q2 2008	Q3 2008	Q4 2008	Q1 2009	Q2 2009	Q3 2009	Q4 2009	Q1 2010	Q2 2010
Industrial Sector	21.7	14.9	-7.0	-11.9	-19.0	-13.1	-6.5	10.3	16.9
Construction Sector	5.2	43.8	12.9	5.3	-17.4	-16.7	6.7	17.1	7.8

Fig 3 (b)

Current Quarter Business Outlook Index by Sector

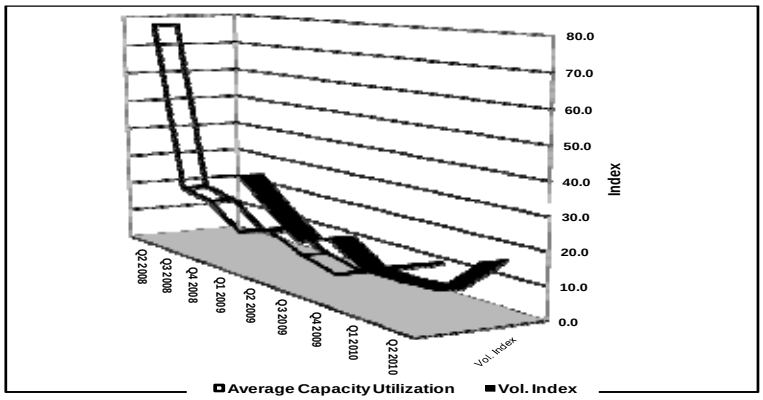


4.3 Business Confidence on Own Operations

Respondent firms from the wholesale/retail trade and industrial sectors were expecting an upturn in business operations, as the indices remained positive at 7.1 and 7.0 points, respectively. In contrast, the downtrend of the services sector in the current quarter could be attributable to insufficient power supply, the high interest rate and the deteriorating liquidity position of the respondent firms. The upswing in the capacity utilization index was largely as a result of the substantial increase in the volume of orders (11.8 points from 1.2 points in the preceding quarter) and consequently resulted in the increased volume of business activities.

Fig 4

Volume and Capacity Utilization Index



The average capacity utilization index (ACU) remained positive at 17.5 index points during the second quarter of 2010. This was 4.5 and 2.3 points above the levels achieved in the preceding quarter and in the corresponding quarter a year ago, respectively (Fig 4). The upswing in the capacity utilization index was largely as a result of the substantial increase in the volume of orders.

The volume of the respondents' business activities in the current quarter remained positive at 16.4 index points, up from the 4.6 points achieved in the preceding quarter. However,

compared with the corresponding period a year ago, the index rose by 5.7 points. By the next quarter of 2010, the volume of business activity outlook is expected to remain positive with a diffusion index of 71.9 points indicating an uptrend (Fig 4).

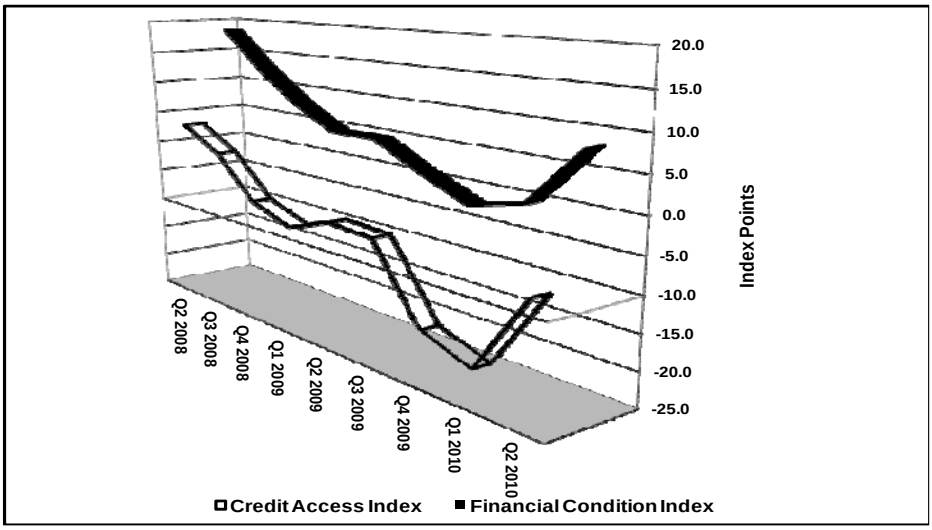
4.4 Access to Credit and Financial Condition

The access to credit in Q2 2010 improved slightly as the credit access index (CAI) remained negative at –8.8 index points, up from –20.7 points in Q1 2010. This negative perception of the respondents could be attributable to insufficient power supply, the high interest rate and financial problems.

The financial condition index (FCI), which is an indicator of the internal liquidity situation of respondents' enterprises in the current quarter, improved to 8.1 points from –0.3 in the first quarter of 2010 and 4.6 points recorded a year ago. This indicated that there were more respondent firms with favorable cash/liquidity positions in Q2 2010 (Fig 5). The marginal upswing in financial conditions of respondent firms was moderated by the limited access to credit and the high interest rates.

Fig 5

Credit Access and Financial Condition Index



4.5 Employment and Expansion Plans

The employment outlook index in Q2 2010 stood at 40.1 points, suggesting that firms are expected to hire more in the next quarter. The employment outlook was expected to be particularly strong for the construction sector (58.8 index points), wholesale/retail trade sector (44.7 index points) and services sector (44.1 index points) as a result of their expansion plans in the next quarter. The number of construction and services sector firms with expansion plans for the next quarter of 2010 is expected to rise to 52.9 per cent each. In the services sector, financial intermediation firms have the largest expansion plans, followed by renting and business activities. This augurs well for the economy, as it points to renewed investor confidence in the country.

Although the business outlook in Q2 2010 was seen as generally improving, respondents cited insufficient power supply (72.7 index points), the high interest rate (62.8 index points), financial problems (51.9 index points) and the unfavorable economic climate (47.5 index points) as major constraints to their business operations.

4.6 Expectations on Key Economic Indicators

Respondent firms anticipated that the naira would depreciate in Q2 2010 and appreciate in the next quarter with an exchange rate index of –2.4 and 25.2 points, respectively. Inflation is expected to accelerate in both the current and the next quarter, while the borrowing rate is expected to rise in Q2 2010 and drop in the next quarter with a borrowing rate index of 3.1 and –2.6 points, respectively.

Table 3

Correlations between BES Indicators and Key Macroeconomic Variables

BES Data	Economic Variable	Correlations (Q2 08–Q2 10)
BOI	GDP growth, LR	0.827, –0.543
VBI	ER, LR, $\pi_{food,}$ MPR	–0.824, –0.884, 0.617, 0.647
ERI	ER, $\pi_{core,}$ LR	–0.533, –0.689, –0.703
CAI	ER, $\pi_{core,}$ LR, MPR	–0.723, –0.666, –0.829, 0.715
FCI	EX, $\pi_{food,}$ LR, MPR	–0.821, 0.690, –0.917, 0.735
ACU	ER, $\pi_{core,}$ LR, MPR	–0.645, –0.799, –0.817, 0.539

Source: Authors' Calculation.

5. Implications for Monetary Policy

The Business Expectations Survey aims to provide monetary policymakers with some indicators of economic activity as a guide to monetary policy formulation. Given its forward-looking nature, indices generated from the survey do provide the Monetary Policy Committee of the Bank with supplemental indicators on the current and near-term economic conditions and other indicators of aggregate demand that are useful inputs for the formulation of monetary policy. The survey outputs which are disaggregated by sectors could influence the movement of key economic variables such as nominal gross domestic product (GDP), maximum lending rate (LR), monetary policy rate (MPR), naira/dollar exchange rate (ER) and inflation rate (π). These BES indicators include the overall business outlook index (BOI), volume of business activity index (VBI), credit access index (CAI), financial condition index (FCI), average capacity utilization (ACU) and exchange rate index (ERI).

To evaluate the contributions of the BES to monetary policy, we computed the correlation coefficient between selected economic indicators of the BES data and key macroeconomic variables. It was found that the BOI has a strong positive correlation with nominal GDP growth. The implication is that if all the business conditions are right there is a likelihood for high output growth in the economy. The negative correlation between the BOI and the LR indicates that high lending rates are counter-productive to overall economic performance. This, therefore, suggests that monetary policy actions should be geared towards reducing the lending rate to enhance cheap access to credit. Similarly, the VBI had a strong correlation with nominal GDP growth, ER, LR and MPR. This means that high output growth is synonymous with the volume of business activities in the economy, while at the same time, the prevailing exchange rate, lending rate and monetary policy rate have a strong influence on the performance of the real sector. Consequently, policy actions should be tailored to enhance the stability of these variables.

The ERI exhibited high negative correlations of –0.689 and –0.703 with core inflation (π_{core}) and LR respectively. This shows that exchange rate movements affect the level of inflation

as well as the lending rates. The stability of the exchange rate would therefore have a moderating effect on the price levels in the economy. In this regard, the Central Bank has to adopt appropriate exchange rate policy to ensure favorable outcomes.

An examination of the FCI shows a high positive correlation with nominal GDP growth, food inflation (π_{food}), and MPR, while it has a very strong negative correlation with LR. The CAI correlates positively and significantly with MPR, but it correlates negatively and significantly with ER, π_{core}, and LR. This is in line with a priori expectations. Also, considering ACU, there is a positive correlation with MPR, while it correlates negatively with ER, π_{core}, and LR (see Table 3).

It is instructive to note that four BES indicators (VBI, FCI, ACU and CAI) exhibited strong and positive correlations with the MPR set by the Monetary Policy Committee of the Bank. This suggests that there appears to be a strong transmission mechanism between access to credit by the SMEs and MPR through the interest rate channel. This finding is further reinforced by the strong negative correlations exhibited by the BES indicators and weighted average maximum lending rate.

6. Summary and Conclusion

The paper showed that the SMEs have not had the desired impact on the Nigerian economy in spite of all the efforts and support of succeeding administrations and governments. This underscores the belief that an infrastructural gap, insufficient power supply, lack of access to credit, lack of technical skills, high interest rate, unclear economic laws, unfavorable trade policy, poor investment climate and unfavorable economic climate limit the productivity of businesses and retard economic growth. Some of these identified factors are the possible causes of the premature death of some of the industries in the country. Other constraints which SMEs face in Nigeria include irregular power supply and unfavorable fiscal policies such as multiple taxes, levies and rates, fuel shortages, policy inconsistencies, reversals and shocks, competition with cheaper imported products and problems of inter-sectoral linkages given that most large scale firms import some of their raw materials instead of sub-contracting to small scale enterprises.

In recognition of the crucial roles played by SMEs with respect to economic growth and development, succeeding governments in Nigeria have undertaken various initiatives aimed at promoting the cause of SMEs in the country. The most tangible among the different incentive packages was the focus on enhancing the financial opportunities for the small, medium and large scale enterprises. Other services provided by local authorities and industry associations, at times with the involvement of non-governmental organizations (NGOs), include commercial finance, venture capital, information training and retraining, research and development support, infrastructure and tax incentives.

From the result, it was discovered that the outlook on business activity contains information about future growth and investment and provides a good measure of inflation expectations, exchange rate expectations, and borrowing rate expectations. The findings were that the volume of business activity index, financial condition index, average capacity utilization index and access to credit index correlate strongly with the monetary policy rate and, coupled with the fact that monetary policy decisions must be taken before actual data on key macroeconomic variables are available, the BES should provide a useful guide to the monetary authority in assessing the business conditions in the economy. In conclusion, therefore, a record of the outcome of such surveys over a reasonable period of time would help the Monetary Policy Committee to take informed decisions and formulate appropriate policies for effective economic management.

References

Central Bank of Nigeria (2010). Business Expectations Survey. *Quarterly Publications* of the Central Bank of Nigeria 2nd Quarter, 2010.

Ekpenyong, D.B. and M.O. Nyong (1992). Small and Medium Scale Enterprises in Nigeria: their Characteristics, Problems and Sources of Finance. *AERC Research Paper* 16, African Economic Research Consortium, Nairobi, Dec. 1992.

Hall, C. (2002). Profile of SMEs and SME Issues in APEC 1999–2000. APEC SME Ministerial Meeting, Mexico.

Lafleche, T. (2007). The Bank of Canada's Business Outlook Survey. *IFC Bulletin* No. 30.

OECD (2000). Organization for Economic Cooperation and Development Small and Medium Enterprise Outlook. OECD Publications Service.

Stuti, K.I.A.S. (2005). Overcoming Barriers to Innovation for Indian SMEs. Ministry of Small Scale Industries, New Delhi, India.

Wan, S.D. (2003). The Implications of E-Financing: Implications for SMEs. *Bulletin on Asia-Pacific Perspective*, United Nations.

The use of surveys to measure sentiment and expected behaviour of key sectors in the economy: evidence from the business survey conducted by the Central Bank of Lebanon

Sana Souaid Jad[1]

Introduction

The current financial turmoil revealed information gaps in both the interrelated financial system and the real economy. Following the IMF's Spring Meetings in April 2009, a global statistical response to the economic and financial crisis emerged: data gaps were to be identified and appropriate proposals for strengthening data collection to be provided for.[2]

The international community proposed to go beyond the conventional statistical production approaches by improving the availability of sectoral balance sheets for non-financial corporations and households, as well as obtaining timely and higher-frequency economic and financial indicators.[3]

Regarding these new recommendations, several central banks focused on collecting a variety of data and indicators about market developments based on surveys in parallel with the conventional methods. Among those surveys, the so-called "Business Survey" is one of the most important tools in monitoring business cycles, and in helping policymakers to get more timely statistics.[4]

Developed countries didn't experience major data gaps, and yet, responses to the financial crisis were mainly addressed to them in order to avoid future crisis and support early warning efforts. What would be the case for emerging markets, where larger statistics and information gaps exist? It is provided that the lack of proper macroeconomic statistics has a negative impact on investment, and thus on economic growth, usually leading to a speculative climate and estimations, conducting emerging markets to severe crisis.

In view of the growing importance and significance of qualitative statistics, we decided to examine how the sentiment information obtained from the BS conducted by the BDL could be a useful tool for policymakers in conjunctural analysis and short-term forecasting.

First, this paper presents briefly the methodological approach of the BS conducted by the BDL since 1996.

Second, it exploits the BS results by selecting and constructing single and composite indicators. Finally, it shows how some of these indicators could be helpful in monitoring the business cycle and predicting turning points in the Lebanese economy during the last 12 years.

---

[1] PhD in International Economics, Senior Economist, Statistics & Economic Research Department, Banque du Liban.

The views expressed in this paper are those of the author and do not necessarily reflect the views of the Banque du Liban.

[2] "The Financial Crisis and Information Gaps", Report to the G20 Finance Ministers and Central Bank Governors, prepared by the FSB secretariat and IMF staff, 29 October 2009.

[3] "Macroeconomic Statistics and the Recent Financial Crisis", Statistics Department IMF, 23 February 2010.

[4] In this context, the IFC has sponsored three workshops on "The Use of Surveys by Central Banks": Pune-India, 27–30 June 2007; Buenos Aires, 11–13 December 2007; Vienna, 18–20 March 2008.

1. Methodological approach

BSs, named by Piatier "Statistiques sans chiffres", emerged immediately after the Second World War in Europe. These prompt and qualitative surveys were conceived to monitor business cycles and forecast short-term developments in all major industrial countries.

During the 1970s, the EU established a standard framework for BSs to facilitate comparisons between countries, and to produce economic indicators for country groups. Two decades later, the OECD developed, in collaboration with the EU, the "harmonized business tendency surveys", in order to expand this system to transition and developing countries in Europe, North-Africa, Asia and Latin America.[5] As for the Middle-East, Lebanon, Turkey and Israel are the only nations that conduct regular BSs.[6]

In Lebanon, the BS was launched in 1996, initially in industrial and commercial sectors, followed in 1998 by the construction and public work sector, and in 2000 by the tourism sector (Hotels and Restaurants).[7] The BDL has followed international knowledge and experience by adopting similar methods to those undertaken by the INSEE and Banque de France. Furthermore, this methodology is in line with the harmonized business tendency surveys implemented by the OECD,[8] thus allowing comparison of the results across various countries.

1.1. Sample selection

In accordance with the harmonized system, sectors that are most sensitive to cyclical fluctuations have been selected: Industry (which represents 9% of GDP),[9] Trade (26% of GDP) and Construction-Public Work (20% of GDP).

The sample represents 5% of total population for each sector. Its selection should permit cost-reduction, rapid execution and representativeness. The use of stratified random sampling is the ideal sampling method for BSs. Usually strata (subpopulations) are defined in terms of the size of enterprises and the kinds of activities in which they are engaged.

The choice of firms is random and the sample is stratified by size and by activity, so as to cover all the three sectors in every region (Mohafaza) in Lebanon.

The size of the enterprises is represented by the annual turnover of each one of them.[10] Large firms are almost entirely included in the sample, as they represent a large market share. SMEs have also been integrated, as they are known to have a more pronounced direct impact on short-term economic developments, and are consequently quicker to report changes in cyclical movements.

Concerning the activity criteria, each sector is divided by type of activity: the industrial sample contains firms that belong to four sub-sectors: Intermediary Goods, Capital Goods, Consumer and Durable Goods. The trade sample consists of enterprises that exercise

---

5 Development in this field is also due to the activities of the Centre for International Research on Economic Tendency Surveys – CIRET.

6 See the main advantages of the BS in annex 1.

7 This sector is excluded from the study.

8 "Business Tendency Surveys: a Handbook", OECD, 2003.

9 Lebanese National Accounts, 2008. The evolution of these sectors is usually correlated with key macroeconomic aggregates: Industry with GDP, Trade with Consumption and Construction-Public Work with Gross Fixed Capital Formation.

10 Annual turnover brackets.

wholesale and retail sales in three types of products: Intermediary Goods, Capital Goods, Consumer and Durable Goods.

1.2. Questionnaire form

The survey is easily completed and the questions are simple and of a qualitative nature. Questionnaires are filled out every quarter by senior managers, as they are better capable of answering questions without referring to accounts, and able to transmit anticipation of business evolution.

The questionnaires have been formulated according to the one used in France by the INSEE, taking into consideration the specificities of the Lebanese economy. The information requested relates to judgments on past trends, on the current situation and on expectations for short-term developments of the main economic variables (i.e. Production, Demand, Investments, Inventories, Orders, Prices, Sales, Construction…).

Questions are formulated as multiple choices, requesting answers of type "up", "same" or "down", (i.e. "improve", "unchanged" or "worsen") for each variable.[11]

1.3. Balance of opinion

BSs can be defined as *Economic Trend Surveys* or *Opinion-Based Surveys* as they refer to judgments on tendencies. Respondents have three reply options (up=+1 / same=0 / down=-1).

A "BO" is obtained for each variable, equivalent to the difference between the proportion of interviewed managers estimating that there has been an improvement and those who consider that there has been a decline in the said variable. For example, if 50% of managers in the Industry sector have reported an increase in their production levels, while 35% have reported a decrease, the BO related to production would be equal to 50% – 35% = 15%.

1.4. Procedure and time frame

In order to get a quick publication of the results every quarter, the process of the BS follows a strict calendar of two stages:

Data collection — The territory is divided into five Mohafaza: Beyrouth, Mount Lebanon, North, Bekaa and South. The survey's team has representatives in each of the BDL branches conducting surveys in their own geographical areas. Questionnaires are sent to all enterprises either by fax, mail or personal interview during the first week of the month following the quarter under review.

Statistical data treatment — The received questionnaires are centralized in the BDL main branch in Beirut. Their answers are entered in a special database program that calculates balances of opinions, by region and by sector, after weighing and seasonal adjustments have been applied.

[11] Refer to annex 3.

Results weighing

The importance of the answer is assumed to depend on the size of the enterprise, since answers from a large firm have more weight than answers from a small one.

According to the OECD, the firm's value added or the number of its employees should be used as the weighing variable as the BS results will then most closely reflect movements in GDP. Because value added data are not available, annual turnover margins of the enterprise have been selected as the most suitable weighing variable. This confidential information about turnover is requested by size classes, rather than exact numbers so that the information can be easily provided without referring to accounting records.

Seasonal adjustment and smoothing technique methods

The questionnaires eliminate seasonal variations by asking respondents to give their opinion about the evolution of their activity during the quarter under review compared to the same quarter of the previous year. Even so, some seasonality remains in many time series that show seasonal variation.[12] Therefore, seasonal adjustment, a prerequisite for cyclical analysis, is carried out via the X-11 ARIMA program of the US Bureau of the Census, using the additive version[13] for the BS series.

Finally, smoothing technique methods are used. Cyclical movements could be volatile and some short-lived false cycles may obscure true cyclical movements. One way of reducing this cyclicality problem and screening out false cycles is through smoothing using a simple centred moving average (three quarters moving average).

This whole process takes one month, and the survey results are released in time to be useful to policymakers and analysts. They are published officially in the BDL quarterly bulletin and are presented at the end of each quarter to the BDL Open Market Committee. These qualitative statistics, complemented by real, monetary and financial quantitative data,[14] help monetary authorities in assessing Lebanon's economic situation and therefore implementing adequate timely policies.[15]

2. Business survey results: a useful tool for conjunctural analysis and short-term forecasting

The conjunctural analysis aims at understanding the recent development of the economy, as well as foreseeing its evolution during the coming months.

Conjunctural analysis has deeply changed in the last decades.[16] The number of statistical tools used by analysts has increased and their quality improved: establishment of annual and quarterly national accounts, enlargement of the coverage provided by conjunctural indicators and launching of BSs designed for the conjunctural analysis' specific needs.

---

[12] For example, Sales in the trade sector is a seasonal series. There are, typically, peaks at the fourth quarter (seasonal highs) and dips at the first quarter (seasonal lows) due to year-end holidays.

[13] We use specific seasonal adjustment software (E-Views). When we have zero or negative values in a series we implement the additive model.

[14] Coincident indicator, CPI, BDL reserves, commercial banks' deposits and credits, interest rates, public debt and financial market statistics.

[15] Refer to annex 2.

[16] Alfred Sauvy is considered as a pioneer in the field of conjunctural diagnosis and treatment of temporal series in the 1930's. He established the three phases of conjunctural analysis: description, diagnosis and forecast of main economic aggregates such as GDP, Employment, Prices and Foreign Trade.

In Lebanon as in most developing countries, the statistical sources of conjunctural analysis are insufficient.[17] The BS carried out by the BDL remains consequently the main tool for conjunctural analysis. Its importance lies in the fact that it integrates corporate managers' past, present and future judgments on the main economic variables.[18] The analysis of these macroeconomic variables' fluctuations enables us to obtain more reliable estimations on conjunctural cycles.

The economists' interest in the cyclicality of economic variables goes back to the second half of the 1940's, at the instigation of the NBER, which laid the methodological foundations of conjunctural research. The NBER defines a business cycle as:

> *"Recurrent sequences of alternating phases of expansion and contraction in the levels of a large number of economic and financial time series".*[19]

The classical method for measuring conjunctural cycles consists in studying the national production or GDP fluctuations, on either side of a stable tendential growth rate.[20]

2.1. Selection criteria of cyclical indicators

It was only in 1961 that the NBER started to outline the conjunctural situation in a monthly magazine entitled "Development of business cycles" where the cyclical indicators-based approach was made official. A list of 26 indicators is described by G.H. Moore in an article entitled "Business Cycle Indicators".[21] Several reviews have taken place over time, in the light of the new available information.

Concerning the construction of such indicators, it could be different between regions but the selection process is the same by choosing indicators which fit a number of criteria. In 2001, the United States Conference Board presented an expanded set of economic and statistics criteria in selecting data series for its composite indicators. These are: economic significance, conformity to the business cycles, consistency of timing, statistical adequacy, smoothness and frequency.[22]

If we test the ability of statistical series derived from BSs to predict turning points, we find that they are very suitable as cyclical and leading indicators:

In terms of economic significance and cyclical behaviour, variables which measure the early stage of production, respond rapidly to changes in economic activity and measure market expectations could give advance warnings of changes in the direction of economic activity.

Besides, BS variables related to judgments and expectations register a change in the cycle earlier than corresponding quantitative statistical series. In fact, judgments and expectations lead to plans and only after these plans have been implemented will they be reflected by conventional statistical data.

---

[17] While national accounts were interrupted due to the war, Lebanon resumed their preparation in 1997. Concerning conjunctural indicators, only the CPI is calculated by the Central Administration for Statistics on a monthly basis.

[18] Such as: industrial production, sales, prices, employment, and investment.

[19] See also the basic definition of Burns and Mitchell (1946). They were the pioneers in the field of conjuncture empirical measurement.

[20] The NBER is not only interested in the GDP, but also in industrial production, employment, revenues, wholesale and retail, in order to assess the status of economic cycles. These variables, inter alia, represent cyclical indicators that either lead or coincide with the business cycle.

[21] G.H. Moore proposed a list of preliminary indicators in 1950 in: "Statistical Indicators of Cyclical Revivals and Recessions".

[22] See annex 4.

Finally, BS series fit practical and statistical considerations like the frequency of publication (every quarter), timeliness and availability of a long time series which is relatively smooth with no breaks. The smoothness of the series is partly explained by the fact that BS qualitative data are less sensitive to disruptive events and exogenous shocks that could affect quantitative statistics (unusual weather conditions, war…).

However, it's to be noted that the selection and construction of cyclical indicators relying on either quantitative or qualitative data is still relatively rare in developing countries like Lebanon. The main limitation has been data availability and the lack of long time series statistics.

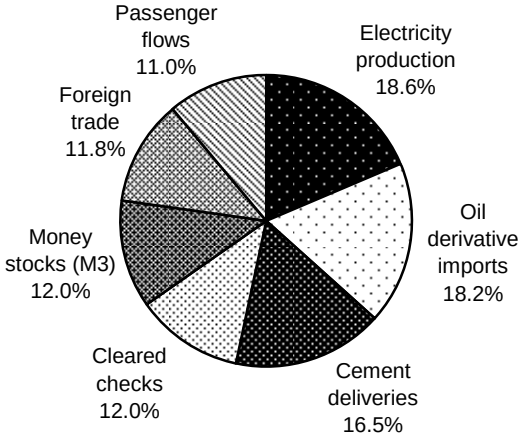
With our relatively short but significant 1996–2010 sample we can, however, tackle this issue by selecting among the BS series the best cyclical indicators that ensure the description of the conjunctural phases of the Lebanese economy as a whole and the prediction of turning points.

2.2. Coincident and business indicators: new instruments to help in conjunctural diagnosis in Lebanon

Inspired by the cyclical indicator cited above, the BDL adopted in 1994 a composite indicator named "coincident indicator" which is a monthly approximation to the GDP. It is composed of eight economic variables that reflect the Lebanese economic activity.

Chart 1

Coincident indicator's components[23]



Source: Statistics & Economic Research Department, BDL.

The CI[24] is computed from the total of these quantitative variables, as weighed according to their importance in the GDP, and has consequently a similar performance to economic activity.

In parallel to the quantitative CI, it would be interesting to propose several business indicators summarizing the quarterly information contained in the BO provided by the BS.

Regarding the subjective nature of the answers, interpretation of BS data is more complicated than traditional statistics. In fact, the BO is not considered as the growth rate of

[23] 1993 average was adopted as a basis year =100. Weighting coefficients were fixed in 1993.

[24] The monthly CI is de-trended and transformed into quarterly series in order to compare its evolution with the quarterly business survey results. This is done by taking the arithmetic mean of the three months in the quarter and calculating the year-on-year growth.

the variable under study but as an indicator of the evolution in its trend.[25] This is why long series of results are needed in order to analyze them and compare them with other quantitative data such as the CI after passing through several filters.[26]

Business indicators will be divided in two categories:

– Variables representing the BO of every single survey question.

– Composite indicators that combine several questions into a single composite indicator.

Both single and composite cyclical indicators will be constructed around the reference series (the quantitative CI: proxy of GDP) which is used to establish the "timing classification" of statistical indicators into leading, coincident and lagging indicators and the "direction classification" into procyclical, countercyclical and acyclical variables.[27] The cross-correlation coefficient is also calculated to examine the "general fit" of the selected indicators in relation to the reference series at all stages of the cycle.

2.2.1. Indicators based on single questions

Seeking to keep only the series that better meet the economic and statistical criteria, 13 indicators are selected in different sectors and divided among three groups: coincident, leading and lagging indicators.

Table 1

Indicators based on single questions

Selected indicators	*Direction*	*Timing*	*Cross-correlation coefficient*
I. Industry			
1.1. Production	Procyclical	Coincident	0.91
1.2. Demand	Procyclical	Coincident	0.90
1.3. Investment	Procyclical	Leading/Lagging	0.69
1.4. Stock of finished goods	Countercyclical	Lagging	0.27
1.5. Stock of raw materials	Countercyclical	Lagging	0.36
1.6. Registered orders	Procyclical	Leading	0.83
1.7. Expected production	Procyclical	Leading	0.52
II. Trade			
2.1. Sales	Procyclical	Coincident	0.87
2.2. Stock of goods	Countercyclical	Lagging	0.10
2.3. Expected sales	Procyclical	Leading	0.67
III. Construction and Public Work			
3.1. General activity	Procyclical	Coincident	0.83
3.2. Construction	Procyclical	Coincident	0.79
3.3. Portfolio of projects	Procyclical	Leading	0.78

Source: Statistics & Economic Research Department, BDL; own classification and calculations.

[25] The BO is seasonally adjusted and centred in all the charts.

[26] Seasonal adjustment, outlier detection, de-trending and smoothing techniques.

[27] See annex 5.

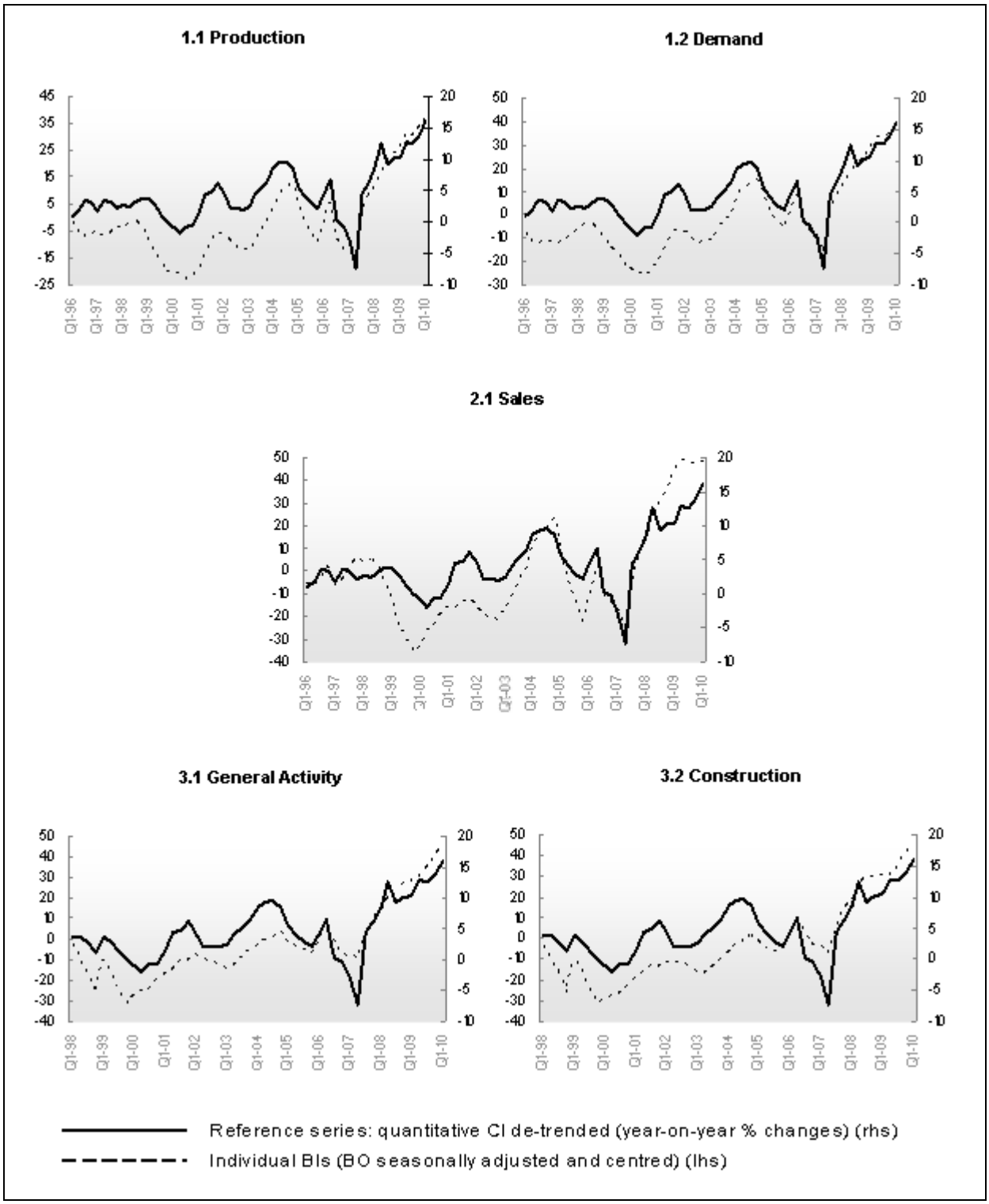
Coincident group

The coincident indicators include industrial production and demand, as well as commercial sales.

Chart 2

Business coincident indicators: breakdown by question

In per cent



Source: Statistics & Economic Research Department, BDL; own calculations.

The conjunctural analysis is considered by many as the follow-up and the forecasting of industrial production, but statistics in this field are generally incomplete and belated. The question in the BS about industrial production's quarterly development is very important since the industrial production index is not calculated in Lebanon. By calibrating the BOs over the years, we can first of all estimate the production variation in the very recent past for which we do not have accounting measures. Industrial production's fluctuations are very similar to those of global economic activity, which explains its coincident character. Moreover, knowing that a firm's main decision on the quantity of output to be produced depends on the size of total demand, the evolution of industrial production and demand are strongly correlated.

Consumption is by far the bigger component in GDP; thus, consumption evolution has a decisive impact on the economy's short-term dynamics. However, the conjunctural statistics concerning consumption are available only through the follow-up of the development of commercial sales (consumption proxy) in the BS: a rise in consumption leads to a decrease in savings and consequently to an increase in investment which, in turn, leads to an improvement in production and the available gross revenue.

These indicators have similar performance to the business cycle and their coincident character has been proved and tested over the years by several studies on cyclical indicators.[28] Our results confirm the coincident nature of these qualitative variables in the case of the Lebanese economy.

The evolution of General Activity and Construction in the Construction and Public Works sector coincides as well as these latter with economic activity. This sector plays an important role in economic development in developing countries. Many writers have referred to its effect on employment creation, others to its multiplier effects in the national economy.[29]

Leading group

Among leading indicators, we have selected mainly: expected production and sales, registered orders in Industry and portfolio of projects in the Construction sector.[30] These variables, among others, obviously reflect business confidence, which gives early information about changes in business behaviour and consequently in economic activity and cyclical developments.

It's widely recognized that business people's subjective individual expectations play a key role in economic developments and short-term forecasting. As business confidence and optimism rises we typically see similar increases in investments, production, consumption and economic growth.

Chart 3 shows that expected production and sales are the best proxies for confidence with a respective correlation coefficient of 0.52% and 0.67%.

Registered orders and portfolio of projects can also be an important determinant of confidence in the industrial and construction sectors: increases in orders lead to increases in production, drops in orders are followed by a build-up of inventories and, eventually, a decline in production.

---

[28] See Philippe Sigogne and Véronique Riches: "Genèse des indicateurs cycliques", revue de l'OCDE No. 45, June 1993.

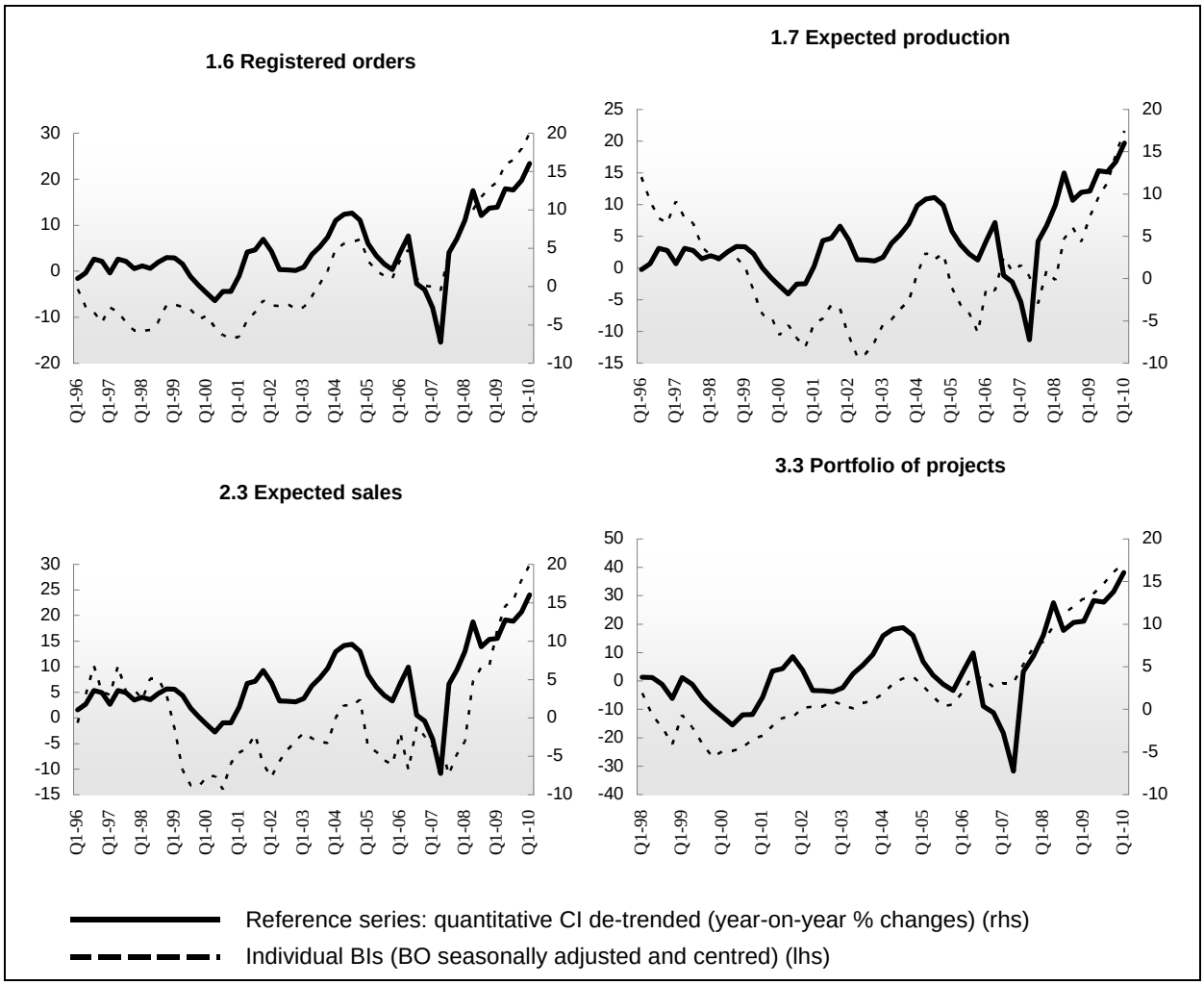
[29] Turin (1973) and Wells (1987) found an association between construction investment and economic growth. That result is consistent with our results and with the classical approach in growth theory in which capital formation is the main engine of economic growth and development.

[30] International systems of leading indicators-main leading indicators- "Cyclical Indicators and Business Tendency Surveys", OECD, Paris, 1997.

Chart 3

Business leading indicators: breakdown by question

In per cent



Source: Statistics & Economic Research Department, BDL; own calculations.

As for the portfolio of projects, it is, in essence, the result of savings, but particularly a sign of entrepreneurs' confidence in the durability of growth. As the saying goes: "*When the building trade is doing well, everything is doing well*"; this sector, and particularly this variable, is a driving force for the whole economy. It creates job opportunities and thus impacts on final consumption and then on economic growth.

These two indicators are supposed to be leading ones, but their leading nature is not pronounced, or even absent, during the sample period. They might be contaminated with other kinds of political and security factors. Therefore, when analysis is made, these factors must be considered in order to track the business cycle appropriately.

According to chart 3 (1.6–3.3), there is no evidence of a significant lead in the timing of the turning points but a similar evolution with the business cycle.

Lagging group

Investment contributes to a large extent to conjunctural fluctuations, plays a vital role within the supply behaviour of companies, and is decisive for the development of production capacities and competitiveness.

Based on the usual theoretical pattern, which interprets the cycle as being the result of the interaction between the multiplier and the accelerator, and which confers a crucial role to the progression of investment compared to production, industrial investment must be considered as a leading indicator. However, according to E. Malinvaud (1982),[31] investment's leading nature does not appear systematically in real developments. He explains this mechanism as follows: in the short term, the need for equipment and stocks is practically proportional to production, therefore there must be huge investment and stocking when production grows rapidly, while less investment and rather less stocking would be sufficient when production declines. Once started, any fluctuation in production causes a relatively stronger fluctuation in investment and stocking, which accelerates the initial movement.

The question concerning investment expenditures in the industrial sector represents the only infra-annual, or rather quarterly, source on industrial investment in Lebanon.[32] In fact, a careful study of the evolution of its BO shows that the latter is lagging after Q1-2004 compared to a leading evolution before that period.

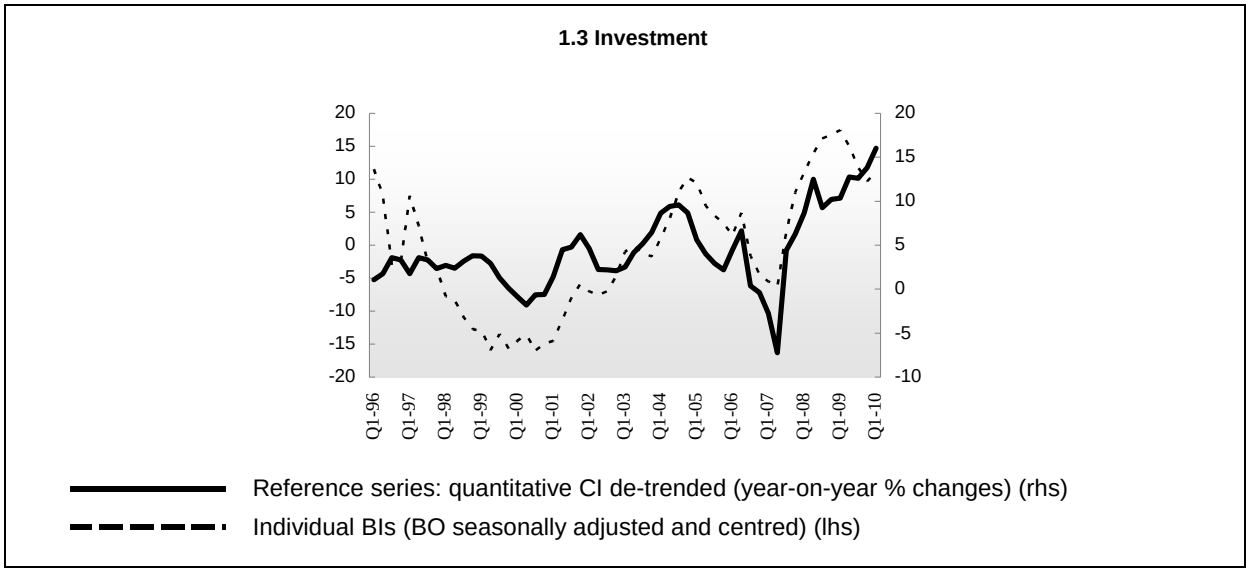
Having a low cross-correlation with the reference series and countercyclical properties, inventories of finished goods and raw material in the industrial sector and commercial stocks questions are excluded from our cyclical analysis.

In spite of the stocks' countercyclical character and the ambiguity of the BO concerning this question,[33] stocks-related variables can be a good indicator for the manager's assessments of the current production level, considering the suitability of the production to the demand.

Chart 4

Business lagging / leading indicator

In per cent



Source: Statistics & Economic Research Department, BDL; own calculations.

[31] Edmond Malinvaud, Théorie macroéconomique, tome 2, Paris Dunod, 1982.

[32] The sales of inter-industrial goods in the commercial sector also represent an indirect indicator for investment.

[33] The balance of opinion concerning the stock level of industrial and commercial finished goods is the difference between the percentage of above-normal and below-normal answers and represents a blind stock level by reference to the normal level. This normal level is taken as a reference by industrials' changes over recession and recovery cycles, but we may consider as certain that the normal stock increases simultaneously to the firm's production.

Lastly, it's worth noting that the nature of the BS variables, whether leading, coincident or lagging, is not always verified and is sometimes suspect due to the variability and subjectivity of the BS answers. Consequently, their fluctuations could be at times unrelated with the acceleration and deceleration of the reference series.

2.2.2. Composite indicators

Most institutes conducting BSs select a set of survey series and combine them into a single composite indicator. This is done in order to reduce the risk of false signals, and to provide a cyclical indicator with better forecasting and tracking qualities than any of its individual components. These indicators are calculated on the equally weighed average of every single indicator in line with the OECD system.

The EU and the OECD presented in 2003 four composite confidence indicators that they found useful in several countries[34] for monitoring the current economic situation and predicting the likely changes in the short term. These indicators were given as examples, since other combinations may perform better for particular countries, such as the following:

Business composite indicator (BCI)[35]

This indicator is interpreted as a measurement for the global conjunctural climate as seen by surveyed managers. It is constructed by selecting and combining the appropriate coincident variable from each sector, providing a more global economic view. The BCI is coincident with economic fluctuations and has a strong correlation coefficient of 0.80%.

Confidence composite indicator (CCI)[36]

Confidence could be low, because business people are uncertain about prospects and/or unhappy with current company performance. This may reflect uncertainty about the macro-environment within which the company operates.[37] Usually this type of sentiment indicator is designed to forecast the direction of the economy and is considered a leading indicator.

In Lebanon, confidence is mainly related to political and security stability, which explains the lagging nature of this indicator after Q1-2005. Starting this period, the sequence of turmoil had hardly affected economic activity thus spreading a pessimistic business climate which started to recover one year ago.

Trade confidence indicator (TCI)[38]

It is inspired from the OECD composite confidence indicators. In Lebanon, the leading nature of this indicator is more pronounced in the beginning of the sample period compared to the end of it because of the political and military turbulence between 2005 and 2008. This might also be

---

[34] The industrial confidence indicator (ICI), the construction confidence indicator (CCI), the retail trade confidence indicator (RCI) and the confidence indicator for services (SCI).

[35] It's the arithmetic average of the answers (BO) to the questions on current production, sales, general activity and construction.

[36] It's the arithmetic average of the answers to the questions on expected production and sales.

[37] The strength of the sentiment and the behaviour of the managers can be seen in the magnitude of chart 5. The chart is determined by the difference between positive and negative answers. Therefore a headline above zero indicates positive confidence or optimism, while a negative number shows negative confidence or pessimism.

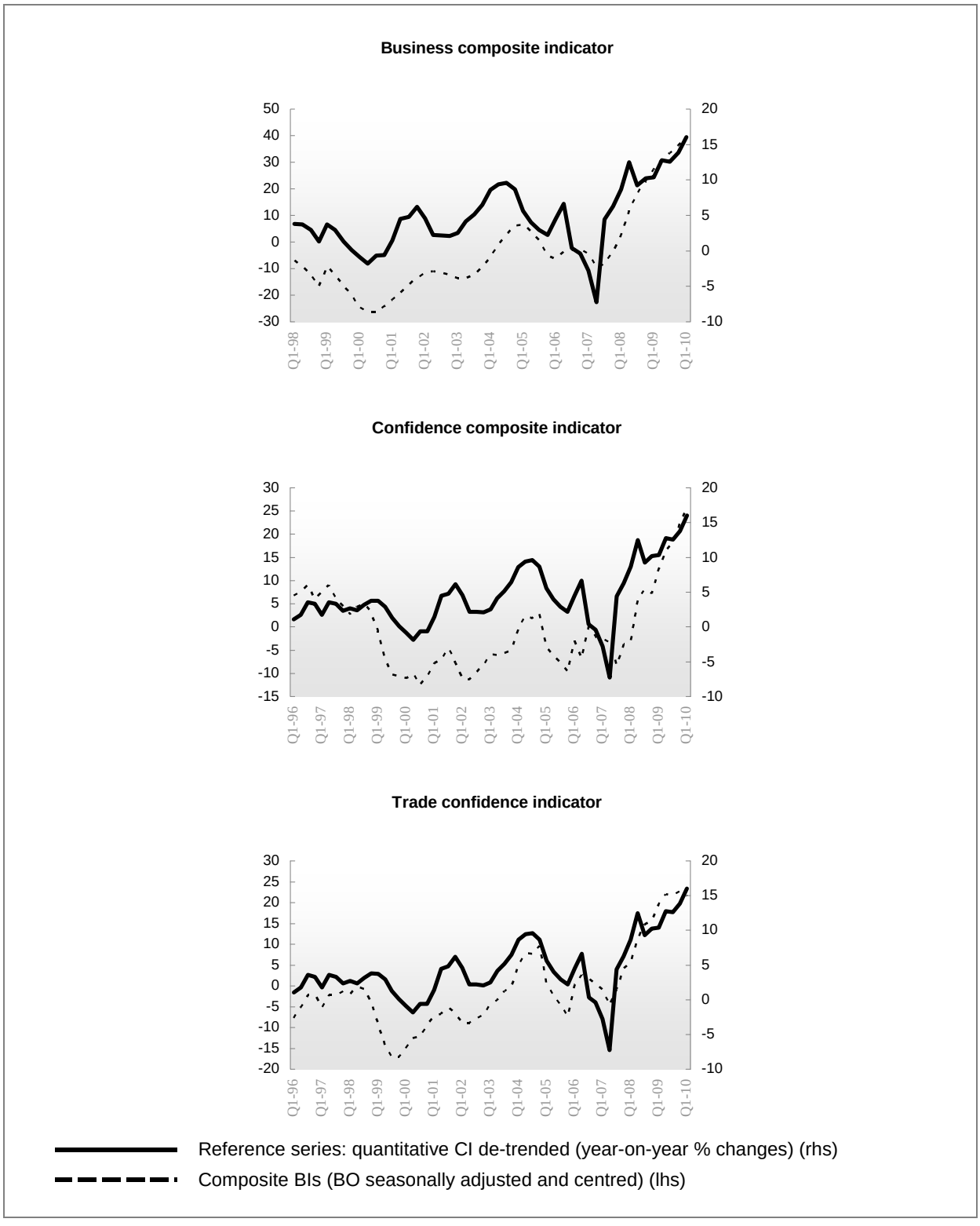
[38] It's the arithmetic average of the answers to the questions on current sales, expected sales and stock of goods (inverted).

attributable to the sharply leading nature of one of the three questions considered (expected sales) while the other questions have no leading properties (current sales and stocks).

Chart 5

Composite indicators

In per cent



Source: Statistics & Economic Research Department, BDL; own calculations.

Table 2

Composite indicators

Composite indicators	*Direction*	*Timing*	*Cross-correlation coefficient*
Business composite indicator (BCI) (= 1.1 + 2.1 + 3.1 + 3.2 / 4)	Procyclical	Coincident	0.80
Confidence composite indicator (CCI) (= 1.7 + 2.3 / 2)	Procyclical	Leading	0.62
Trade confidence indicator (TCI) (= 2.1 + 2.3 – 2.2 / 3)	Procyclical	Leading	0.83

In all, among the composite indicators constructed, the BCI will be chosen as the best significant tool for tracking economic changes. It combines the relevant coincident indicators in each sector reflecting consequently the business climate as a whole.

3. The Lebanese conjuncture as seen through the coincident indicator and the business composite indicator: 1998–2010

Small countries with an open market economy, like Lebanon, differ considerably from the industrialized ones in the nature and characteristics of short-run macroeconomic fluctuations: cycles are generally shorter and irregular.

By monitoring the movement of the CI and the BCI, the different phases and turning points of the Lebanese business cycles can be detected from 1998 till 2010.

Chart 6 shows the different peaks and troughs in the Lebanese economy during the sample period where shaded areas correspond to downturns in the CI (the reference series) and unshaded areas to upturns.

The results are reported in table 3: from Q1-1998 to Q1-2010, there were eight turning points, consisting of four troughs and four peaks (referring to the Bry and Boschan method).[39]

Table 3

Business cycles in Lebanon

Trough	Date	Duration of upturn (quarters)	Peak	Date	Duration of downturn (quarters)
T1	Q2-00	6	P1	Q4-01	3
T2	Q3-02	8	P2	Q3-04	5
T3	Q4-05	2	P3	Q2-06	4
T4	Q2-07	4	P4	Q2-08	-

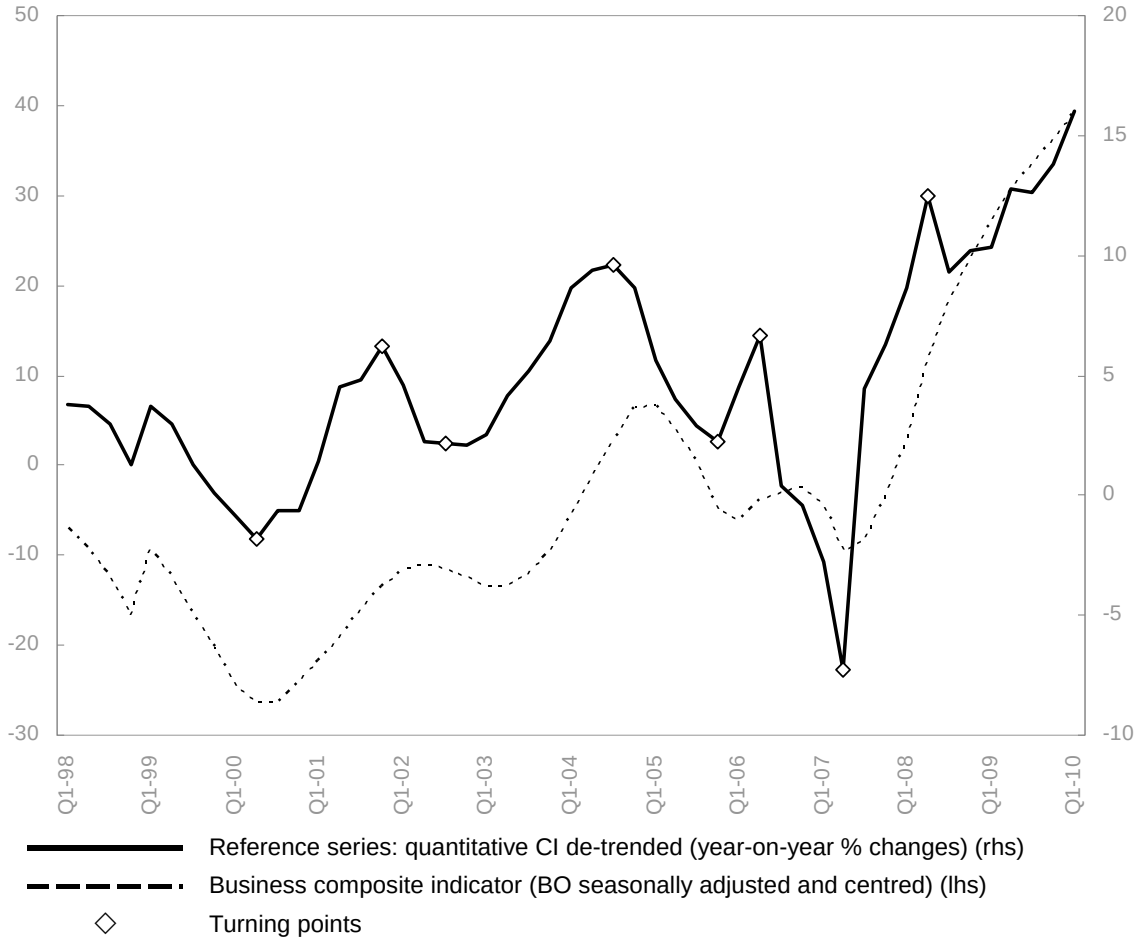
Source: Statistics & Economic Research Department, BDL; own calculations.

[39] See annex 6.

Chart 6

Business cycles in Lebanon

In per cent



Source: Statistics & Economic Research Department, BDL; own calculations

Q1 1998–Q2 2000: Recession

The public finance crisis along with the restrictive policy that followed starting in 1998 had together led to a drop in investment and a recession turning into depression in the year 2000. Chart 6 points out how the crisis in 2000 had been accompanied with a significant slowdown in the CI growth as well as a significant decline of the activity as stated by the negative value of the surveyed managers' BO in the different sectors.

The causes of the said crisis are mainly endogenous and structural. In fact, the open-door policy adopted by the Lebanese government years ago had been accentuated in 2000 through the sudden and spectacular customs duties taxes cut. Nevertheless, this policy had multiple adverse effects on several economic sectors exposed to foreign competition such as the industrial sector that witnessed a massive closing of enterprises as well as a severe production drop.

Moreover during this period a general decline in prices and demand were depicted causing deflation in conjunction with a notable decrease in purchasing power[40] and an increase in indirect taxes.[41]

By comparing the evolution of the CPI with the sales prices or industrial final good prices from the BS results, we can clearly notice that prices fell from 2.7% in 1999 to 0.05% in 2001 with a similar decline in the BO concerning prices. Annex 7 shows a concordance between the quantitative indicator and the qualitative ones except in the period between 2003 and 2004 where the quantitative statistics on inflation show a relative decline compared to a significant increase in both sales prices and industrial final good prices due to the introduction of value added tax.[42]

Q3 2000–Q3 2004: Recovery & Expansion

Upon Rafic Hariri's return as Prime Minister after 2000, the resumption of investment following 11 September 2001 as well as the effects of the Paris II Agreement[43] banishing the fears of a financial crisis, had contributed to the revival of the economy reaching its edge in Q3-2004. Furthermore, the Association Agreement[44] signed with the EU in 2003 also had positive effects on growth. Subsequently, the business climate started to quasi continuously improve starting in that period indicating an increasing optimism in the business field (however keeping a rate inferior to its long period average until Q3-2004).

Q4 2004–Q2 2006: Slowdown

The assassination of Rafic Hariri and all the political and security troubles in 2005 had put a term to this growth that slightly resumed in Q2-2006 despite the political instability. During that period, an obvious degradation in confidence was shown in the real sectors of the economy. However, the banking sector had solely known how to grant confidence to the savers via the practice of a policy of support for the Lebanese Pound.

Q3 2006–Q2 2007: Recession

The July 2006 war had harmful effects on the Lebanese infrastructure and consequently on economic growth. This recession had reached its lowest point during the studied period reflecting a real deterioration in the business field accompanied with a negative growth rate. The disastrous results of the war had led, in January 2007, the international donors to meet again at the Paris III Donor Conference and pledge more than USD 7.5 billion to Lebanon for developing projects and budget support.

---

40 Purchasing power fell by 31.8% between 1997 and 2003 referring to Reach-Mass institute.

41 Indirect taxes/total tax revenues increased from 45.2% in 1992 to 70.6% in 2002 – Ministry of Finance.

42 VAT was introduced in February 2002 and implemented progressively during the transitional period from 2003 till 2004. The CPI, which includes for 50% products and activities exempted from VAT (medical services, hospitalization expenses, education and essential food products), was less affected than the BS prices.

43 The 2002 Paris II Conference allowed a strong mobilization of the international community to restructure the Lebanese debt. In total, Lebanon had also obtained financing of USD 10.1 billion (32% of the global debt).

44 Interim agreement signed on 1/03/2003, agreement in force on 1/04/2006.

Q3 2007–Q1 2010: Revival & Strong Growth

After a political crisis paralyzing the public institutions over a period of one year and a half, the Paris III Agreement as well as the presidential election in June 2008 had contributed to a confidence regain translated into an economic revival in all sectors and in particular construction, nearly two years ago.

Contrarily to some Gulf, European and Asiatic countries, Lebanon knew how to show a real resistance to the international financial crisis. The Lebanese exception against the crisis was mainly due to the cautious measures and regulations adopted by the BDL over the last years.

In addition, remittances into Lebanon have increased since the start of the financial crisis as the expatriates preferred to liquidate a part of their fixed assets due to the bad world economic context and effectuate transfers into a trustworthy banking system.

Since then, the Lebanese banks have benefited from very high liquidity ratios that have pushed the BDL to promote credits assented to the productive sectors as well as on the housing loans.[45] These loans, benefiting from the exemption of the obligatory reserve, have contributed to a remarkable growth of the credits granted in Lebanese Pounds and subsequently to an activity revival in the industry and construction field.

The CI and BCI clearly reported this revival: the business climate indicator recovered starting Q1-2008, went on progressing and clearly exceeded its long period average during the last two years (BO = +16).

Furthermore, the continuing annual growth of the CI since 2008 has reached historical values during the last quarters.

Finally, it's to be noted that the duration of upturns after the two troughs in 2005 and 2007 are shorter than those of 2000 and 2002. This is due to the fact that exogenous factors, like the political turmoil in 2005 and the 2006 war effect can have a significant negative impact on the economy but their upturn phases are relatively faster than those related to economic and endogenous considerations.

Conclusion

This paper presents a pioneering analysis along with early results of how the statistical series provided by the Lebanese BS, conducted by the BDL, can be applied in the assessment of the conjunctural economic situation and short-term forecasting during the period 1996–2010.

The first part of the paper deals with the technical aspects of the BS statistical output: timeliness and transparency. It exposes brief but transparent information about the sample selection as well as the sources of the data and the methods used to edit and process them in time.

Information provided by this type of survey essentially deals with opinions about the current and the near future state of the economy, and is considered as an early warning indicator because of its premature availability. In this context, the second part of this study attempts to

[45] See www.bdl.gov.lb, intermediary circulars no 195 (11/1/2010) and 213 (26/6/2009) related to basic circulars no 80 and 84.

extract business indicators from the BDL BS in order to track the Lebanese business cycle over the last 12 years and try to avoid possible crises by providing early signals of economic changes.

The results show that between Q1-1998 and Q1-2010, there were eight turning points, consisting of three peaks and four troughs. Only two individual indicators related to expectations (Expected Production and Expected Sales) and reflecting confidence were proved as short leading indicators. Besides, the CCI and the TCI seem particularly useful in predicting turning points during the stable period before 2005 with an average lead time of one quarter for peaks and troughs.

The BCI, reflecting the business climate as a whole, has been proved as a sound tool for explaining the different phases of expansions and recessions of the Lebanese business cycle.

It's worth noting that cyclical indicators, especially leading ones, which perform well in one country, may not work well in another because of differences in economic and statistical systems and other exogenous factors like political and security considerations.

Finally, since this is the first time that this topic has been dealt with in Lebanon, it is manifestly impossible to cover the broad subject of the title without some limitations. Thus, future expansions including improvement of the survey as a whole and at the sectorial level can be developed. Moreover, there is always a possibility to improve the cyclical performance of the business indicators by constructing other new composite ones combining several unexplored questions from the BS. These different lines proposed as future research could raise lastly a very relevant question for policymakers: to what extent do BS results contribute to implementation of adequate monetary policy?

Annex 1:
Main advantages of the business survey

- BSs provide rapid, low cost statistics of a qualitative nature, which usually go ahead of conventional statistics (full reporting and census). The quantitative statistics are often disclosed with long delays. Likewise, in Lebanon, as in other emerging economies, there is a shortage of standard national accounts statistics (i.e. measurement of the GDP, investments…), which makes it impossible for policymakers to use them in analyzing the current situation or taking remedial actions to avoid financial and economic turmoil.
- These surveys explore domains where statistics are still scarce. The information covered by them goes beyond variables that can easily be captured in traditional quantitative statistics, such as information on the early stage of production (i.e. registered orders, expectations for future production and sales, and managers' views on the overall economic situation).
- Qualitative data could be comparable across countries, regions and sectors. In Lebanon, the survey's results are released at national, regional and sectorial levels, allowing the depiction of business trends in each region and the comparison of evolution between sectors.
- Firms have access to the survey's results, enabling them to assess their position within their sector of activity and their region, as well as monitoring the general trends in business activity.
- The statistical series derived from BSs are particularly suitable for monitoring business cycles and detecting turning points. Therefore, BSs are helpful for central bankers to analyze macroeconomic phenomena from a microeconomic perspective, and to consequently adopt the appropriate monetary policy.

Annex 2:
Business survey process flowchart

Annex 3:
Questionnaire forms

Construction and Public Works (Q2-2010)

I. Trend of your activity

Activity trend during the previous quarter compared to the same quarter of the previous year

	Below the normal	Normal	Above the normal
Both Construction & Public Works			
Construction			
Public Works			

Expectations for the next quarter compared to the previous quarter

	Below the normal	Normal	Above the normal
Both Construction & Public Works			
Construction			
Public Works			

II. Portfolio of projects

What is the status of your portfolio of projects at the end of this quarter?

Below the normal	Normal	Above the normal

III. Trend of construction costs

What was the trend of construction cost during this quarter compared to the same quarter of the previous year?

Below the normal	Normal	Above the normal

IV. Situation of your investments

Did you incur any investment expenditures during the previous quarter?

Yes	No

How do you expect your investment expenditures to evolve during the next quarter compared to the previous quarter?

Below the normal	Normal	Above the normal

V. Evolution of employment in your company

How did the number of employees evolve during the previous quarter compared to the same quarter of the previous year?

Below the normal	Normal	Above the normal

VI. Overview

How do you expect the overall activity in the building and public works sector to evolve in the coming quarter?

Below the normal	Normal	Above the normal

I. Evolution

Indicate the evolution of the following indicators during the second quarter 2010 compared to the same quarter of 2009

Please put an "X" in the corresponding boxes

	Decrease ↘	Stability →	Increase ↗
Production			
Demand			
Foreign demand			
Prices of finished goods			
Prices of raw materials			
Number of employees			
Average monthly wage rate			

If the average monthly wage rate has increased, please state the percentage change: %

II. Actual situation

What is the present situation of the following indicators at end of June 2010?

	Below normal	Normal	Higher than normal
Stock of finished goods			
Stock of raw materials			
Registered orders			

III. Expectations

How do you expect the following indicators to evolve during the third quarter 2010 compared to the second quarter 2010?

	↘	→	↗
Production			
Demand			
Foreign demand			
Prices of finished goods			
Prices of raw materials			
Number of employees			

	Below normal	Normal	Higher than normal
Stock of finished goods			
Stock of raw materials			

IV. Investments

How were the investment expenditures during the second quarter 2010 compared to the same quarter of the previous year?

Lower	Equivalent	Higher

How do you expect the level of your investment expenditures to be during the third quarter 2010 compared to the second quarter 2010?

Lower	Equivalent	Higher

V. Overview

How do you expect the activity in your industrial sub-sector to evolve during the next three months?

↘	→	↗

I. Evolution

Indicate the evolution of the following indicators during the second quarter 2010 compared to the same quarter of 2009

Please put an "X" in the corresponding boxes

	Decrease ↘	Stability →	Increase ↗
Sales volume			
Prices			
Number of employees			
Average monthly wage rate			

If the average monthly wage rate has increased, please state the percentage change: %

II. Actual situation

What is the present situation of the following indicators at end of June 2010?

	Below normal	Normal	Higher than normal
Stock of goods			

III. Expectations

How do you expect the following indicators to evolve during the third quarter 2010 compared to the second quarter 2010?

	↘	→	↗
Sales volume			
Prices			
Number of employees			
Stock of goods			

V. Overview

How do you expect the activity in your commercial sub-sector to evolve during the next three months?

↘	→	↗

Annex 4:
Statistical & economic criteria of business cyclical indicators

Economic significance	Its cyclical timing must be economically logical.
Conformity	The data series must conform consistently in relation to the business cycle.
Consistent timing	The series must exhibit a consistent timing pattern as a leading, coincident or lagging indicator.
Statistical adequacy	The data must be collected and processed in a statistically reliable way.
Smoothness	Its month-to-month movements must not be too erratic.
Frequency	The series must be published on a reasonably prompt schedule.

Source: http://www.investopedia.com/university/conferenceboard, Conference Board: Composite Index Of Leading Indicators-Chris Stone.

Annex 5:
Direction & timing classification of economic variables

Variable direction	*Procyclical*	The variable moves in the same direction as the business cycle. In a recession, the variable decreases. In an expansion, the variable increases.
	Countercyclical	The variable moves in the opposite direction to the business cycle. In a recession, the variable increases. In an expansion, the variable decreases.
	Acyclical	There is no clear relationship between the business cycle and the variable.
Variable timing	*Leading*	The variable tends to move slightly in advance of a peak or trough in the business cycle. It helps to predict when a recession or expansion will begin or end.
	Coincident	The variable moves at the same time as the business cycle.
	Lagging	The variable begins to move after a peak or trough in the business cycle.

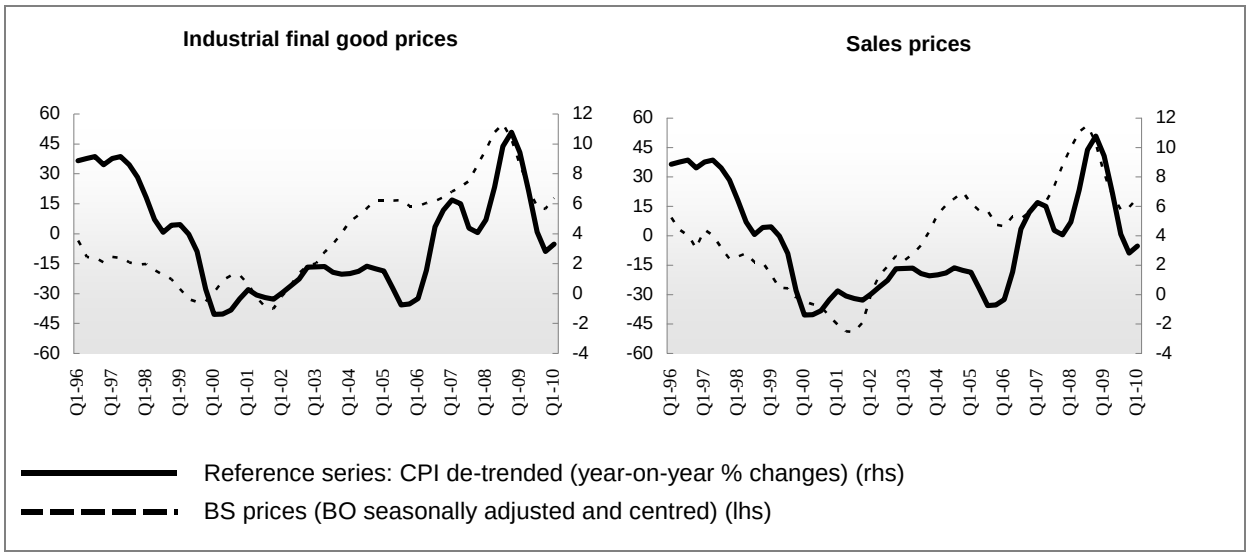
Annex 6:
Assumptions for the quarterly Bry & Boschan procedure

▶	A peak (trough) must be followed by a trough (peak)
▶	A cycle (from peak to peak or from trough to trough) must have a duration of at least 5 quarters
▶	A phase (from peak to trough or from trough to peak) must have a duration of at least 2 quarters
▶	Turning points are not to be situated within the first or last 2 quarters of a time series
▶	The first (last) peak and trough must be higher respectively lower than values closer to the beginning (end) of the data series

Source: Everts Martin P., 2006, “Duration of Business Cycles”, p. 7.

Annex 7:
Consumer price index *versus* business survey prices

In per cent



Source: Consultation & Research Institute; Statistics & Economic Research Department, BDL; own calculations.

List of abbreviations

BCI Business Composite Indicator
BDL Banque du Liban
BI Business Indicator
BO Balance of Opinion
BS Business Survey
CCI Confidence Composite Indicator
CI Coincident Indicator
CPI Consumer Price Index
EU European Union
GDP Gross Domestic Production
IMF International Monetary Fund
INSEE National Institute of Statistics & Economic Studies
NBER National Bureau of Economic Research
OECD Organisation for Economic Co-operation & Development
SME's Small & Medium Enterprises
TCI Trade Confidence Indicator
VAT Value Added Tax

Bibliography

Bardaji José, Minodiet Christelle, Clavel Laurent & Tallet Frédéric, 2008, "Deux Nouveaux Indicateurs pour Aider au Diagnostic Conjoncturel en France", INSEE.

BIS, 2009, "The Use of Surveys by Central Banks", IFC Bulletin No. 30.

Burns Arthur F. & Mitchell Wesley C., 1946, "Measuring Business Cycles", NBER.

Cling Jean-Pierre, 1990, "L'Analyse de la Conjoncture", Edition La Découverte, Paris.

Consultation & Research Institute, 2009, "Consumer Price Index For Beirut and It's Suburbs", Lebanon.

Dagum Estella Bee, Laniel Normand, 1987, "Revisions of Trend-Cycle Estimators of Moving Average Seasonal Adjustment Methods", Journal of Business and Economic Statistics, Vol. 5 No. 2, pp. 177–189.

Ece Diliana, Hamsicie Tulkunurand & Ece Oral, 2005, "Building up a Real Sector Business Confidence Index for Turkey", Research & Monetary Policy Department, Central Bank of the Republic of Turkey.

El Akkaoui Ali, 2005, "L'Analyse de la Conjoncture Economique: Expérience de l'INAC", Institut National d'Analyse de la Conjoncture, Séminaire sur l'Analyse de l'Information Statistique pour le Développement, Tunis.

El Akkaoui Ali, 2005, "L'analyse de la conjoncture: Pratique et perspectives de développement au Maroc", les Cahiers du Plan No. 2.

Everts Martin P., 2006, "Duration of Business Cycles", paper presented at a seminar at the University of Bern University, Department of Economics.

Gyomai Gyorgy & Guidetti Emmanuelle, 2009, "OECD System of Leading Indicators, 2008", International Seminar on Early Warning & Business Cycle Indicators, Scheveningen, Netherlands.

IMF and Financial Stability Board (FSB), 2009, "The Financial Crisis and Information Gaps", Report to the G20 Finance Ministers and Central Bank Governors.

IMF, 2010, "Macroeconomic Statistics and the Recent Financial Crisis", Statistics Department.

Kershoff George, 2000, "Measuring Business & Consumer Confidence in South Africa", Bureau for Economic Research BER, Stellenbosch.

Kose Ayhan M., Otrok Christopher and Prasad Eswar, 2008, "Cycles économiques: découplage ou convergence?", Finances & Development, article inspiré du document de travail à paraître du FMI, intitulé "Global Business Cycles: Convergence or Decoupling?".

Lopes J., Ruddock L. & Ribeiro F.L., 2002, "Investment in Construction and Economic Growth in Developing Countries".

Malinvaud, E., 1982, Théorie macroéconomique, tome 2, Paris Dunod.

Maroun Ibrahim, 2004, "Crise Economique au Liban et Politique de Relance".

Moore G.H., 1950, "Statistical Indicators of Cyclical Revivals and Recessions", UMI.

Nijathawon Bandid, 2009, "Rethinking procyclicality – what is it now and what can be done?", BIS Review 160/2009.

Nilsson Ronny, 2000, "Confidence Indicators & Composite Indicators", Paper for Presentation at the CIRET Conference in Paris, OECD.

OECD, 1997, "Cyclical Indicators & Business Tendency Surveys", OCDE/GD (97) 58, General Distribution.

OECD, 2003, “Business Tendency Surveys: a Handbook”.

OFCE, 1993, “Cycles d’Hier et d’Aujourd’hui: Développements Théoriques, Approche Conjoncturelle, Instruments et Analyses Empiriques, Permanences et Changements”, Revue de l’OFCE No. 45.

Pedersen Michael, 2009, “Use of Chilean Business Surveys in Conjunctural Assessment & Short-Term Forecasting”, Central Bank of Chile.

Ramirez-Djumena Nathalie, 2009, “IMF works to Plug Data Gaps Exposed by Crisis”, IMF survey on line.

Sigogne Philippe & Riches Véronique, 1993, “Genèse des indicateurs cycliques”, revue de l’OCDE No. 45, June.

Tedang Djoret Biaka, 2006, “Les Indicateurs Avancés de la Conjoncture”, une Revue à Partir des Séminaires sur la Conjoncture Economique du 2nd semestre 2006 et les Prévisions à Court Terme dans les Etats membres d’Afristat.

Towe Christopher, 2009, “The Financial Crisis & Information Needs for Financial Surveillance”, Addressing Information Gaps, IMF Staff Position Note.

Tsatsaronis Konstantinos, “Investigating the relationship between the financial and real economy”, BIS Papers No. 22.

Turin, D.A., 1973, “The Construction Industry: Its Economic Significance and its Role in Development”, UCERG, London.

UNSD, 2009, “Progress on the Global Statistical Response to the Economic & Financial Crisis”, International Seminar on Early Warning & Business Cycle Indicators, Scheveningen, Netherlands.

Vanhaelen Jean-Jacques, Dresse Luc & De Mulder Jan, 2000, “The Belgian Industrial Confidence Indicator: Leading Indicator of Economic Activity in the Euro Area”, NBB Working Paper No. 12.

Visco Ignazio, 2009, “The financial crisis and economists’ forecasts”, BIS Review 49/2009.

Wells, J., 1987, “The Construction Industry in Developing Countries: Alternative Strategies for Development”, Croom Helm Ltd, London.

Yabuta Yuriko, 2009, “Tracking the Mexican Business Cycle”, International Seminar on Early Warning and Business Cycle Indicators, Scheveningen, Netherlands, INEGI (National Institute of Statistics & Geography).

Zhang Wenda & Zhuang Jushong, 2002, “Leading Indicators of Business Cycles in Malaysia & the Philippines”, Economics & Research Department ERD Working Paper series No. 32, Asian Development Bank.

Inflation forecasts from the Bank of Italy-Sole 24 Ore survey of expectations of inflation and growth

Raffaele Tartaglia-Polcini[1]

1. Introduction

Measures of inflation, and expectations thereof, are a typical concern of central banks. These parameters of the economy enter all types of loss function used by these institutions. The inflation rate is closely monitored as the main concern of monetary policy and in some cases explicitly targeted. All flavours of the Phillips curve include the inflation rate and expectations thereof, measured at different time lags. An accurate knowledge of inflation expectations among economic agents and the way they are formed is crucial to check, among other goals, if inflation expectations are properly anchored.

Inflation expectations can be made observable in different ways. A review of the main indicators used to measure inflation expectations in the euro area can be found in European Central Bank (2006). The break-even inflation rate calculated from prices of inflation-indexed assets can be considered an indirect measure, providing very high frequency data; but market-specific noise often prevents the correct individuation of the expectation component. But research is highly divisive also about usefulness of direct measures coming from survey data, as pointed out, for example, by Kershoff and Smit (2002) and Stekler (2002). Conclusions often rely heavily on the assumptions made and show no consistency over time. Serious criticisms from various authors include lack of correct (or bluntly distorted) incentives at work when formulating a figure (or a direction) during the interview and excessively different information sets available to the respondents, factors which could, among other effects, prevent the assessment of rationality of expectations. A review of uses of survey data in forecasting is found in Pesaran and Weale (2006).

Nonetheless, it seems that resorting to survey data is unavoidable when the moment comes for a reality check. Thus, from the survey conducted by the Michigan Survey Research Center since 1966 to the many local and global surveys where inflation expectations are collected, directly asking agents about future inflation has become common practice. Although sentiments cannot be ignored (as they directly influence consumption decisions), to query consumers on the projected quantitative inflation rate may be deceptive: recent studies pointed out the dangers of significant distortionary effects of perceptions, depending on factors (like frequency of purchase) at work particularly during regime changes (Del Giovane, Fabiani and Sabbatini, 2008).

Businesses or experts may also be queried within regular surveys. Examples are the Consensus Forecasts or the Survey of Professional Forecasters, where an independent private body collates forecasts made available by a poll of major banks and financial operators in a simple unweighted average. These sources are widely used by financial operators and central banks. Surveying inflation expectations on a sample of industrial businesses is not particularly widespread practice. Indeed, senior managers in prominent firms are often part of experts panels, for example for computing the Purchasing Manager

[1] Bank of Italy, Economics, Research and International Relations – Economic and Financial Statistics. The views expressed in this paper are the author's own and do not necessarily reflect those of the Bank of Italy. E-mail: raffaele.tartagliapolcini@bancaditalia.it.

Index (PMI); yet those are not always randomly selected (as they are deemed "subject matter experts"); sample size is normally very small and information collected is mainly qualitative. A random sample survey of businesses aimed at collecting information on projected inflation and the course of own prices is conducted in few countries. Colombia and Hungary run inflation expectation surveys on firms similar to that of the Bank of Italy (BIS, 2009). The National Bank of New Zealand, a private bank, conducts monthly a survey of the macroeconomic climate (National Bank Business Outlook, NBBO) where a sample of 1,500 firms, chosen from among this bank's clients, is asked about forecasts of general inflation and own prices. South Africa also surveys a panel of firms, taken from a convenience non-probability sample, for inflation expectations. The European Commission collects data on inflation and own price changes expectations of firms in qualitative form through national research bodies like Ifo in Germany and ISAE in Italy.

Uses of survey expectations are not limited to, nor centered on, their forecasting power. As stated, they bear interest in themselves as they provide information on the way they are formed. Nonetheless, their predictive content may be of use in models that include also other forecasting sources.

This paper illustrates the 10-year results of the quarterly Bank of Italy survey of expectations of inflation and growth. Section 2 contains a description of the survey and the data available. Section 3 describes the main statistical features of the aggregate estimates and contains an assessment of their forecasting performance, also in comparison with a widely used series such as Consensus Forecasts and a couple of mechanical benchmarks. The predicting content of forecasts from some subgroups in the sample is also investigated. Section 4 concludes, putting forward further work.

2. The survey

The Survey of Expectations of Inflation and Growth (SEIG henceforth) is conducted in partnership with the Italian daily financial newspaper "Il Sole 24 Ore". A letter, signed by senior executives of both the Bank and the newspaper, is sent to the selected firms as an invitation to participate in the survey. "Il Sole 24 Ore" has the right to publish and comment on the main results with priority over any other media. This entails the advantage of sharing the cost of the field, which is conducted by a firm specialized in economic polls. Methods and sample design are developed, and estimates are produced within the Sample Surveys Unit of the Economic and Financial Statistics directorate of the Research department. The results of the surveys are published by the Bank among its statistical publications and made available on the Bank's website[2].

This initiative started in December 1999, as a reprise of a former initiative set forth by the Bank of Italy and the late economic weekly "Mondo Economico" dating back to 1952, the results and implications of which are extensively reviewed in Visco (1984). While the latter was a biannual opinion poll, the 1999 edition is quarterly and based on a random sample. The sample size is about 500, chosen among the universe of industrial and service firms with 50+ employees, stratified by size of workforce, sector of economic activity and geographical location. Tables 1 & 2 provide some basic information on the sample design and participation in the survey. By design, firms with at least 1,000 employees are over-represented in the sample. Service firms also include some banks. Since the very first wave, interviews have been mainly conducted on a web interface (well over 90 per cent). In principle, the same

[2] http://www.bancaditalia.it/statistiche/indcamp/indaspe;internal&action=_setlanguage.action?LANGUAGE=en.

firms are constantly re-contacted in order to achieve a panel dimension. Panel average size is around 30 per cent of the sample.

The field is kept open in the first weeks of the last month of each quarter (namely March, June, September and December). Its duration, originally four calendar weeks, was reduced to three in year 2007, when the Bank of Italy Economic Bulletin became quarterly, in order to allow a comment of the results in that report.

A quantitative assessment of general inflation, in the form of a forecast of the 12-month inflation rate one year ahead, has been asked for since the beginning of the survey. In order to channel respondents' answers towards plausible figures, an anchor is proposed in the questionnaire, in the form of the latest definitive (hence referred to two months earlier) official HICP (Harmonized Index of Consumer Prices) figure, for both Italy and the euro area. To realize a uniform informational framework, interviews are started just after the announcement of the latest provisional HICP figure referred to the preceding month. During the field, the definitive figure of the same index is published, but the impact of this is irrelevant, as revisions to the provisional index are normally very limited. Answers to these questions are summarized and published in a sample weighted mean. Starting in June 2009, a question on the projected 12-month inflation rate at end of the next 24 months was added.

The questionnaire also contains a quantitative question on expectations of own prices, in the form of a 12-month change one year ahead. Starting in 2003, a retrospective question (on past 12 months) was also inserted. These answers are published as sample weighted means, in which the weights take into account not only the design but also the size of the firms in terms of workforce (as a proxy of turnover). Own prices may record significant changes, either firm-specific or sector-specific, so that some outliers may be detected in the database. Estimates are protected from the related undesirable effects through winsorization (i.e. values outside the 5-95 percentile interval of the distribution are set equal to the respective thresholds prior to computation). The magnitude of the robust estimates is, anyway, comparable: this indicates a low influence of the outliers overall.

Standard errors of the estimates have constantly been quite low: on average, 0.04 percentage points for inflation forecasts; 0.33 percentage points for predicted own price changes (0.21 when considering winsorized estimates); 0.53 percentage points for declared realized own price changes (0.32 when considering winsorized estimates).

A qualitative question is posed about direction and intensity of the impact of some factors (such as demand, competition and cost components) on own prices developments. The questionnaire also includes qualitative assessments on the general economic situation, an outlook of business and employment conditions and relevant factors thereto, an assessment on investment conditions in the past three months and other topics that may be of interest in the short term.

The questions on general inflation are the only mandatory items in the questionnaire, although data are ordinarily inspected for missing values and records with a high proportion of missing responses are discarded. Typically, information on own prices is not provided by all firms participating in the survey, although the item non-response rate remains acceptable (below 10 per cent on the average of all 42 waves).

3. The aggregate estimates as forecasts

This section is devoted to describing the performance of the macro forecast estimates (IT12 henceforth) aggregated from the SEIG since the beginning of the survey in December 1999 up to the wave of March 2010, by means of standard forecast performance evaluation tools like those recommended by Theil (1961, 1966). Such descriptive tools appear adequate

to describe the behaviour of forecasts where the number of observations for which a comparison with realizations is possible (38) is relatively low.

The comparison will be conducted with respect to Consensus Forecasts[3] (the other main source for which quarterly quantitative survey data for Italy are available – CONS henceforth). Surveys collecting expectations in qualitative form, hence requiring a further model to envisage the latent quantities, will not be considered here. Two mechanical benchmarks will also be compared: the naive forecast (NAIVE), obtained by simply shifting the realized values 12 months forward, and a non-trivial autoregressive model (ARP) recursively estimated on the aggregate official data, to simulate the conduct of a forecaster willing to use baseline econometric tools[4].

As stated, accuracy is not the only relevant feature of survey forecasts; it is considered here as an objective starting point for further analysis. Figure 1 shows a classical Theil's prediction-realization diagram for the main series we wish to compare. Most of the observations cluster around the line of exact forecast for values between 2 and 3 per cent; the slope appears negative overall. This behaviour, although clearly linked to the dependency of the forecasts on past values, is also related to difficulty in forecasting. A more consistent pattern can be revealed by excluding outliers, detected according to an appropriate definition: points whose forecast error exceeds a certain quantile of the distribution of the errors of the naive forecast[5]. Figure 2 shows the positive slopes revealed by considering a threshold at the 85th percentile[6].

An extensive array of literature has clearly shown that inflation expectations – especially those collected in surveys – tend to be heavily influenced by past realizations. SEIG results are no exception; by no means, anyway, can this apparent behaviour automatically void the forecast content of the estimates. Figure 3 shows the trend of the time series over time. Both IT12 and CONS appear clearly influenced by past realizations; while CONS is less volatile and regularly underestimates inflation[7], IT12 appears more in line with the average level of inflation observed in the period. The time series being rather short, this comparison should be interpreted with caution; but the discontinuity due to the advent of the single currency would have suggested prudence, even if the series had contained more data from the past.

Let l be the time lag (or lead), measured in quarters, between the forecast and the time where the forecast is to be referred to. Thus, a forecast is formulated at $l = -4$ and targeted to inflation realized at $l = 0$. Figure 4 shows the cross-correlation curve for the SEIG, Consensus Forecasts and the naive forecast. Correlation with realized inflation ($l = 0$) is relatively weak and negative for all three forecasts. On the contrary, correlation is positive and strong with respect to official data disseminated at the moment of the interview ($l = -4$).

---

[3] Consensus Forecasts is a survey conducted by Consensus Economics, a private body, which involves a convenience non-probabilistic sample of professional forecasters from financial institutions. For Italy, the individual estimates of some 15 bodies are aggregated in a simple unweighted mean.

[4] These estimates are obtained by applying the SAS FORECAST procedure to monthly official HICP data for Italy, starting from January 1997 and up to the same quarter where firms were interviewed, in order to obtain, for each quarter, an out-of-sample forecast 12 months ahead. The SAS FORECAST is an automated forecasting procedure that combines time trend regression with an autoregressive model, using a stepwise method to select the lags of the autoregressive process.

[5] A special definition of "outlier" is key to the robustification process here; using the quantiles of each own distribution instead would have reflected only the mechanical effect of removing points far away from the diagonal.

[6] This quantile is also higher than correspondent quantiles of the remaining distributions.

[7] This could also be related to the fact that Consensus Forecasts participants know that they will be allowed to update (revise) their forecast (on the same point in time) in the subsequent month or quarter.

Comparable results are obtained by running a simple OLS regression of IT12 on realizations and lagged values thereof, which shows that only the coefficient at $l = -4$ is significant. This shows clearly that expectations rely heavily on the information available at the moment of the interview. Not surprisingly, the same behaviour is shared by CONS and, by construction, by the naive forecast. On the other hand, Figure 4 shows for IT12 a strong and positive correlation with inflation realized about 9 quarters ahead of the moment where the forecasts were formulated. This would suggest a better forecasting capability of IT12 on this time horizon.

The tools we use to assess the forecast accuracy of the series under scrutiny are the Root Mean Square Forecast Error (RMSFE) and Theil's U statistic. The former is the root mean quadratic distance between forecast and realizations; the latter measures the RMSFE of the given forecast as a quota of the RMSFE of the naive forecast, considered as the "least informed forecast", yet not necessarily the easiest to beat. Estimates having a U statistic less than 1 should exhibit some forecasting content. Both CONS and IT12 forecasts show this property, with distinct features. In the period considered, CONS has constantly tended to underestimate inflation, so that the forecast error has been mostly positive. As a result, the overall RMSFE of the IT12 forecast has been steadily lower than that of CONS until recently. These results are shown in Figure 5, depicting the trend of Theil's U of the series over the subsequent forecasting exercises[8].

It would also be possible to check if qualitative unbiased information is contained in firms' forecasts. This can be done by checking out whether the forecasts are able to detect direction-of-change and turning points. The latter are detected in over 60 per cent of total cases[9] but there is no clear superiority of any forecast in this comparison; detection of direction-of-change is seldom satisfactory for any estimates.

The SEIG survey allows us to check if there are groups of firms whose forecasting capability is relatively more accurate, by using different aggregations of microdata. A simple comparison can be done between forecasts as expressed by different groups of firms according to design stratification variables. Results are shown in Table 4. Economic sector of activity and geographical area do not appear as relevant factors, whereas firm size clearly matters: firms with at least 1,000 employees show a better forecasting power than any other group (its performance over time is depicted by series IT12_CLD_3 in Figure 5); estimates from small firms, on the contrary, are shown to regularly overshoot with respect to those of bigger firms (Figure 6). OLS show a strong positive correlation between forecasting accuracy and firm size. It may also be of interest to note that the small subsample of banks that can be isolated within the SEIG also exhibit a better-than-average forecasting performance.

A test (Giacomini and White, 2006)[10] can be run on the aggregate estimates to check if their out-of-sample predictive power is significantly different. Results in Table 5 suggest that the series aggregated on bigger firms (IT12_CLD_3) exhibits a higher predictive power than IT12.

Since firm price changes should eventually affect overall inflation, some suggest that survey forecasts of own price changes, although possibly biased as such, should contain some information on future inflation. An apparent feature of SEIG own price changes (both

---

[8] The first values of the series have no statistical significance, being based on a handful of time points. The reader should focus on the right half of the graph.

[9] For the definitions of turning point and of direction-of-change see Theil (1961, 1966). To avoid spurious matches due to the chosen accuracy (1 decimal digit) for forecasts and realizations, the former have been added 0.05 when on LHS, subtracted 0.05 when on RHS of a "<" inequality, and vice-versa.

[10] This test is based on a comparison between the series of errors of the two forecasts at stake, the null hypothesis being of equal predictive power.

declared realizations and forecasts) is that they are very often lower than realized inflation and lower than forecasts for general inflation. This is true of the aggregates (Figure 7) but also of microdata, with almost 70% of firms overall showing the same behaviour individually. Although there could be many explanations for this, a plausible starting point for further analysis could be the hypothesis of a form of social desirability (interviewed firms would not want to be blamed for general inflation). Nevertheless, a preliminary analysis shows that the cross-correlation between projected own price changes and actual inflation is positive for leads between 4 and 6 quarters, which would indicate some forecast content on general inflation 24 to 30 months ahead. This will be the subject of further research.

4. Conclusion and further work

This paper describes the main features of the aggregate forecasts of Italian inflation (as measured by the harmonized index of consumer prices (HICP) computed by Eurostat) collected within the Survey of Expectations of Inflation and Growth (SEIG) run by the Bank of Italy. Evidence to date shows that the forecasting power of SEIG estimates, measured by Theil's U statistic, is broadly comparable to Consensus Forecasts, a commonly used source of quantitative inflation forecasts, over the same time horizon (12 months ahead), although both forecasts are heavily influenced by data available at the time of the interview. A better performance within the SEIG, also confirmed by a test suggested by Giacomini and White (2006), is shown by forecast estimates aggregated on bigger firms only.

The number of observations over time is relatively low as yet, and the expectations collected show some limitations, mainly, the absence of revised estimates on the same time horizon, which is, on the contrary, available for Consensus Forecasts. Yet there seems to be no reason to exclude SEIG data from serious consideration. The panel dimension allows for the possibility of microeconomic analysis on expectation formation; clusters of "best forecasters", possibly homogeneous with respect to some economic features, could be detected. A composite HICP forecast could be constructed, integrating SEIG estimates with other sources: it is graphically apparent, for example, that a simple linear interpolation of IT12 and CONS would have easily constituted, in the period under study, a forecast more accurate than the two single estimates. In this case, a composite index could exploit the distinct skills of two "forecasters", i.e. IT12 being more accurate in low volatility and CONS being more accurate in high volatility. Quantitative data on firms' own price changes could allow us to study the link between these measures and production prices on one hand, and general inflation on the other.

Possible developments of the SEIG survey are currently being debated within the team. Improvements proposed include a split sample test to verify the sources of the correlation between current inflation data and the forecasts provided; and asking participants for a whole forecasting curve (e.g. 3-6-9-12 months ahead…), which would provide a useful third panel dimension, as suggested in Davies and Lahiri (1995).

Tables and figures

Table 1

Composition of sample and sampling universe

Number of firms, percentages; March 2010

	Sample size (a)	Universe of firms[1] (b)	Sample coverage rate (a / b) * 100
Size class			
50-199 employees	199	17,490	1.1
200-999 employees	164	3,513	4.7
1,000+ employees	110	500	22.0
Sector			
Industry	283	11,727	2.4
Services	190	9,776	1.9
Geographical area			
North-West	183	8,484	2.2
North-East	153	6,134	2.5
Centre	82	3,774	2.2
South and Islands	55	3,111	1.8
Total	**473**	**21,503**	**2.2**

(1) Source: Italian National Institute of Statistics (Istat) (2007).

Table 2

Response rates and data collection via the Internet

Number of firms, per cent; March 2010

	Firms contacted	Response rate[1]	Data collected via the Internet[2]
Size class			
50-199 employees	576	33.9	95.4
200-999 employees	298	53.7	95.0
1,000+ employees	122	84.4	99.0
Sector			
Industry	558	47.3	96.2
Services	438	44.3	95.9
Geographical area			
North-West	394	43.9	98.3
North-East	301	50.2	96.7
Centre	166	51.2	91.8
South and Islands	135	36.3	93.9
Total	**996**	**46.0**	**96.1**

(1) Percentage of companies contacted that were interviewed. (2) Percentage of firms interviewed that completed the questionnaire via the Internet.

Figure 1

HICP forecasts and realizations, 2000q4-2010q1

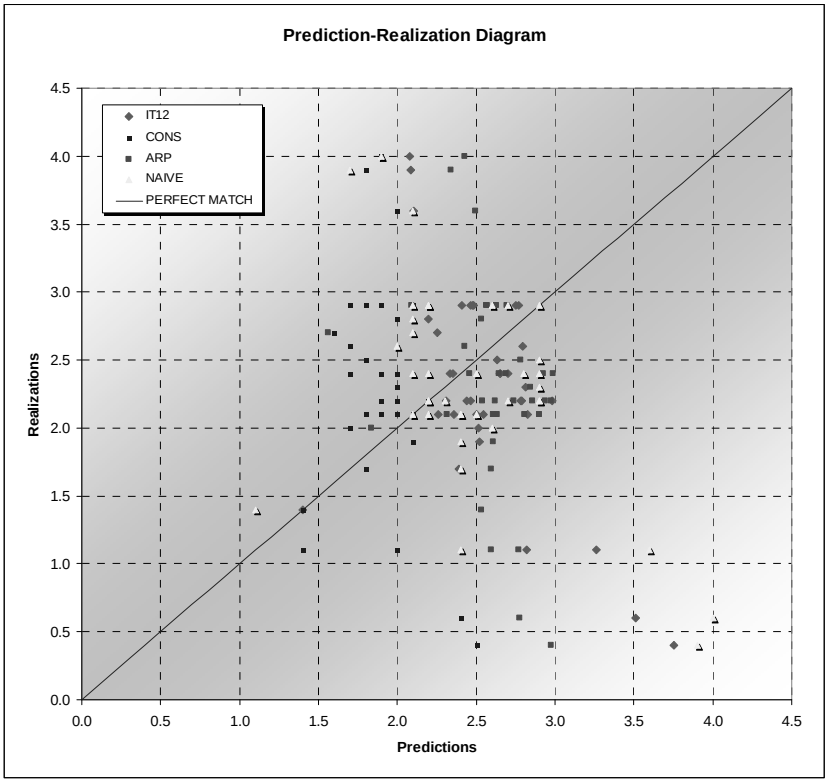


Figure 2

HICP forecasts and realizations, 2000q4-2010q1 (robust diagram)

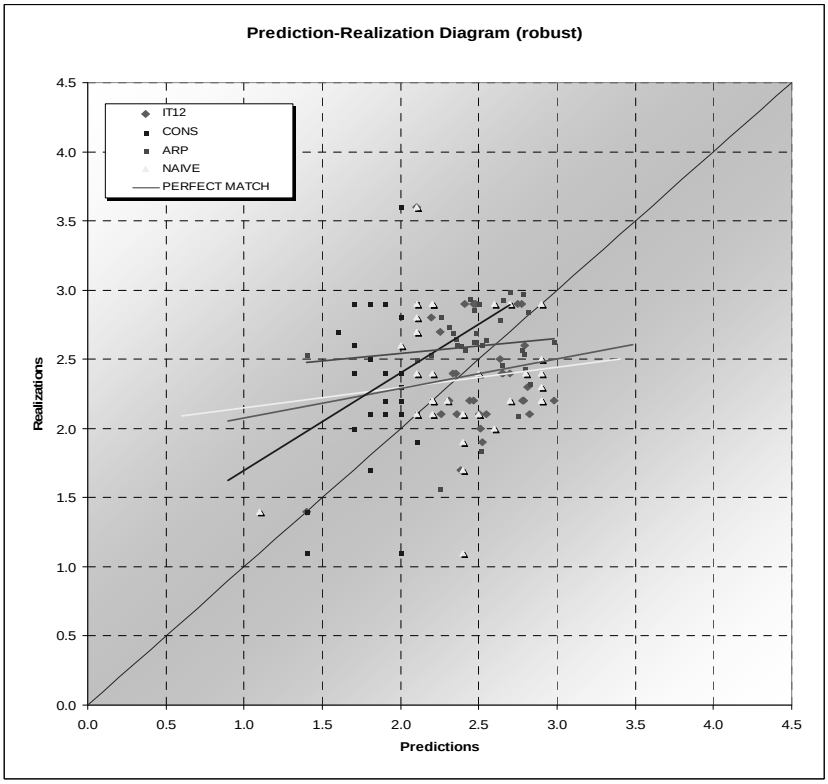


Figure 3

Quarterly inflation forecasts of HICP and realizations over time

Per cent

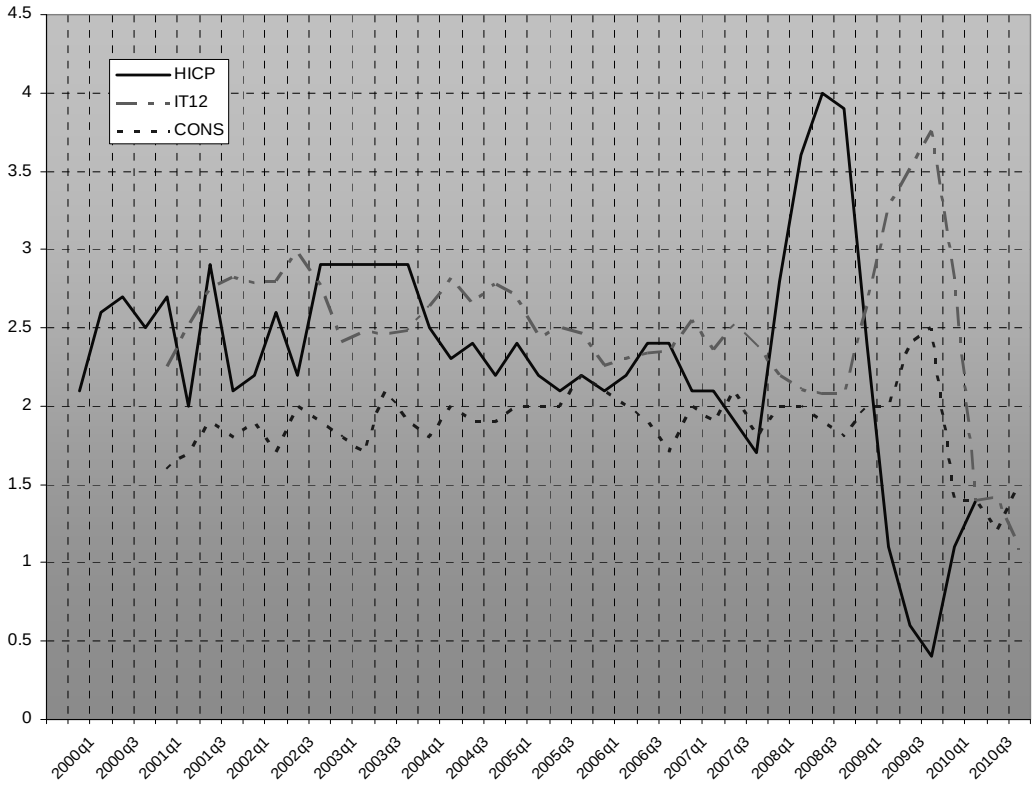


Figure 4

Cross-correlation between forecasts and realizations at different time lags

Pearson's ρ

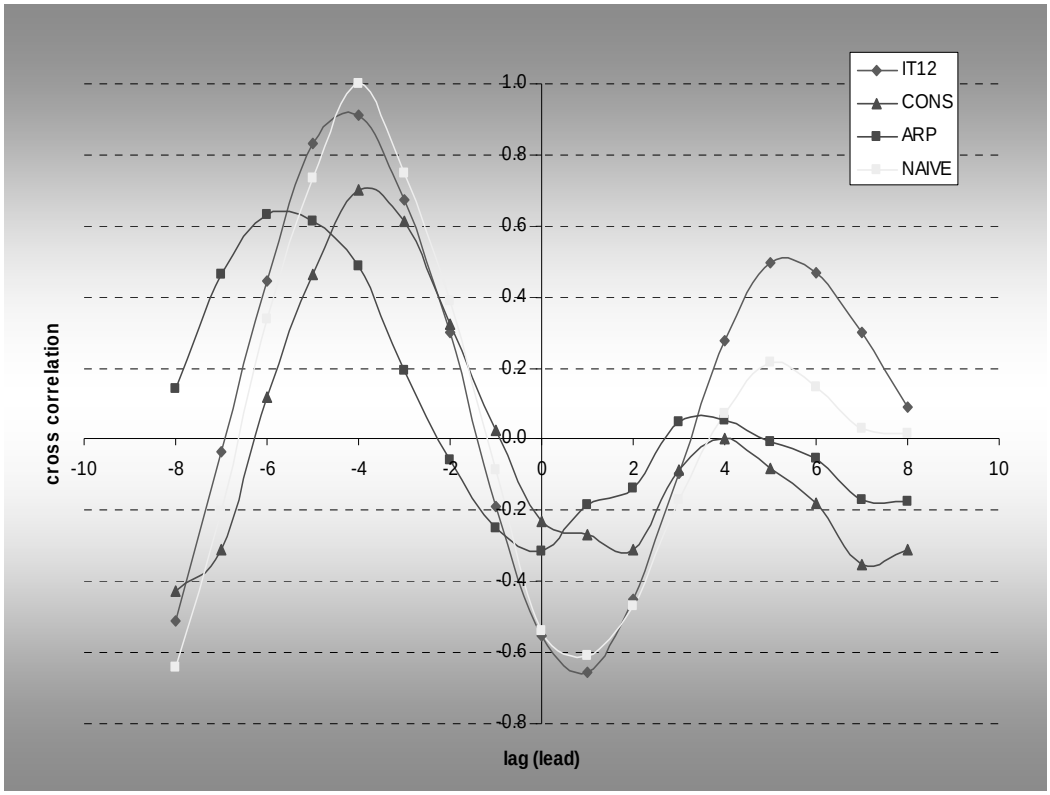


Figure 5

RMSFE of forecasts relative to the naive forecast (Theil's U) over the forecasting exercises

% units of RMSFE of the naïve forecast

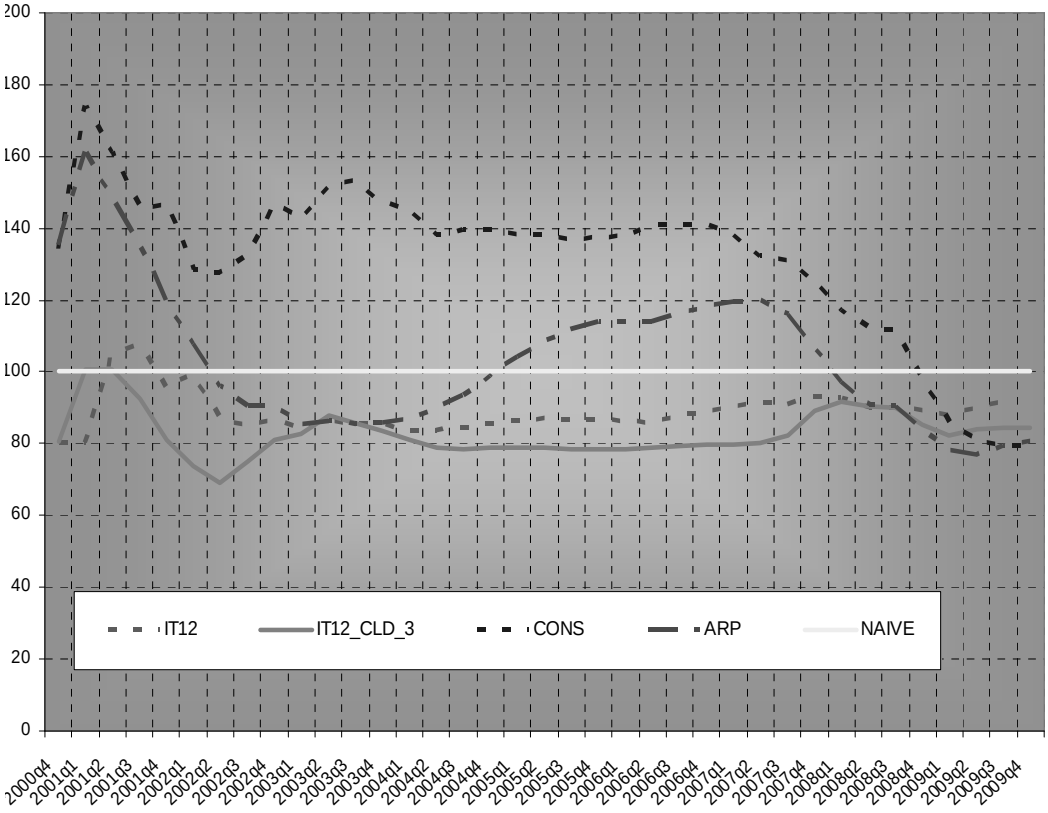


Figure 6

Inflation forecasts, by firms' size class

Per cent

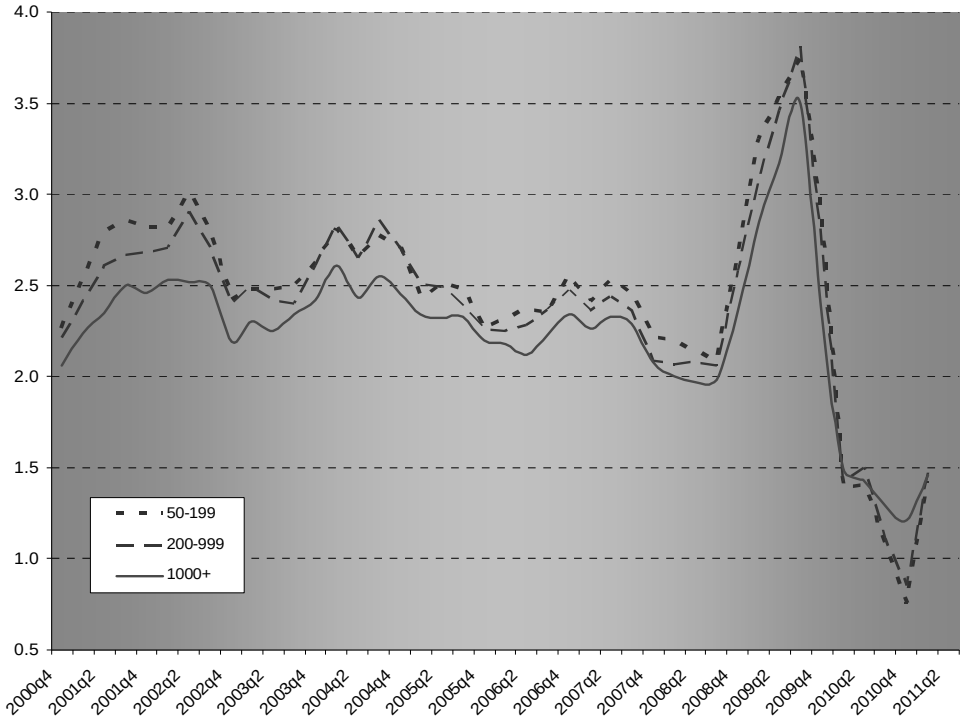


Table 3

RMSFE and Theil's U of HICP forecasts for Italy(1)

	IT12	CONS	ARP	NAIVE
RMSFE(2)	1.07	0.97	0.93	1.15
Theil's U(3)	0.92	0.79	0.81	1.00

(1) Based on 38 observations (2000q4 to 2010q1). (2) Percentage points. (3) RMSFE of the forecasts as a percentage of RMSFE of the naive forecast.

Table 4

RMSFE and Theil's U of HICP forecasts for Italy: estimates from subgroups[1]

	Size class			Geographical area				Sector				Total	Naive
	50-199	200-999	1,000+	North-West	North-East	Centre	South/ Islands	Indus-try	Services	Banks	Non-banks		
RMSFE[2]	1.07	1.05	0.98	1.08	0.98	1.05	1.10	1.08	1.06	0.98	1.07	1.07	1.15
Theil's U[3]	0.92	0.91	0.84	0.93	0.84	0.91	0.95	0.93	0.91	0.84	0.92	0.92	1.00

(1) Based on 38 observations (2000q4 to 2010q1). (2) Percentage points. (3) RMSFE of the SEIG aggregate forecast as a percentage of RMSFE of the naive forecast.

Figure 7

Own prices and general inflation: expectations and realizations

Per cent

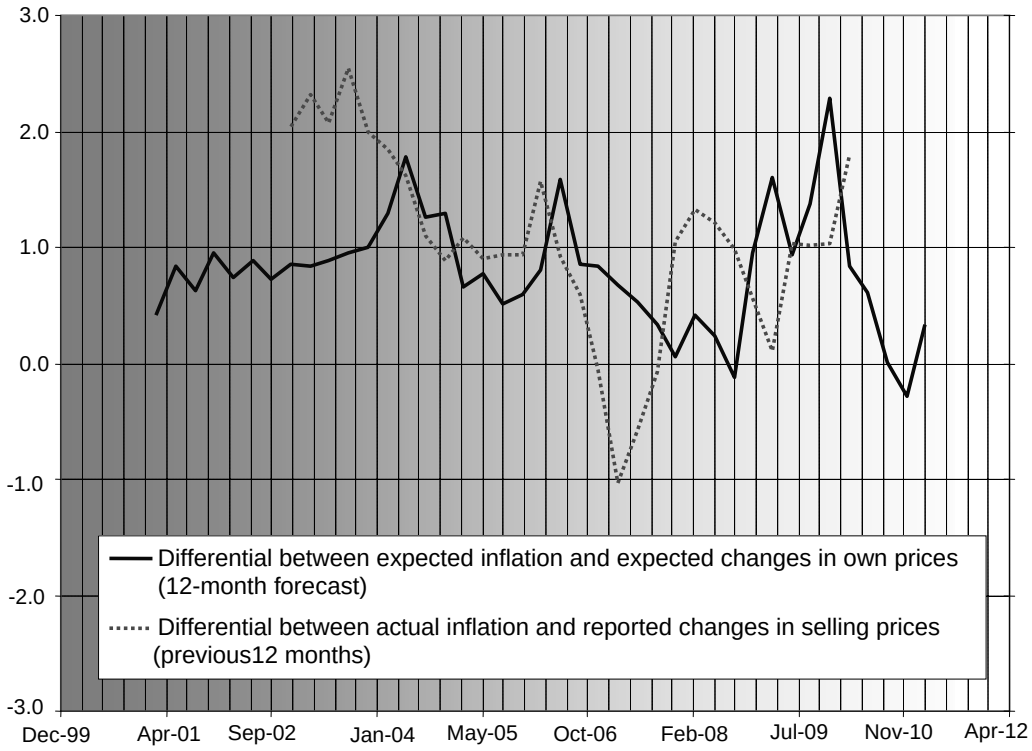


Table 5

Giacomini-White test of conditional predictive power[1]

IT12 compared to	IT12_CLD_3	CONS	ARP	NAIVE
GW	3.364*	1.057	1.785	3.458*
p-value[2]	(0.066)$^{+}$	(0.304)	(0.182)	(0.063)$^{-}$

(1) Based on 38 observations (2000q4 to 2010q1). – Null hypothesis of equal predictive power rejected at the confidence level of : *** 1%, ** 5%, * 10%. – (2) Plus sign: IT12 is outperformed (higher RMSFE) by the comparison series; minus sign: IT12 outperforms (lower RMSFE) the comparison series.

References

Bank for International Settlements (2009). Monetary policy and the measurement of inflation: prices, wages and expectations. *BIS Papers* no. 49, December.

Bank of Italy (2010). Survey of Inflation and Growth Expectations – *Supplements to the Statistical Bulletin – Sample Surveys* – various issues.

Davies, A. and K. Lahiri (1995). A new framework for analyzing three-dimensional panel data. *Journal of Econometrics* 68, 205–227.

Del Giovane, P., S. Fabiani and R. Sabbatini (2008). What's Behind "Inflation Perceptions"? A Survey-Based Analysis of Italian Consumers. *Bank of Italy Temi di Discussione (Working Papers)* no. 655, January.

European Central Bank (2006). Measures of inflation expectations in the Euro Area. *ECB Monthly Bulletin*, July.

Giacomini, R. and H. White (2006). Tests of Conditional Predictive Ability. Econometrica, Volume 74, Issue 6, pages 1545–1578, November.

Kershoff, G. J. and B. W. Smit (2002). Conducting inflation expectation surveys in South Africa. *The South African Journal of Economics*, March, 70:3.

Pesaran, M. H. and M. R. Weale (2006). Survey expectations. *Handbook of Economic Forecasting, Volume 1, Chap. 14.* New York: Elsevier, 715–776.

Stekler, H. O. (2002). The rationality and efficiency of individuals' forecasts. Chapter 10 in Clements, M. P. and D. F. Hendry (eds.) *A Companion to Economic Forecasting*. Oxford: Blackwell.

Theil, H. (1961). Economic forecasts and policy. Amsterdam: North-Holland.

Theil, H. (1966). Applied economic forecasting. Amsterdam: North-Holland.

Visco, I. (1984). Price expectations in rising inflation. Amsterdam: North-Holland.

Session 4 B

The usefulness of micro data

Chair: Chihiro Sakuraba, Bank of Japan

Papers:

How can administrative databases help us to understand the funding behaviour of non-financial corporations?
Homero Alexandre Martins Gonçalves, Bank of Portugal

Recession-induced mean and distributional effects on business profitability: addressing information gaps using corporate firm-level balance sheet data
Dominik Elgg and Timm Körting, Deutsche Bundesbank

Micro-data as a necessary infrastructure – standardisation of reference data on instruments and entities as a starting point: need for a Reference Data Utility
Francis Gross, European Central Bank

How can administrative databases help us to understand the funding behaviour of non-financial corporations?

Homero Alexandre Gonçalves[1]

1. Introduction

The contagion effects associated with the adverse international environment, characterised by high uncertainty about the sustainability of public finances in several European countries as well as the upward revision of the estimated general government deficit in Portugal in 2009, have been negatively conditioning the evolution of the yield on Portuguese Treasury bonds. This increase in risk premiums associated with the government debt is already being reflected in other economic agents' funding costs, namely banks, with potential widespread macroeconomic impacts.

This is particularly noteworthy for an economy where indebtedness has become a structural feature as the move in the International Investment Position easily illustrates. In 1999, the year when the country joined the euro, the net debtor position for economic agents resident in Portugal stood at 32 p.c. of GDP. By the end of 2009 it had soared to more than 109 p.c. of GDP, with almost half of this position corresponding to the resident banking sector, while the remainder is essentially public debt in the hands of non-residents. Given its role in financial intermediation with the rest of the world, the indebtedness of the banking sector emerges as the external counterpart of the non-financial private sector domestic debt.

This setting emphasises the critical need for having detailed data on these institutional sectors in order to assess their financial soundness and how they are being affected by the adverse economic situation. Data gaps are, however, an unavoidable consequence of the ongoing development of markets and institutions and are usually highlighted when a lack of timely and accurate information hinders the ability of policy makers and market participants to develop effective responses. The recent worldwide economic events drew attention to many data gaps and have clearly underlined the importance of going beyond traditional statistical production approaches to obtain a set of indicators in more innovative ways.

In this sense, this paper demonstrates how administrative databases can be used to fill in data gaps in the Non-Financial Corporations (NFC) sector. The focus will be twofold: on the one hand, it intends to unveil more detail on the NFC sector balance-sheet; on the other hand, it illustrates how these databases can be used to complement traditional macro statistics on this sector.

The report is centred on Portuguese corporate finance, in particular the amount of external financing, the choice between debt and equity, and the composition and maturity structure of debt as well as its cost. The analysis is performed in a way which allows identification of the peculiarities that depend on the activity sector and the company size. The results are particularly relevant to supporting productivity and economic growth, monetary policy and financial stability.

---

[1] Banco de Portugal, Statistics Department, hgoncalves@bportugal.pt

The views expressed in this paper are those of the author and do not necessarily reflect those of the Banco de Portugal. The author would like to express his gratitude to Luís Sarmento, Margarida Brites, Mário Lourenço and Vítor Silveira for their valuable comments.

The analysis is based on data derived from two databases administered by the Banco de Portugal under the responsibility of the Statistics Department: the Central Balance-Sheet Database (CBSD) – containing economic and financial information based on non-consolidated accounting reports – and the Central Credit Register (CCR) – containing information on every individual credit, above €50, granted by the resident financial system.

The use of these data sources has the great advantage of making available additional and more detailed information that, in the case of the CBSD, comes directly from the companies. This is particularly relevant in a sector where most of the existing data comes indirectly from other sectors' statistics or from surveys which are often based on small samples highly biased to larger companies. Another important feature is that all of this additional information is guaranteed without overburdening reporting agents given that both reports are already set up for other purposes.

The remainder of this paper is organised as follows: section 2 introduces both databases used in this study as well as some methodological issues. Section 3 presents the Portuguese NFC sector using mainly traditional macro statistics. Section 4 uses the micro data to characterise in more detail NFC funding behaviour and its cost while section 5 illustrates how these same databases are used for financial stability purposes, to analyse banks' exposure to NFC. Section 6 concludes.

2. Databases and methodology

This section presents the two databases used in the paper. Firms' size distinction and activity sector aggregations are explained. Finally, the method used to control activity and size effects is presented.

2.1 Databases

All the analysis presented in sections 4 and 5 is based on data gathered from two micro databases administered by the Banco de Portugal under the responsibility of the Statistics Department: the Central Balance-Sheet Database (CBSD) and Central Credit Register (CCR). From these two sources it is possible to obtain an almost complete sample of the Portuguese Non-Financial Corporations (NFC).

An important feature of these data, as a source for statistics, comes from the fact that all the reported information concerns individual firms. This allows for an accurate classification of companies and instruments according to relevant statistical criteria, taking advantage of the knowledge and statistical reference data resources available at the Banco de Portugal, as part of the Portuguese national statistical system.

2.1.1 Central Balance-Sheet Database (CBSD)

Since 2006, CBSD data has been based on corporate accounts reported in fulfilment of firms' statutory obligations. This database has detailed and carefully harmonised balance-sheet and profit/loss data on nearly all non-financial companies in the country. The information is reported with a delay of about seven months from the reference period.

Table 1
Sample coverage, by number of non-financial corporations, number of employees, turnover and total assets
In per cent

	2006	2007	2008
Number	91.9	93.7	91.9
Employees	94.8	96.8	94.9
Turnover	96.8	98.3	97.0
Total assets	98.2	98.2	96.1

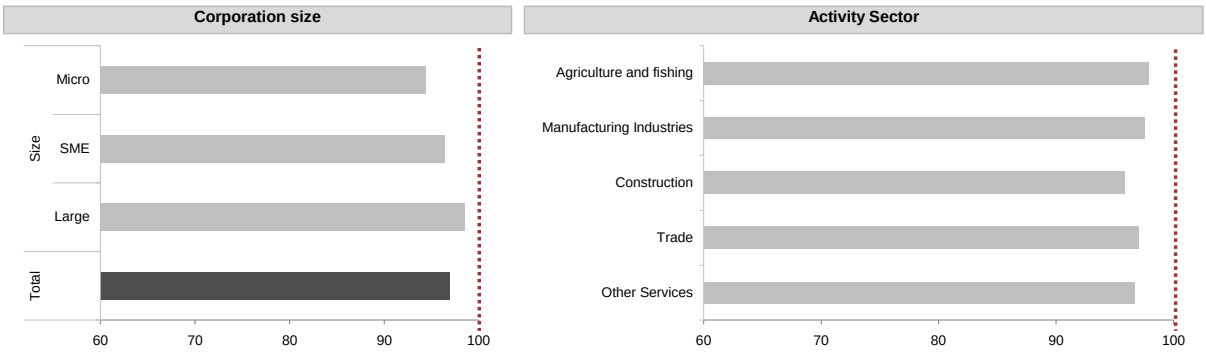
Source: Banco de Portugal

As table 1 demonstrates, the coverage level in any of the indicators (number of companies; number of persons employed; turnover; total assets) is well above 90 p.c. in every year.

Detailing the coverage indicators, at the turnover level it is possible to verify that the Portuguese CBSD has the great advantage of showing almost no bias towards larger companies or to any of the activity sectors. In fact, the CBSD represents equally well smaller and larger firms (95 p.c. for micro; 96 p.c. for SME and 99 p.c. for large) and the same happens for all activity sectors with the one with smaller coverage, "construction", being covered at more than 95 p.c. (figure 1). This high coverage level implies that the size and sectoral structure of the Portuguese economy is being well replicated in the database.

Data quality control is a crucial step in this process. Each year, the CB receives reports from more than 350 thousand companies with each one reporting up to 1 600 indicators. The massive amount of data increases the chance for reporting errors making quality check procedures a key element in order to allow the good use of this information. The data control starts with automatic consistency tests performed at the reporting level that are later complemented with additional individual quality control at the Banco de Portugal.

Figure 1
CBSD turnover coverage by companies' size and activity sector (2008)
In per cent



Sources: CBSD, Banco de Portugal

The large amount of available data provides comprehensive disaggregated information (e.g. by activity, firm size, geographical area), tail/distribution information, and can be crossed with other data sources[2].

2.1.2 Central Credit Register (CCR)

The CCR contains information on actual and potential[3] credit granted by the resident financial system[4], both positive (when contractual obligations are being duly fulfilled) and negative (when there are arrears).

Borrowers are resident or non-resident entities, both individuals and organisations, receiving credit from resident financial institutions. Information is reported to the CCR by the lenders on a monthly basis, with reference to the outstanding liabilities at the end of each month. Participants are obliged to supply the CCR with information related to all borrowers whose total debt outstanding (actual or potential) is over €50.

Given the reduced threshold used for reporting operations and the mandatory report, this database has virtually all credit operations granted by the financial system in Portugal. As reference, just for the month of December 2009, the CCR received 1 057 560 registries concerning only NFC.

The main aim of the CCR is to provide the participants with relevant data for their assessment of the risks attached when granting credit. To this end, participants can assess aggregate information on the credit liabilities of each client (borrower) vis-à-vis the financial system as a whole[5]. From a legal point of view, information on credit liabilities can be used for the supervision of financial institutions and for the compilation of statistics[6].

2.2 Aggregation used

In order to facilitate the analysis and identify common trends, some aggregations were performed at the company level, namely concerning companies' size and activity sector.

2.2.1 Size dimensions

The size classes considered herein are based on the European Commission Recommendation of 6 May 2003 related to the definition of micro, small and medium sized companies.

In many studies these three categories are taken together as SME. Given that in Portugal micro companies account for the large majority of firms it was decided to treat them as an autonomous group in order to enable the identification of their specific characteristics.

---

2 See *Simplified Reporting: Inclusion of the Simplified Corporate Information in the Statistics on Non-Financial Corporations from the Central Balance-Sheet Database* (http://www.bportugal.pt/en-US/Estatisticas/PublicacoesEstatisticas/Tumbnails%20List%20Template/sup-be-1-2008-en.pdf) for more details about the CBSD.

3 Potential liabilities consist chiefly of the situations that constitute irrevocable commitments by participants, such as available credit on credit cards, credit lines, pledges given by participants and other credit facilities which may become actual debt.

4 Banks, savings banks, mutual agricultural credit banks, credit institutions, specialised consumer finance companies, leasing companies, factoring companies and credit card issuing or managing companies.

5 In 2009 financial institutions assessed data on more than 7 million borrowers (non-financial corporations and households) in the CCR.

6 See *A New Source for Monetary and Financial Statistics: the Central Credit Register* (http://www.bportugal.pt/en-US/Estatisticas/PublicacoesEstatisticas/Tumbnails%20List%20Template/sup-be-1-2005-en.pdf) for more details about the CCR.

Accordingly, this study has adopted three categories: micro companies, small and medium sized companies (SME), which entails both classes referred to in the EC Recommendation, and large sized companies, which are considered to be those who are above the thresholds mentioned in table 2.

Table 2
Definition of micro, small and medium sized companies

Enterprise category	Employees	Turnover		Balance-sheet total
Medium sized	<250	≤ €50 million	**or**	≤ €43 million
Small	<50	≤ €10 million		≤ €10 million
Micro	<10	≤ €2 million		≤ €2 million

Source: European Commission

2.2.2 Activity dimensions

The business segments considered throughout this analysis are those foreseen for NFC in the 3rd revision of the Portuguese Economic Activity Classification (CAE rev3) that is equivalent to NACE Rev. 2. Nevertheless, in order to simplify the activity sector analysis, it was made an aggregation which, although based on NACE Rev. 2 Section codes, only comprises five categories, as shown in table 3.

Table 3
Categories considered in the business segments classification
NACE Rev. 2

NACE Rev. 2 Section	Description	Additional categories
A	Agriculture, Forestry and Fishing	Agriculture and Fishing
B	Mining and Quarrying	Manufacturing Industries
C	Manufacturing	
D	Electricity, Gas, Steam and Air Conditioning Supply	
E	Water supply, Sewerage, Waste Management and Remediation Activities	
F	Construction	Construction
G	Wholesale and Retail Trade, Repair of Motor Vehicles and Motorcycles	Trade
H	Transportation and Storage	Other Services
I	Accommodation and Food Service Activities	
J	Information and Communication	
L	Real Estate Activities	
M	Professional, Scientific and Technical Activities	
N	Administrative and Support Service Activities	
P	Education	
Q	Human Health and Social Work Activities	
R	Arts, Entertainment and Recreation	
S	Other Service Activities	

Source: NACE Rev.2 – Statistical classification of economic activities in the European Community, Eurostat, 2008

2.3 Method of adjusting financial indicators

In order to unveil the respective influence of the firm's size and activity sector on the firm's financial structure, the financial indicators taken from the CBSD and CCR were adjusted.

For the size effect, the adjustment consists in imposing on each size class the same sectoral structure as that observed at aggregate level (taking all size classes together). In analytical terms, that is expressed as:

$$Y(d)_t = \sum_s y(d)_{s,t} \cdot w_{s,t}$$

Where:

$Y(d)$ = aggregate value of the variable at the size class d level

$y(d)_s$ = individual value of the variable at the size class d – sector s level

w_s = weight of each sector in total value added (taking all size classes together)

s = 1,…S sectors

d = 1,…D size classes

t = 1,…T years

To reveal the sector effect, the adjustment means considering that the class structure within each sector is equivalent to that observed at aggregate level (taking all sectors together), expressed as:

$$Y(s)_t = \sum_d y(s)_{d,t} \cdot w_{d,t}$$

3. The Portuguese non-financial corporations sector – a macro statistics approach

The NFC sector plays a major role in the Portuguese economy. Indeed, in 2009 NFC were responsible for more than two thirds of the employment and more than half of the gross value added of the Portuguese economy.

3.1 Companies' structure

This sector is composed essentially by very small firms[7], as they represent 87 p.c. of the total although in terms of employment and turnover they stand for only 26 p.c. and 15 p.c., respectively. With large companies the opposite situation takes place. With a weight of less than 1 p.c. in number, they stand for 27 p.c. of employment and 42 p.c. of turnover. SME hold, however, the largest share of persons employed (47 p.c.) and turnover (43 p.c.).

[7] This analysis does not consider self-employed businessmen as they are, for statistical purposes, part of the household sector.

Table 4
Non-financial corporations sector structure, by size and by activity sector (2008)
In per cent

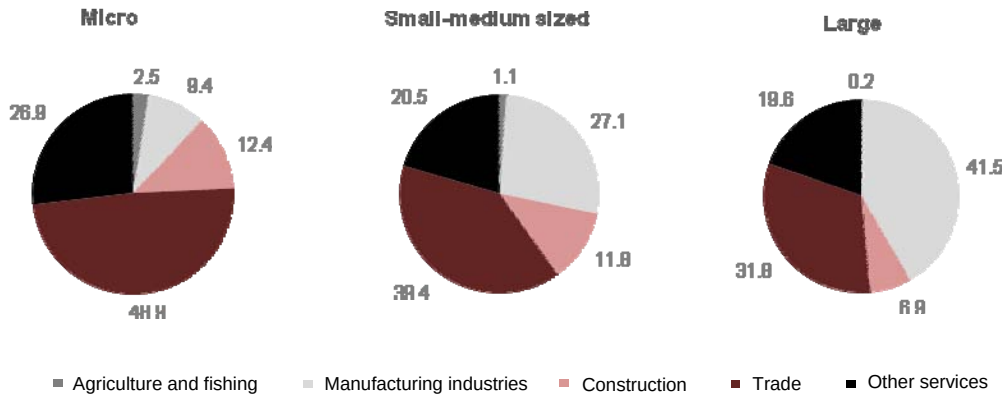
	Nr. of NFC	Employees	Turnover
By size dimension			
Large	0.3	27.4	41.9
Small and medium sized	13.2	46.6	42.8
Micro	86.5	26.0	15.3
By economic activity			
Agriculture and fishing	2.5	1.5	0.9
Manufacturing industries	11.9	25.4	29.4
Construction	13.6	13.7	9.6
Trade	27.3	20.6	36.4
Other services	44.7	38.8	23.7

Source: Banco de Portugal

From an economic activity perspective, the services sectors emerge as the most relevant no matter the indicator being considered. When "trade" and "other services" are merged, they represent 72 p.c. of the companies, 59 p.c. of total employment and 60 p.c. of total turnover. "Construction" and "manufacturing industries" are balanced in terms of number of companies, yet the second clearly dominates in number of persons employed (25 p.c. against 14 p.c.) and turnover (29 p.c. against 10 p.c.). The primary sector is nowadays almost inexistent (table 4).

Combining dimensions – size and activity sector – and focusing on turnover, it is clear the large relevance that "trade" has in all size aggregations although its influence decreases with company size (figure 2). Indeed, for micro companies and SME, "trade" is the most relevant activity with almost half of the total turnover for the former and 39 p.c. for the latter. For large companies it appears only as the second most relevant with 32 p.c.

Figure 2
Structure of the non-financial corporations' turnover by size and by activity sector (2008)
In per cent



Source: Banco de Portugal

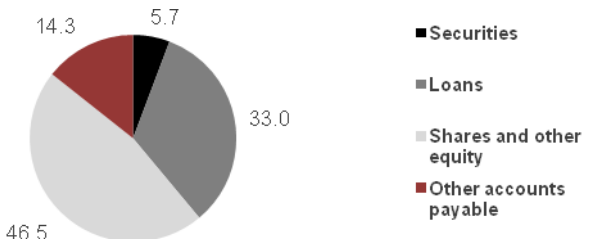
"Manufacturing industries", being in general a sector involving large investments, shows the opposite trend, increasing its relevance in total turnover with the firm's size, having the

highest weight for large companies (42 p.c.). “Other services” are balanced across size dimensions with a slight bias towards smaller companies while “construction” is about two times more relevant in micro and SME than in large firms.

3.2 Funding structure

Financial Accounts data show that own funds represent almost half of the total value (47 p.c.) followed by loans (33 p.c.) and other accounts payable, which include trade credits and advances (figure 3). The share of debt securities (6 p.c.) demonstrates the small relevance that this instrument has for Portuguese firms.

Figure 3
Non-financial corporations’ liabilities structure (2009)
In per cent



Sources: Financial Accounts, Banco de Portugal

Comparing the actual structure with the one existing at the beginning of the decade, financial debt (loans and securities other than shares) increased its weight by 7 p.p. while own funds and trade credits reduced by 3 p.p. and 2 p.p., respectively. The boost in debt can be seen by the large increase in the financial debt ratio[8], which has moved from 65 p.c. in the year 2000 to 83 p.c. in 2009.

This increase in debt also had effects on the maturity structure. In the year 2000, the weight of long term financial debt in total financial debt was 72 p.c. while in 2009 it rose to 78 p.c. However, it is interesting to notice that this is due to the large weight that loans have in total financial debt given that in the case of securities other than shares, in the same period, the short term component increased its relevance from 43 p.c. to 56 p.c. essentially due to higher amounts of issued commercial paper. The increased relevance of this instrument can be explained in part by the problems associated with the issue of debt securities at longer terms in the most recent periods.

Given this liabilities structure, it is important to know which sectors are financing the NFC. Analysing whom-to-whom tables, also derived from Financial Accounts, it is possible to see that more than 62 p.c. of the funding is coming from other institutional sectors with emphasis on the Financial Sector with a share of 42 p.c. of this value while the Rest of the World and Households represent around 29 p.c. and 27 p.c., respectively.

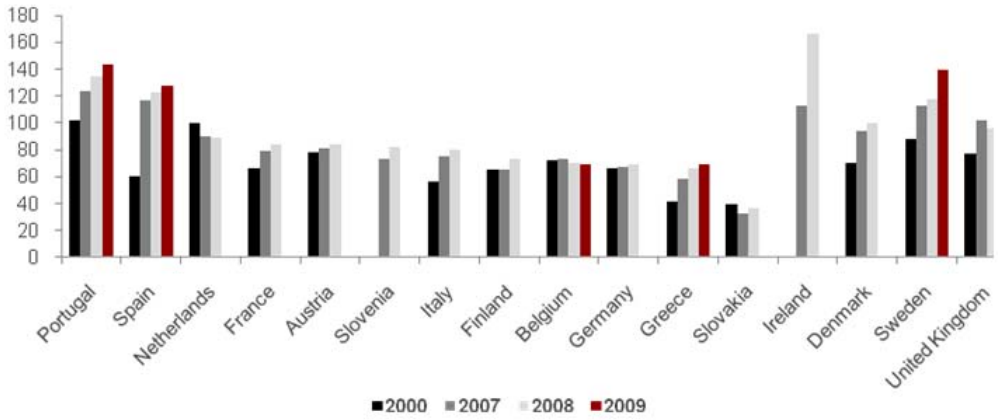
Detailing by instrument, debt securities are mainly in the hands of the Financial Sector (55 p.c.) and Rest of the World (42 p.c.). The largest component of loans is granted by the resident Financial Sector (55 p.c.). Concerning shares and other equity, more than 45 p.c.

[8] Ratio between financial debt and shares and other equity.

are in the hands of other companies inside the NFC sector (45 p.c.), Households detain 25 p.c. and the Rest of the World 20 p.c.

Focusing only on the magnitude of other sectors' exposure to NFC, through the consolidated financial debt it is possible to verify that, at the end of 2009, the indebtedness of NFC to other institutional sectors in instruments paying interest amounted to 143 p.c. of GDP, one of the highest in the euro area. This comparatively high level of debt is recurrent but, as figure 4 demonstrates, the gap to most of the other countries has widened in these last ten years.

Figure 4
Non-financial corporations' financial debt
As a percentage of GDP



Note: Consolidated amounts except for Ireland and the United Kingdom
Source: EUROSTAT

Within a framework of a meaningful differentiation of sovereign risk at international level, with the Portuguese Republic rating under downward revision, firms will probably face more constraints to accessing debt markets and bank financing, namely by incurring higher costs. The high indebtedness level and the prevalence of credits with rates indexed to money market interest rates makes Portuguese NFC even more vulnerable to this situation. Given that, for Portuguese firms, bank loans represent a significant share of the financial debt, this instrument interest rate can be a key indicator to analyse NFC funding costs.

3.3 Funding cost

The ECB, along with the euro area national central banks, publishes, on a monthly basis, data on a set of euro area interest rates on lending business. These Monetary Financial Institutions (MFI) Interest Rate statistics (MIR)[9] provide a comprehensive, detailed and harmonised picture of the level of interest rates applied by the MFI, and their changes over time. They are particularly useful to analyse the monetary policy transmission mechanism, especially the extent of the pass-through of official rates to the lending and deposit rates paid and received by the Households and NFC.

The interest rate on outstanding amounts of loans granted to NFC reflects the weighted average interest rate applied by MFI to the stock of these loans in a certain time reference period. It covers all loans used and not yet repaid by customers in all the periods up to and including the reporting date, although excluding bad loans and loans for debt restructuring at

[9] These statistics are covered by the Regulation (EC) No 290/2009 of the ECB, of 31 March 2009, amending Regulation (EC) No 63/2002.

rates below market conditions. The figures for individual countries reflect loans granted by the resident banking sector to all companies resident in the euro area.

Figure 5 demonstrates that the average interest rate on outstanding amounts of loans granted by MFI to NFC closely follows the market interest rates' behaviour, here represented by the six month EURIBOR. It is also noticeable that the spread between both rates shrank until the first tensions in the financial sector were felt in summer 2007.

Figure 5
Interest rates
In per cent

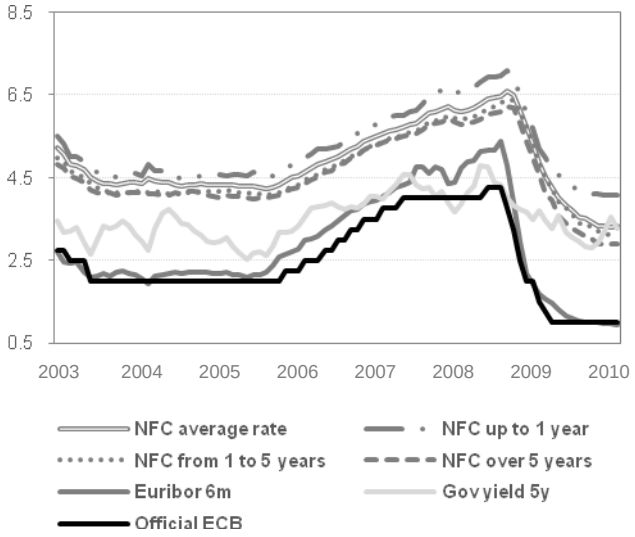
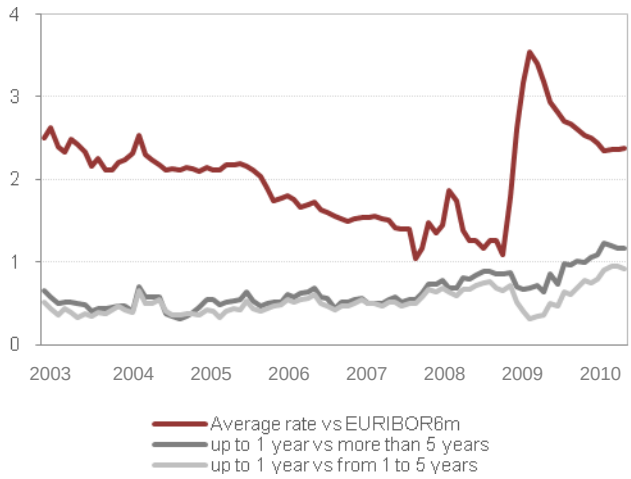


Figure 6
Non-financial corporations' interest rate spreads
In percentage points



Sources: Banco de Portugal, author's calculations

With the Lehman Brothers bankruptcy in September 2008, and all the turbulence that it provoked in financial markets, central banks started a substantial cut in their official interest rates in an effort to pull down market rates, which eventually happened. Nevertheless, although more than 98 p.c. of the new loans granted to NFC are with initial rate fixation up to one year, the fast decline in market rates was not immediately reflected to the total stock of loans. Given this, between September 2008 and January 2009 the spread between these rates increased markedly (figure 6). Since that date, it has started to decrease again although, in the latest months, it has remained flat, probably reflecting more careful behaviour from the banks.

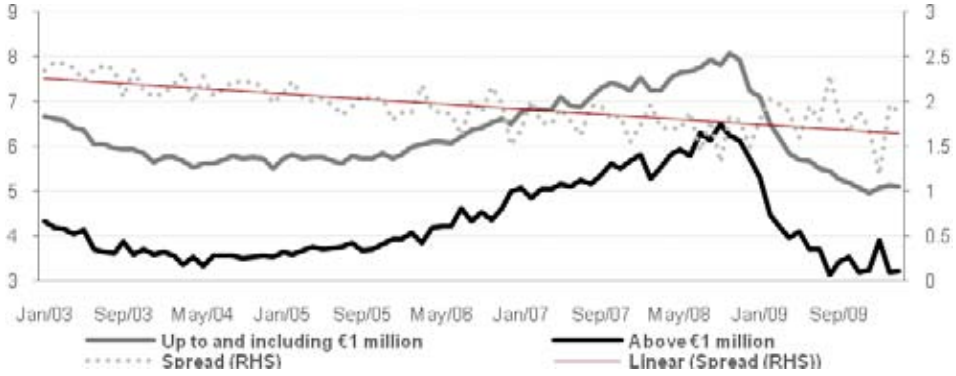
Also from figure 5 it is possible to see that, even with the referred link of NFC loans to short term interbank rates, credits with shorter maturity pay higher rates. That differential in costs between short and medium and long term loans has also increased in the latest periods[10].

MIR statistics also include figures on new operations from which it is possible to gain a better idea of the interest rate level being currently applied by banks. In these statistics, for NFC, a distinction is drawn between loans above and below €1 million in order to have an approximation to the effect of the company size on the interest rate level. As can be seen from figure 7, larger loans have smaller interest rates along the entire series.

[10] Another remarkable feature that can also be seen in figure 5 relates to the most recent events in sovereign debt markets and how they managed to pull the government bond yields above the average interest rate paid by banks on bank loans.

Rates on larger amounts present significant volatility – due to the impact that some large operations have on the average rate – making the spread highly variable. Nevertheless, adding a linear trend to it, it is possible to detect that this differential has been presenting a slightly downward tendency. In January 2003 it was 2.4 p.p. while in December 2009 it stood at 1.7 p.p.

Figure 7
Interest rates on new loans to non-financial corporations
In per cent



Sources: Banco de Portugal, author's calculations

This section presented, by means of traditional macro statistics, the NFC sector structure, funding sources and related costs. One of the points highlighted here relates to the high indebtedness level presented by NFC which is a major source of concern in the current difficult economic context, marked by credit restrictions to the Portuguese economy.

This situation will surely have negative impacts on many firms. In order to support economic growth, policy makers are expected to intervene and for that, they need to be aware of which subgroups of companies and instruments must be targeted, a goal which can only be accomplished if more detailed data is available.

The conclusions presented here, being based on macro figures, mask all scope of heterogeneous behaviour than can be found by looking into smaller subsets of companies. The relevant issue then, is to ascertain if these conclusions are in fact valid for all types of companies. Are smaller companies paying similar interest rates to the larger ones? Do all activity sectors use the same funding sources? Which companies are riskier in terms of credit? All these questions are difficult to answer based on aggregate figures and the cost of collecting additional, more detailed, data is high. The next two sections of this paper show how these questions can be addressed in a cost effective way by using existing administrative micro databases.

4. Micro databases – complementing traditional macro statistics

National accounts provide a full picture of the transactions and financial positions of institutional sectors in a country. They enable a comprehensive analysis of the links between financial and non-financial developments in the economy and the relationships between the various institutional sectors.

MIR statistics provide a comprehensive, detailed and harmonised statistical picture of the level of interest rates applied by the MFI, and their changes over time. They facilitate the analysis of the transmission mechanism of monetary policy, especially the extent of the

pass-through of official rates to the lending and deposit rates paid and received by the Households and NFC.

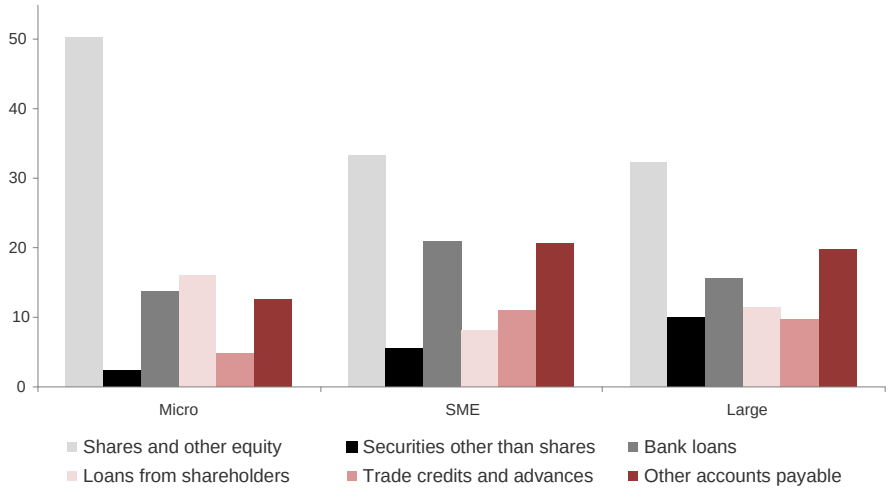
Both statistics, however, only allow analysis at a high aggregation level making it impossible to identify important heterogeneities existing inside institutional sectors. This section, with the help of micro data, deepens the analysis by showing additional details by activity sector and company size. The use of CBSD and CCR data to complement Financial Accounts and MIR statistics reveals the usefulness of administrative databases in overcoming the lack of more detailed data on the NFC balance-sheet position and funding cost. It is worth mentioning that the additional information obtained from these databases does not imply overburdening of reporting agents given that these are administrative tools created mainly for other purposes. Yet, in recent years, that information has started being treated and employed also for statistical purposes. This additional usage has also carried large benefits in terms of the quality of those databases. Indeed, the thorough statistical use demands detailed quality control of the basic registries, often implying crosschecks with other statistical sources. Any inconsistency detected needs to be explained, resulting quite often in error correction.

The conclusions derived from this analysis are notably relevant in a context marked by an economic crisis and among fears that NFC access to credit is being restricted.

4.1 Balance-sheet data

Decomposing the funding structure into three size classes immediately highlights some relevant disparities (figure 8). Larger companies are the ones presenting more diversified funding sources as their dependence on the various instruments is more balanced. Going to the instrument detail, although own funds is the major funding source for all groups its relative weight varies deeply. For micro companies it represents 50 p.c. while for large companies, the same component weight drops to 32 p.c. This shareholder dependence showed by micro companies is also evident in the weight of loans granted by their capital owners (16 p.c.) that compares with 8 p.c. for SME and 11 p.c. for large companies.

Figure 8
Non-financial corporations' liabilities structure, by company size (2008)
As a percentage of the total



Sources: CBSD, Banco de Portugal

Another important funding source is financial debt (excluding loans granted by shareholders). Breaking down this component, it is clear that bank loans are the most relevant source of funding for all companies, with some emphasis on SME, where it reaches 21 p.c. of total

liabilities. The balance between loans and securities other than shares, as a source of funding, grows with company size. Indeed, for micro companies the difference between the two instruments is 12 p.p. (2 p.c. for securities and 14 p.c. for bank loans) while for large it goes down to 6 p.p. (10 p.c. for securities and 16 p.c. for bank loans).

Trade credit and advances are twice as relevant for SME and larger companies than for micro companies. Remaining debt, including diversified components such as taxes, accruals and deferrals and other debtors, is also less relevant in micro companies.

The same analysis can be made by activity sector. Figure 9 compares the financial structure indicators in the five activity sectors used in this study: agriculture and fishing; manufacturing industries; construction; trade; and other services.

Figure 9
Non-financial corporations' liabilities structure, by activity sector (2008)
As a percentage of the total

Sources: CBSD, Banco de Portugal

The first important remark highlighted by the graph is that bank loans are the major source of funding for "construction" while for all the remaining activities it is own funds. Securities other than shares only present some relevance for the "manufacturing industries" sector and "other services", while for "trade" and especially for "agriculture and fishing" these are almost inexistent. The remaining instruments present some equilibrium between activities with the main highlights being the higher significance of trade credits for the "trade" sector and loans from shareholders in "agriculture and fishing".

All this analysis directly based on the figures reported by firms can be biased if there is a large concentration of a certain activity in one particular company size group, or vice-versa. A great advantage of using individual balance-sheet data is that it enables one to detect and control specific effects. The remainder of this section takes activity sector and companies' size composition into consideration.

4.1.1 Size dimension

Various points suggest that small firms' financing methods differ from those used by larger firms, or may even be subject to financial constraints[11]. Problems of information asymmetry are probably more significant in the case of small firms, which often suffer from a degree of information opacity in the sense that they don't face such an intense scrutiny as listed and larger companies. Therefore, it is usually harder for small companies to build a reputation, ending up, most of the time, being judged by the average behaviour.

Information asymmetry entails costs (screening, contracting, monitoring costs, etc.) for the lender and those often have a large fixed component, making the average cost decline for larger borrowers and encouraging the banks to prefer larger customers. Small firms generally also have relatively fewer assets available to use as collateral, to protect creditors against adverse selection or moral hazard problems and clearly have less bargaining power than larger companies.

The previous analysis, being based on data taken directly from the companies' accounts, may imply that some of the figures are biased by the activity distribution existing in each class. That is, some results may be mainly reflecting the characteristics of an activity that has more weight in that company's size group. To overcome this situation, all indicators presented in this section were adjusted for activity sector effects by using the method described in section 2.3.

Table 5 presents a set of selected financial ratios that, by synthesising information provided by the financial statements, are useful indicators of firms' performance and financial situation.

Table 5
Financial ratios, by company size
3 year (2006-2008) average adjusted for activity effects; in per cent

	Micro	SME	Large
Debt to equity	188.0	220.6	260.0
Financial debt/Turnover	87.4	56.4	40.0
Weight of long term financial debt on total financial debt	51.5	61.8	59.0
Days in receivables	106.5	99.1	74.4
Days in accounts payable	122.3	90.5	77.3
Cost of debt	11.3	5.1	4.4
EBITDA/Interest and similar charges	124.1	242.8	289.6
Liquidity ratio (current ratio)	121.2	125.9	107.8
Reduced liquidity ratio (quick ratio)	81.3	89.7	88.2
Return on Assets (ROA)	7.0	5.1	5.4

Sources: Banco de Portugal, author's calculations

The first conclusion that can be derived from the indicators presented in table 5 is that Portuguese firms are highly leveraged with that effect growing with the company size. Indeed, adjusting for the activity sector effects, the debt-to-equity ratios are 188 p.c. for micro companies, 221 p.c. for SME and 260 p.c. for large companies.

[11] The Flash Eurobarometer 174/184 – SME access to finance – conducted in 2006 by the European Commission showed that a considerable proportion of small and medium sized enterprises did not have enough financing to enable them to complete their projects.

Higher leverage increases the potential return of the company, but also the risk. Assuming everything else remains constant, if the Return on Assets (ROA) of the company is greater than the rate of its financing, then the Return on Equity (ROE) will be greater than it would if the company was not leveraged. Conversely, if the company's ROA is lower than the interest rate on its financing, then the ROE will be lower than it would if the company was not leveraged.

According to the available data, the leverage effect seems to be particularly positive for larger companies while for micro companies it appears to be negative. Indeed, for large companies the implicit interest rate[12] on financial debt is 4.4 p.c. while ROA stands at 5.4 p.c., whilst for micro the values are 11.3 p.c. and 7 p.c., respectively. The easier access larger companies have to debt markets seems to enable them to benefit from a leverage effect. In any case, the high dependence on debt is also a source of risk particularly in a crisis context where the ROA may well be affected negatively.

Given the high debt level presented by Portuguese NFC it is important to examine their ability to meet their financial obligations. Bearing in mind that financial debt has a higher weight in larger companies' financing structure, it is noteworthy that for this size class it represents only 40 p.c. of total turnover while for micro companies it reaches 87 p.c. Also from table 5, it is possible to verify that for micro companies only 52 p.c. of the debt has a long term maturity, compared to 59 p.c. for large and 62 p.c. for SME. These figures show that a large portion of micro companies' debt has to be paid, or revolved, briefly.

Liquidity ratios can help assess their ability to meet their immediate financial obligations. As table 5 demonstrates, all groups present current ratios above 100 p.c. meaning they have enough liquidity to cover short term liabilities. Comparing across dimensions it is possible to see that larger firms are the ones presenting lower values for that indicator (108 p.c.). However, focusing on the quick ratio[13] the values are more balanced between segments with the micro companies being now the ones appearing with the lowest value (81 p.c.). It is clear then, that the higher liquidity showed by smaller companies through the current ratio is due to inventories which quite often include items that are not that easy to transform into money.

Besides the repayment of the credit, companies also have to be able to pay the associated costs. The interest coverage ratio, obtained by dividing EBITDA by interest costs, indicates how well the firms' operational earnings can cover the interest payments on their debt. There is a clear difference between the capacities shown by different groups of firms, with micro companies showing the lowest coverage (124 p.c.) while SME and especially larger companies present a more comfortable situation (243 p.c. and 290 p.c., respectively).

The CBSD also allows the calculation of days in receivables and in accounts payable. This information clearly demonstrates that the time lag used for payments and receivables has a negative correspondence with the companies' size, with the difference between micro and large companies reaching 32 days for receivables and 45 days for payments. These figures also indicate that micro companies manage to finance themselves by trade credit, in net terms[14]. On average they take 122 days to pay their accounts while they manage to receive in 107 days. By this analysis, it is also possible to see that SME have the opposite situation (99 days to receive and 91 to pay) while for large companies both maturities are balanced.

---

[12] The rate is obtained by the ratio of all interest costs and the financial debt taken directly from the CBSD. This rate is merely indicative as its calculation has some methodological drawbacks. Section 4.2 identifies some of these shortcomings and presents another funding cost estimation method.

[13] The quick ratio, often referred to as the acid test, removes inventories from current assets in the liquidity ratio numerator.

[14] This is indeed an important funding source given that in general it bears no interest costs.

In brief, the figures presented in this section indicate that micro companies are the group showing a more fragile financial situation. Indeed, these companies present a high indebtedness level with a large portion having short term maturity, meaning that many of these loans will have to be paid or renegotiated briefly. Given that the debt incurring interest payment covers 87 p.c. of the turnover, paying their loans immediately would imply a big effort for these firms. The option then would have to be renegotiating. However, in a context of restrictions to credit access this option also brings concerns. Indeed, given that currently interest costs already cover a large part of the operational earnings, it will be difficult to support higher interest levels. Commercial credit seems to be the better source of funding for micro companies. In any case, their bargaining power is probably small making it difficult to continue to benefit from this source of finance if larger companies feel serious problems in getting credit through their usual channels.

4.1.2 Sectoral dimension

This section presents figures at the sectoral level in order to detect if the aggregate indebtedness is comparatively high due to a widespread and uniform use of external resources in all activity sectors, or whether, by contrast, it happens in only some of them. To better understand the funding structures it is necessary to disentangle the size effect from them. Table 6 presents a set of selected financial ratios adjusted for this effect using the methodology presented in section 2.3.

Table 6
Financial ratios, by activity sector
3 year (2006-2008) average adjusted for activity effects; in per cent

	Agriculture and fishing	Manufacturing industries	Construction	Trade	Other services
Debt to equity	163.1	207.0	324.3	210.6	236.0
Financial debt/Turnover	37.6	28.1	60.9	9.8	97.4
Weight of long term financial debt on total financial debt	53.2	49.8	59.3	34.6	64.5
Days in receivables	100.7	96.0	121.8	66.9	88.6
Days in accounts payable	109.7	90.5	126.5	70.7	88.8
Cost of debt	3.1	3.9	5.4	2.5	9.1
EBITDA/Interest and similar charges	390.5	293.9	179.7	257.6	209.5
Liquidity ratio (current ratio)	140.2	114.3	159.4	130.6	101.5
Reduced liquidity ratio (quick ratio)	84.2	84.4	92.3	93.2	86.5
Return on Assets (ROA)	4.0	4.9	4.0	5.8	6.3

Sources: Banco de Portugal, author's calculations

From the leverage point of view, it is clear that all sectors rely more on debt than on own funds. Here, "agriculture and fishing" and "construction" are noted for being in opposite positions. The former presents a debt-to-equity ratio of 163 p.c., being the activity relying more on own funds, while the latter, with a ratio of 324 p.c., which is by far the highest among all activities, shows that on average these companies' funding structure depends more than three times more on external finance than on own funds.

Comparing "construction" sector ROA (4.0 p.c.) with its implicit cost of debt (5.4 p.c.) it appears that the leverage effect is negatively affecting the sector's profitability. A similar

situation is happening in the "other services" sector[15], while for all the other activities the leverage effect seems to be positive.

Knowing that the "construction" sector depends heavily on financial debt as a source of finance, it is interesting to notice, however, that this debt has a higher weight in "other services" turnover (97 p.c.) than in "construction" (61 p.c.). The opposite scenario can be found in the "trade" sector, where financial debt represents only 10 p.c. of the turnover, which is probably explained by its more intensive use of trade credit.

The interest coverage ratio, given by the ratio EBITDA to interest and similar charges, also shows that "construction" and "other services" are the sectors presenting the lower coverage of interest expenses by operational earnings (180 p.c. and 210 p.c., respectively).

In terms of liquidity, from the current ratio values it is possible to see that, on average, all activities have enough liquid assets to cover their short term liabilities, with "construction", "agriculture and fishing" and "trade" presenting higher coverage. Removing inventories, to consider the most liquid assets only, the ratios drop below 100 p.c., showing however more equilibrium between activities.

Concerning commercial credit, a noteworthy feature is the balanced values presented in days in receivables and payables by most of the activities, when the size effect is controlled. This indicates that, on average, most of the sectors cannot finance themselves, in net terms, by trade credit. The results also show that the larger delays in this credit are verified in "construction" (122 days for payments and 127 for receivables) and the lower ones happen in "trade" (67 days for payments and 71 for receivables).

Summing up, "construction" stands out in most indicators by presenting a somewhat more vulnerable financial situation. This is particularly patent in its high indebtedness level, associated with a negative leverage effect, and by the large proportion of its operational revenues being channelled to cover interest costs.

4.2 Funding cost

Given the high dependence shown by Portuguese firms on debt it is important to evaluate its cost. In section 3, this institutional sector aggregate funding cost was examined using MIR statistics. Here, using data available from the CBSD and CCR, MIR figures are disaggregated, namely to identify the effect owed to the company size and activity sector.

To perform this study we need, for each individual company, a proxy of the interest rate paid on loans granted by MFI. In the accounting report to the CBSD, NFC are asked to provide the total amount of interest paid to banks for their loans. This is an item from the profit and loss account and so it comes as a flow, i.e., gives the total amount of interest paid during one year to banks, and it will be used in the numerator to calculate the interest rate.

In the denominator, the corresponding amount of loans during the year is needed. From the CBSD it is only possible to obtain the outstanding amount at year end as this data comes as a stock from the accounting balance-sheet. Besides that, it also does not discriminate banks from other credit institutions. These are two major setbacks. First, by having only outstanding amounts at year end, it is likely there will be incoherencies between this value and the total amount of interest paid during the year. An example would be a company that had a significant amount of loans during the year but in December, in order to publicise lower indebtedness, paid back a significant portion of the credit. Using the data from the CBSD, this company would present a high level of interest paid to a low amount of received loans

[15] Highly affected by real estate activities.

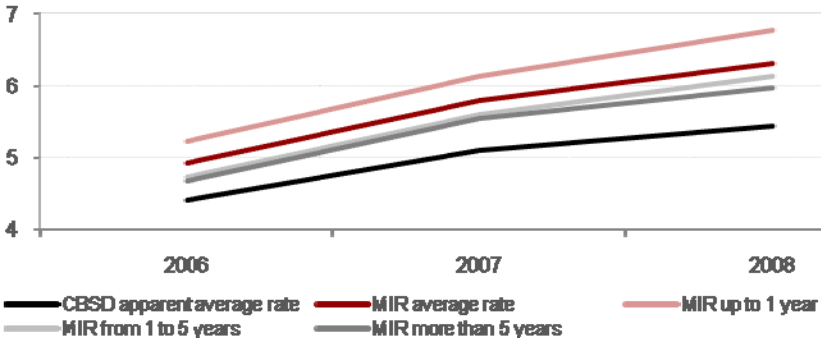
creating an abnormal estimated interest rate. Second, the fact that the CBSD does not isolate MFI from all other credit institutions would imply a lower estimated interest rate, if those values were used. The size of this effect depends on the weight of loans granted by MFI in the total loans granted by credit institutions.

In order to solve these problems, CCR data on monthly loans granted by banks to NFC is used[16]. Given that this database has individual information on the lending institution, it enables the creation of any needed aggregation. Thus, using this monthly average as the denominator in the interest rate calculation completely unravels the problem of differentiating MFI from other credit institutions and also reduces substantially the problem of loans with very short maturity appearing in the component of interest paid but not in loans received.

There are other methodological differences worth mentioning. First, MIR considers all companies in the euro area, while here only those resident in Portugal are taken into consideration. Also the interest reported in the CBSD includes loans received in other countries while MIR does not. Finally, MIR excludes bad loans and loans for debt restructuring at rates below market conditions, while the CBSD does not.

Figure 10 presents the aggregate values obtained by using CBSD methodology along with the ones published by MIR for the period 2006-2008. All rates show similar increasing behaviour along the period with the difference in levels being mostly explained by the above mentioned methodological differences.

Figure 10
Interest rates on bank loans' outstanding amounts
In per cent



Sources: Banco de Portugal, author's calculations

These rates are broken down in the next two sections. First, by firm size, controlling for activity effects and later for activity sector, controlling for companies' size effects.

4.2.1 Size dimension

Some arguments defending the view that smaller companies tend to face more constraints in order to obtain external finance were already mentioned. The analysis of the figures presented in table 7, where loan interest rates are broken down by company size and adjusted for activity sector effects, helps us to understand that this is indeed the case in Portugal for bank loans.

[16] Data from both data sources can be assembled given that both use companies' fiscal number as a unique identifying code.

For the period under analysis, the interest rate has a negative association with the companies' size. In 2008, for example, the average interest rates were: 6.23 p.c. for micro companies, 5.64 p.c. for SME and 4.79 p.c. for large companies.

Table 7
Apparent interest rates on bank loans' outstanding amounts, by company size
Adjusted for activity effects; in per cent

	2006	2007	2008
Micro	5.37	5.78	6.23
SME	4.52	5.10	5.64
Large	4.53	5.00	4.79

Sources: Banco de Portugal, author's calculations

These figures support the idea that the cost of loans is one of the constraints faced by smaller firms which can possibly help explain the lower weight of this type of funding on their balance-sheet when compared to the larger companies.

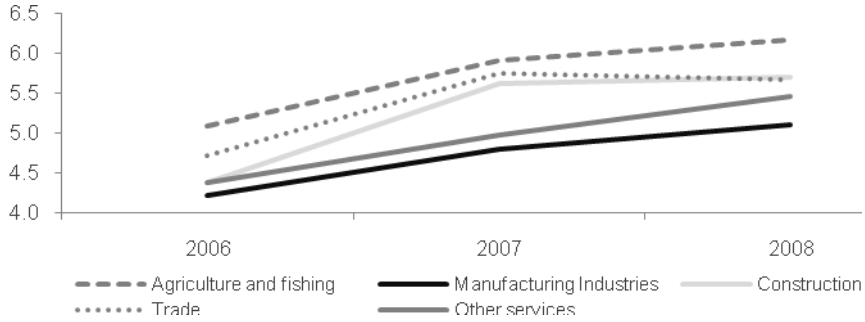
Section 3 showed how MIR statistics on new business use loan size as an approximation to company size. It was clear from the results that higher amount loans pay lower interest rates. The numbers presented here can also be used to support that approximation.

4.2.2 Sectoral dimension

Using the available micro data it is also possible to detail interest rates based on a sectoral perspective. The primary sector is clearly the one facing higher interest rates on its bank loans. This is a sector with very low relevance in the Portuguese economy and it is usually associated with low profitability, being very reliant on government support and extremely risky in the sense that it is highly dependent on unpredictable climatic events. Against this background it is very likely that banks charge higher spreads to these companies in order to deal with the perceived risk.

The "manufacturing industries" sector seems to be the one paying lower rates. The explanation probably lies in the fact that companies in this sector usually need large investments in fixed assets, which makes them more attractive for banks as they possess more assets to use as collateral. In addition, this sector, unlike "agriculture and fishing", is usually associated with higher profitabilities.

Figure 11
Apparent interest rates on bank loans' outstanding amounts, by activity sector
Adjusted for activity effects; in per cent



Sources: Banco de Portugal, author's calculations

Concerning other sectors, the numbers are not so clear but they seem to indicate that "trade" and "construction" have faced similar costs in 2008. The evolution is however noticeable as the latter starts from a lower level in 2006 (4.37 p.c. against 4.71 p.c.) and ends up in 2008 with a slightly higher rate (5.70 p.c. against 5.67 p.c.). This is probably a consequence of the negative impact of the economic crisis on construction companies that resulted in a boost in their default levels[17]. Likely, banks started to be more cautious and this was reflected in higher spreads charged to this sector. "Other services" present through the period a somewhat lower rate.

5. Financial stability – going deeper

The figures presented in section 3 highlighted the NFC funding structure and how it is financed by other institutional sectors. For financial stability analysis, the quality of these exposures is a major concern, particularly in a setting characterised by the acceleration of fiscal consolidation and a significant sovereign risk differentiation that are expected to carry higher short term costs to economic activity and greater materialisation of credit risk.

This section, focusing on bank loans, illustrates how the micro databases used in this study can also be used to complement and validate the aggregate figures available through macroeconomic statistics.

5.1 Banks' exposure to the non-financial corporations sector

Data from money and banking statistics show that, at the end of 2009, the credit portfolio vis-à-vis the non-monetary resident sector accounted for about 72 p.c. of the Portuguese banks' total assets, on a consolidated basis. Of this, 41 p.c. of the loans and 45 p.c. of the securities had NFC as counterparts.

From the same source, it is possible to see that loans to NFC registered substantial growth rates until 2007, the year where the rate reached 11.2 p.c. Since then, credit has started to grow at decreasing rates, ending 2009 with a value of 1.9 p.c. (table 10). In terms of default, the aggregate figures show that the default ratio, reflecting the economic crisis, more than doubled between 2007 and 2009 (from 1.8 p.c. to 4.2 p.c. – table 8).

Once again, it must be noticed that the analysis based on aggregate statistics hinders relevant details that can only be detected with individual data. The use of CCR information in this context illustrates the relevance of micro data. The first striking feature arising from this more detailed analysis is that, at the end of 2009, 18 p.c. of the NFC had credit in arrears (table 8). This, however, only corresponded to 4 p.c. of the total credit, meaning that most of these defaults involve very small amounts. Nevertheless, the total amount of credit granted to these firms stood for 17 p.c. of the total credit granted to NFC. This is an interesting indicator in the sense that if these companies already defaulted on some of their credits it probably means that they are facing financial problems that may well force them to default on other loans as well.

Also interesting is to see the evolution of these indicators over the last few years. As table 8 demonstrates, all those figures have been growing although presenting higher intensity in the last couple of years. For example, from 2006 to 2007 the percentage of companies in default increased roughly 2 p.p., the credit overdue only rose 6 b.p. and the total amount lent to

[17] NFC default level will be addressed in section 5.

them rose 1.5 p.p. Doing the same math for 2009, against 2008, those indicators went up by 2.2 p.p., 1.8 p.p. and 3 p.p., showing a clear credit quality deterioration.

In order to derive implications for macroeconomic and financial stability the next two sections detail these indicators by company size and activity sector.

5.1.1 Size dimension

Individual data gives the necessary flexibility to analyse the bank exposure by loan size, using CCR data, or by company size, using CBSD information.

Table 8 splits credit indicators by loan size – above (large exposures) and below (retail exposures) €1 million – to see how different was these two groups' behaviour. The first salient feature which can constitute an additional risk to the banking sector is the very high concentration of large loans to a very small percentage of companies. Indeed, 6 p.c. of the firms receive more than 79 p.c. of the total loans, or, seen from another perspective, small exposures have 21 p.c of loans' value although they represent 94 p.c. of the borrowers.

Table 8
Default indicators of credit granted to NFC broken down by the size of the exposure
In per cent

	2006	2007	2008	2009
Total exposure				
Number of defaulters (1)	12.2	14.2	16.0	18.2
Credit overdue (2)	1.8	1.8	2.4	4.2
Total credit to defaulting NFC (2)	8.7	10.2	13.8	16.8
Large exposures (higher than or equal to €1 million)				
Number of borrowers (1)	5.8	5.9	6.1	6.1
Total credit in this portfolio (2)	76.8	77.9	79.3	79.5
Number of defaulters (3)	11.2	11.8	15.9	19.3
Credit overdue (4)	1.2	1.2	1.8	3.6
Total credit to defaulting NFC (4)	7.4	9.4	13.2	16.5
Retail exposures (lower than €1 million)				
Number of borrowers (1)	94.2	94.1	93.9	93.9
Total credit in this portfolio (2)	23.2	22.1	20.7	20.5
Number of defaulters (3)	12.3	14.3	16.0	18.1
Credit overdue (4)	3.7	4.0	4.7	6.7
Total credit to defaulting NFC (4)	12.7	13.2	16.2	18.2

Note: (1) As a percentage of the total number of borrowers, (2) As a percentage of total credit, (3) As a percentage of the total number of borrowers in this portfolio, (4) As a percentage of total credit in this portfolio
Sources: Banco de Portugal, author's calculations

In historical terms this concentration can be considered relatively benign to the banking sector as large exposures have always posted the lowest default rates and registered the smaller increases. In any case, it is important to notice that in 2009 the credit overdue in this segment doubled its size when compared to its 2008 value (1.8 p.c. to 3.6 p.c.) and also, for the first time in this series, it presents a higher percentage of companies in default than the retail segment (19 p.c. for larger exposures against 18 p.c. for retail).

This split by loan dimension is often taken as a distinction between large and small companies. Using the CBSD it is possible to break down the data by company size and verify the validity of that assumption. From table 9, it is clear that the default rate decreases with the company size both for the number of companies and for credit overdue. Still, it is important to notice that the default indicators are rising in all segments. From 2008 to 2009 the weight of credit overdue almost doubled its size for SME (2.0 p.c. to 3.9 p.c.) and also for large companies (1.2 p.c. to 2.4 p.c.).

The relevance of the exposure of banks to each segment of firms through the years has been stable in a number of companies. Yet, concerning the credit amount it is possible to notice a slight increase in the larger companies' significance as their weight rises from 20.7 p.c. in 2006 to 25.3 p.c. in 2009.

Comparing table 8 and table 9 it seems to be acceptable that the default indicators of large exposures show the behaviour of large companies and a subset of the SME groups, probably the medium size companies, while the retail group gets much closer to the smaller companies' behaviour.

Table 9
Default indicators of credit granted to NFC broken down by company size
In per cent

	2006	2007	2008	2009
Large				
Number of borrowers (1)	1.1	1.2	1.2	1.2
Total credit in this portfolio (2)	20.7	23.2	24.2	25.3
Number of defaulters (3)	9.8	10.4	13.2	16.0
Credit overdue (4)	0.8	0.7	1.2	2.4
Total credit to defaulting NFC (4)	5.9	7.3	10.3	13.0
Small-medium				
Number of borrowers (1)	20.8	20.3	20.0	19.7
Total credit in this portfolio (2)	52.4	51.4	50.8	49.8
Number of defaulters (3)	11.3	12.9	14.8	17.8
Credit overdue (4)	1.4	1.6	2.0	3.9
Total credit to defaulting NFC (4)	8.1	10.0	13.2	16.5
Micro				
Number of borrowers (1)	78.1	78.5	78.8	79.1
Total credit in this portfolio (2)	26.9	25.4	25.1	24.9
Number of defaulters (3)	12.5	14.5	16.3	18.3
Credit overdue (4)	3.2	3.4	4.6	6.7
Total credit to defaulting NFC (4)	11.9	13.3	18.5	21.4

Note: (1) As a percentage of the total number of borrowers, (2) As a percentage of total credit, (3) As a percentage of the total number of borrowers in this portfolio, (4) As a percentage of total credit in this portfolio
Sources: Banco de Portugal, author's calculations

5.1.2 Sectoral dimension

Table 10 presents credit growth rates detailed by selected activity branches. Here, it is interesting to see how the deceleration of loans was differentiated by sector, reflecting a gap in the transmission of shocks to different activities. Indeed, lending for activities related to real estate lose pace immediately at an early stage of the crisis. From 2007 to 2008, "construction" moved from a growth rate of 10.7 p.c. to 8.6 p.c. and "real estate activities" changed from a rate of 14.4 p.c. to 8.5 p.c. At this period many other activities were still registering increasing credit growth rates, being only affected in 2009, the period where the overwhelming majority of the activities show decreasing growth rates. This situation is perceptible in "trade, hotels and restaurants" with a slight increase in their credit growth rate in 2008, from 6.3 p.c. to 7.5 p.c., but then experiencing a marked slowdown in 2009 closing the year with a negative growth rate of 0.4 p.c.

The last column in table 10 shows that, in opposition to what happens to loan size, bank loans are not very concentrated in one activity. Although they are more centred on the services sector, when these heterogeneous activities are disaggregated, none of those represents, by itself, more than 20 p.c. of total loans. Yet, it needs to be noticed that 39 p.c. of loans are granted for activities related directly to real estate (19 p.c. for "construction" and 20 p.c. for "real estate activities").

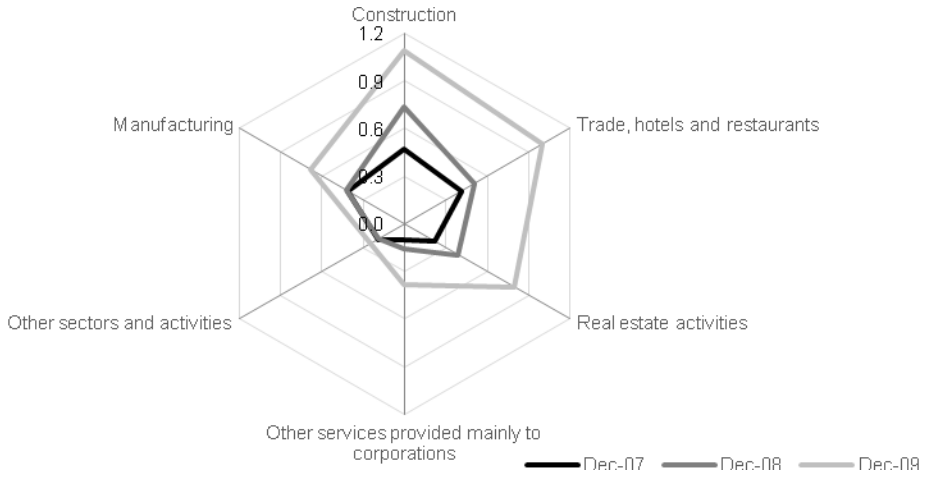
Table 10
Loans to non-financial corporations – by sector
Annual rates of change at end of period, in per cent

	2004	2005	2006	2007	2008	2009	Proportion in total loans (Dec. 2009)
Total	2.5	5.0	7.1	11.2	10.5	1.9	100.0
By activity sector:							
Agriculture, fishing and mining	1.8	3.6	6.4	13.6	20.3	4.0	2.2
Manufacturing	-3.8	-3.0	0.7	7.9	7.7	3.2	12.9
Electricity, gas and water	-2.0	37.9	-11.3	13.7	47.8	10.7	3.1
Construction	6.0	10.7	5.4	10.7	8.6	2.5	19.3
Trade, hotels and restaurants	2.0	3.0	7.1	6.3	7.5	-0.4	16.9
Transport, post and telecommunications	-4.5	-10.6	0.7	11.0	18.3	3.9	6.0
Real estate activities	14.0	12.0	12.9	14.4	8.5	1.3	19.7
Services provided mainly to corporations	-1.7	6.6	13.8	16.6	14.1	-2.0	14.3
Other services activities	2.9	-3.6	9.6	10.0	6.2	9.1	5.6

Note: Rates of change are calculated on the basis of the ratio between outstanding bank loan amounts at the end of the period and transactions calculated on the basis of balances adjusted for reclassifications. They are also adjusted for securitisation operations and write-offs/ write-downs from assets and foreign exchange and price revaluations.
Source: Banco de Portugal

Having seen how credit is spread around different sectors, from a financial stability perspective, it is interesting to verify its default rate. Figure 12, prepared with CCR data, enables the detection of the sectors giving higher contributions to the evolution of the aggregate rate.

Figure 12
Sectoral contribution to the non-financial corporations' default ratio
In per cent



Source: Banco de Portugal

Companies in the "construction", "trade, hotels and restaurants" and "real estate activities" sectors and, to a lesser extent, companies in the "manufacturing industries" had higher default ratios at the end of 2009 than those recorded by the non-financial corporations aggregate, having, this way, the largest contributions to the value of the aggregate rate (4.2 p.c).

Also in the default ratio it is possible to spot a time lag in the transmission of shocks to different sectors of activity. While the "construction" sector registers a balanced increase in its contribution to the aggregate default rate through the years, loans to companies in the "trade, hotels and restaurants" and "real estate activities" sectors saw their weight increase heavily only in 2009.

6. Conclusion

In a context of a deep financial and economic crisis, policy makers are compelled to intervene and for that it is crucial to have access to detailed information on the relevant subject. The recent worldwide events highlighted many data gaps that need to be addressed going beyond traditional statistical production approaches.

This paper has demonstrated how administrative micro databases can be used to complement traditional macro statistics, like national accounts or money and banking statistics, with the advantage of not overburdening reporting agents.

The main focus of the study was on understanding Portuguese corporate finance and its impact on the banking sector exposure to NFC. This analysis is particularly relevant for a country where the NFC sector presents relatively high indebtedness levels when compared to its euro area counterparts.

The individual data gathered from the two micro databases administered by the Banco de Portugal give the flexibility to perform a thorough analysis according to the firms' characteristics. In the course of the study, a distinction between activity sector and companies' size was presented. These breakdowns enable the detection of company subgroups with specific behaviours and particular problems, providing meaningful information to policy makers.

An assessment of the differences between the financial position of micro, SME and larger firms requires sectoral composition effect to be controlled for. Once this has been done some differences emerge more clearly. The highlight arising from this analysis is the delicate financial situation that micro companies face. Indeed, a large component of their high indebtedness level has short term maturity, meaning that many of these loans will have to be paid or renegotiated briefly. However, the debt incurring interest payment already covers 87 p.c. of these companies' turnover, making the option of paying back the loans immediately very costly. The other option would be to revolve those loans, yet, given the current difficult access to credit markets, that will probably imply higher costs. Bearing in mind that interest costs already cover a large part of the operational earnings, there is not much leeway to support higher interest levels.

Larger companies show more diversified funding sources. It is notorious that all company groups, no matter the size, rely more heavily on debt than on own funds, which can be a risk factor in case their access to this type of funding is restricted. Nevertheless, larger firms present higher leverage, which is probably explained by its positive effect on profitability given that the return they take from assets seems to be bigger than the cost they pay for debt. It is also possible to see that interest payments are better covered by firms' earnings as the company size grows, indicating that larger firms are better prepared to absorb possible interest rate shocks. Another indication in this sense comes from the bank loan interest rates disaggregation, where it is clear that there is a negative relationship between these costs and the companies' size.

From a financial stability perspective, a noteworthy feature is that the high concentration presented by bank loans to large companies and large amounts. Given their better financial position, this concentration can be seen as relatively benign. In any case, it must be noted that, in 2009, this segment's default indicators presented the larger proportional increases.

The funding behaviour also differs across sectors, a phenomenon explained mainly by specific characteristics of firms' activities. Construction related segments are the ones standing out in most indicators. Although all sectors are more dependent on debt than on own funds, "construction" is the only activity where, as an individual instrument, bank loans clearly overcome own funds as the major source of funding. This activity's dependence on debt is confirmed by a clearly higher debt-to-equity ratio than all the remaining groups. This can be a challenging position in the sense that the leverage effect in "construction" seems to be negative, meaning that losses are being amplified by these firms' high indebtedness. This is probably a result of the financial and economic crisis that was reflected very early on in this sector with a significant decline in the credit growth rate and higher default ratios on bank loans.

The approach presented here has its merits but also its own drawbacks. The most important one is clearly the large time span between the reference date and the availability of data that, in the CBSD case, reaches seven months. The amount of data, the vast number of companies and all the necessary quality control involved makes very unlikely any relevant decrease in this time gap. Given this, the CBSD is clearly more suitable to be used for structural analysis and forecast models. The way to overcome urgent information needs is through smaller samples that can work as advanced indicators. In Portugal this is being done by a questionnaire (ITENF) that collects from a minor sample of companies a smaller set of the most relevant indicators. This data is available with a three month lag which allows the authorities to follow the NFC sector more promptly. The results are later confirmed and complemented by the CBSD.

References

Banco de Espana (May 2010), “El endeudamiento de las sociedades no financieras españolas. Evolución temporal y comparación con el área del euro”, Boletín Económico.

Banco de Portugal (2005), “A New Source for Monetary and Financial Statistics: the Central Credit Register”, Supplement to the Statistical Bulletin.

Banco de Portugal (2008), “Simplified Reporting: Inclusion of the Simplified Corporate Information in the Statistics on Non-Financial Corporations from the Central Balance-Sheet Database”, Supplement to the Statistical Bulletin.

Banco de Portugal (2010), Financial Stability Report.

Banque de France (2009), “The position of firms in France at end-2008 – Recent developments”, Quarterly Selection of Articles No. 14.

Baugnet, Z. (2007), “Belgian corporate finance in a European perspective”, National bank of Belgium Economic Review.

Custodio C., Gomes A. (2009), “Finanças da empresa”, Booknomics.

European Central Bank (May 2007), “Corporate Finance in the Euro Area”, Structural Issues Report.

European Commission (2005), “SME access to finance”, Flash Eurobarometer No. 174.

European Commission (2009), “Survey access to finance analytical report”.

Recession-induced mean and distributional effects on business profitability: addressing information gaps using corporate firm-level balance sheet data

Dominik Elgg and Timm Körting[1]

1. Background

1.1 The benefits of corporate firm-level balance sheet data

Corporate firm-level balance sheet data are widely used at central banks for the analysis of the economic situation of non-financial companies. In this respect the assessment of the corporate sector can be separated with respect to the following areas: monetary policy, financial stability, provision of statistics for the public and other statistical uses.

A comprehensive understanding of the corporate sector is important from a monetary policy perspective with regard to the impact of the transmission mechanisms. Generally the monetary policy analysis within central banks focuses on the financing conditions and profitability of non-financial companies, emphasising internal financing (corporate saving), external financing (equity, bank loans, debt securities and trade credit) and economic growth. Balance sheet data also provide valuable information about the corporate sector's resilience to economic shocks in the business cycle.

Corporate balance sheet data can also be used in the assessment of financial stability. Non-financial firms are one of the financial sector's key credit customers. If the situation in the corporate sector deteriorates, it leads to a decline in firms' creditworthiness and debt repayment capability which, in turn, may have a direct effect on the financial institutions' situation.[2] An analysis of non-financial corporations is also useful for a better knowledge of the credit risk coming not only from firms' bank borrowings but also from the issuance of corporate bonds through the capital markets.[3]

Although not a primary objective, central banks often provide statistics on the corporate sector as a public good. The predecessor of Deutsche Bundesbank was already evaluating the creditworthiness of non-financial enterprises before World War II. Taking advantage of the electronic processing of mass data received by its rediscount operations, Deutsche Bundesbank had started to produce and publish statistics on non-financial enterprises by the end of the 1960s.

Finally, corporate balance sheet data is often used as an input for the compilation of other statistics, eg in macroeconomic statistics as an information source for the euro area financial and non-financial accounts which are regularly published by the ECB and the European Commission (Eurostat).[4]

---

[1] Deutsche Bundesbank.

The views expressed in this research paper are those of the authors and not necessarily the views of the Deutsche Bundesbank or its staff.

[2] See Deutsche Bundesbank (2006, p 119).

[3] See eg ECB (2010, p 53–56 and p 90–91).

[4] See ECCBSO (2008, p 10).

1.2 Firm-level balance sheet data and national accounts: a comparison

National accounts do also provide information about the corporate sector. With respect to profitability, the main topic in this research paper (in particular gross return on sales, ROS), the European System of Accounts (ESA 1995) distinguishes between "operating surplus" (or "mixed income") and "entrepreneurial income".[5] Naturally, there are a number of conceptual differences between national accounts and the respective business accounting rules, but in general the operating surplus in the national accounts can be compared to the total of operating profit derived from data in the income statements while entrepreneurial income is similar to profit after tax.[6]

The following differences in the two statistics are noteworthy:

- ROS and further income statement items are based on firm-level data, while "operating surplus" and "entrepreneurial income" in national accounts are calculated as a residual in the "generation of income account" and the "entrepreneurial income account".[7]
- Balance sheet data statistics can display distributions of individual values while national accounts typically only show the aggregate. Eg in this paper the distribution of ROS is analysed in more detail presenting additionally the share of loss companies. This analysis can give an indication on early warning signs on business risks within the corporate sector.
- Firm-level data offer a better possibility to take into account the heterogeneity of different economic sectors by disaggregating the results. In particular, manufacturing as the core sector and "engine" of the German economy can be analysed in more depth. In contrast, German national accounts present sectoral results regarding the profitability of non-financial entities only for "operating surplus".[8]
- Accounting data offer the possibility to take size effects into account which are very strong in the corporate sector. Furthermore, only firm-level data provide insights separating size and sectoral effects.
- Corporate balance sheet data allow additional, more detailed insights into the profitability and financing situation of firms. For instance data from the balance sheet permit an analysis of the "financing leverage", differentiating between equity and liabilities, while data from the income statement can be used for the assessment of the "operating leverage", allowing a differentiation between variable and fixed costs. This is in particular interesting with respect to the resistance of costs to adjust in correspondence to output in economic downturns. Furthermore, analysis on profitability can be extended by separating operating and financial income.
- Besides the profitability and financing situation, further analysis of balance sheet data can cover the endowment and structure of assets, cash flow analysis and investments.

---

5 See Eurostat (1996, paragraphs 8.18 and 8.28).

6 For an elaboration of the differences see chapter 4 of Statistisches Bundesamt (2007, p 173–220). The gross return on sales used by the Bundesbank is the profit before tax according to the German Commercial Code (*Handelsgesetzbuch*) as a ratio of net turnover.

7 See Statistisches Bundesamt (2007, p 177 and 204).

8 See for differences Deutsche Bundesbank (2010a) and Statistisches Bundesamt (2010, p 114–121 for sectoral data on "operating surplus").

1.3 The information gap with regard to micro corporate balance sheet data

In January 2010 Deutsche Bundesbank published an article in the Monthly Report concerning the profitability and financing of German enterprises in 2008.[9] Naturally at this time the question arose as to what extent the business sector might have been affected by the sharp economic downturn in the last year and what implications that might have in terms of credit quality, rating migration and the performance and lending behaviour of financial intermediaries, especially banks. However, these basic figures from financial statements were not available at that time owing firstly to the fact that the 2009 balance sheet year had just finished. Secondly, the reporting deadlines are quite long. In particular in Germany, many exemptions are implemented in the German Commercial Code (where accounting rules are specified) in order to provide relief to SMEs with regard to the reporting burden. For instance non-listed corporations are allowed to publish their financial statements with a delay of 12 months after the balance sheet date. This regime causes a late availability of financial statements at the Bundesbank, where an estimate of a given reporting year can only be provided with a delay of 12 months for the German non-financial sector as a total, while statistics on sectoral results are published with a further delay of eight months.[10]

The information gap of micro balance sheet data can also be understood within the mandate of the G20 countries. In the wake of the financial crisis the G20 have attached great importance to enhancing transparency. Thus the IMF and the FSB recommended among others better sectoral-related data, stressing coverage, reliability and timeliness.[11] Micro corporate balance sheet data are mostly available in the European Union through the obligation of companies with limited liability to publish their financial statements as set out in the 4th and 7th European Directive. However, exemptions through member state options are given to SMEs once more, eg as passed on to German SMEs to publish only abridged accounts, thus making these financial statements almost unusable for economic statistics.[12] For this reason, Deutsche Bundesbank receives complete financial statements through different channels, resulting in a coverage with regard to corporations of approximately a tenth of the total population but 80% of the respective turnover.[13] Coverage with respect to companies with unlimited liability is substantially lower (1.2% of the total population, 37% of respective turnover). Altogether this might explain why public authorities and research institutes often have difficulties in assessing the economic situation of SMEs in the corporate sector.

1.4 Outline of the paper

As a result of the information gap regarding timeliness described above, indications from earlier economic downturns are used in this paper in order to estimate the decline in profitability in 2009. In the following, this paper first explains why the years 1990 and 1993 were chosen as reference period and then looks at the sectoral conditions in those years and describes the changes in the distribution of gross ROS on the basis of annual results from micro corporate balance sheet data. The situation in recent years is then examined followed by additional evidence from nine-month consolidated financial statements available at the

---

[9] See Deutsche Bundesbank (2010b, p 15–29).

[10] The yearly article in the Monthly Report gives an indication about the most important sectoral results. However, sectoral statistics are not published at this time.

[11] See also Deutsche Bundesbank (2009, p 81).

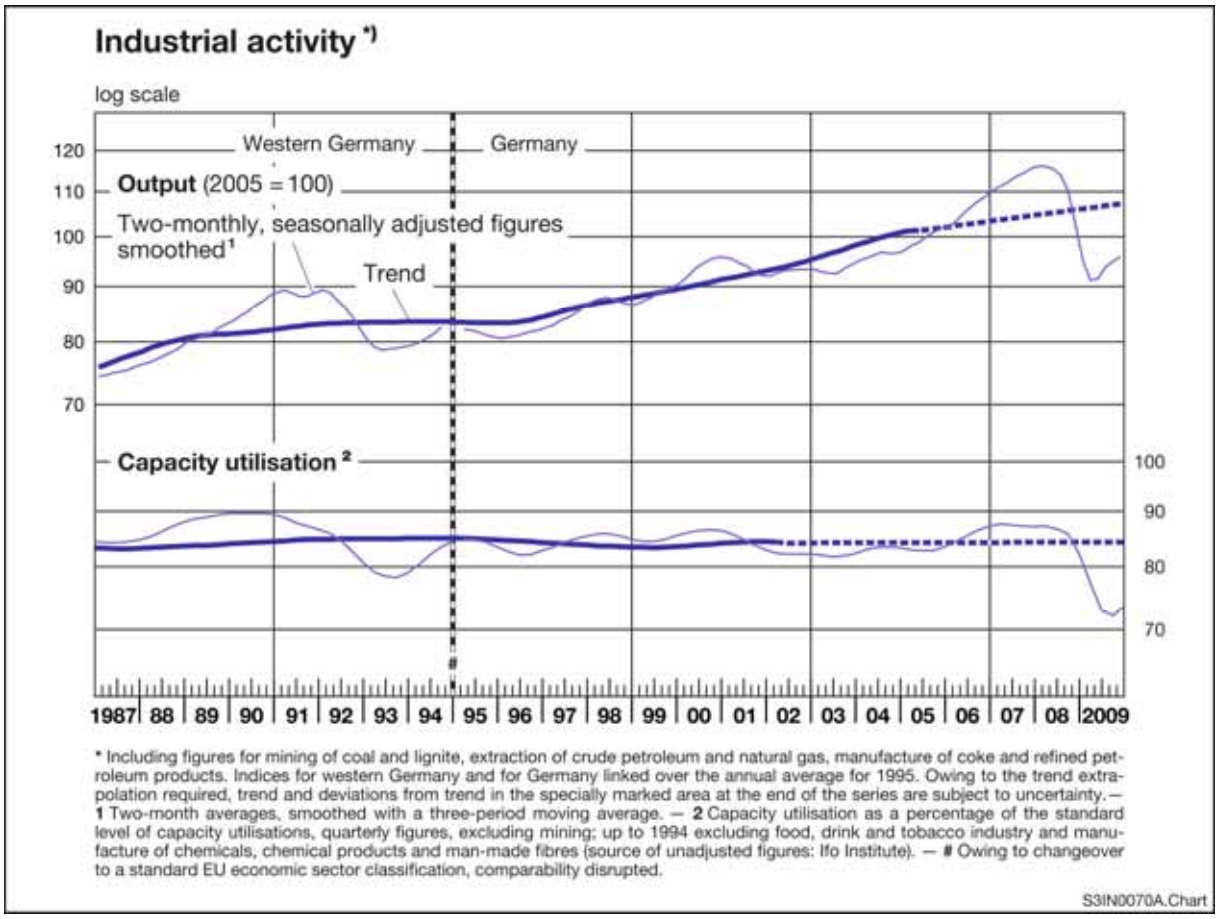
[12] Eg as small companies do not have to publish an income statement.

[13] See Deutsche Bundesbank (2009, p 7). The database itself includes about a fifth of all corporations, however data is filtered for the statistics because of various reasons.

beginning of the year and further on by the full consolidated financial statements available in the second quarter 2010 in order to fill the information gap. The paper concludes with a summary of main findings.

2. Choice of the reference years

On comparing the sharp annual decline in German real GDP calculated for 2009 (4.7% y-o-y) with earlier periods, it is initially clear that a downturn of this magnitude has not been seen in the last 40 years.[14] The extraordinary deterioration in overall economic performance in the last year manifested itself in particular in the industrial sector, which is of "strategic" importance for the German economy and, due to its very high exposure in terms of trade openness and export profile, very sensitive to the international business cycle. Production witnessed an unprecedented shock and capacity utilisation fell to a new historic low of just over 70%, compared to a normal, long-term average of 84% (see chart below).



Source: Deutsche Bundesbank, Statistical Supplement to the Monthly Report 4, Seasonally adjusted business statistics, May 2010, page 83, expanded to include the years 1987–90.

[14] Before the onset of the financial and economic crisis, four cases of a decline in overall annual economic output had been recorded since 1970. As a reaction to both oil crises GDP declined by 0.9% in 1975 and 0.4% in 1982 (data for western Germany in both cases). In 1993, GDP decreased by 0.8% as a result of the end of the stimulus caused by reunification and in 2003 output saw a decline of 0.2%.

The sole benchmark for the decline in gross ROS to be estimated is the recession in the first half of the 1990s as, owing to changes to the German Accounting and Reporting Act (*Bilanzrichtliniengesetz*) made in 1987, the comparability of financial statements produced before this date is limited.[15] The distribution of gross ROS in 1993 is therefore compared with the last preceding profitable year in the corporate balance sheet statistics (1990 balance sheet year). Only income statement data of corporations are used, as the profits for non-corporations do not provide any direct link to the share of enterprises that are operating at a loss since the costs do not include entrepreneurial income.

3. Comparison of return distributions from 1990 and 1993

A pro-cyclical reaction of business profitability is what should be expected in market economies, given the at least partly residual nature of corporate earnings also reflected in the risk premium of capital, that compensates for undiversified volatility. Furthermore, there is much evidence from micro-econometric literature concerning the link between export intensity and the rate of profit, pointing – as a stylised fact – to an important type of heterogeneity.[16] The real issue in the current context is therefore to have at least a best guess about the scale, shape and duration of a profit shock hitting important parts of the business sector.

When investigating cyclical influences on the profitability of non-financial corporations, it is equally important to differentiate between mean effects and distributional effects. Average mean effects typically affect the location parameters of a distribution such as the mode, median and arithmetic mean. Distributional effects, by contrast, affect the further moments of the distribution, particularly the variance, skewness and kurtosis. Additionally, shifts in the constellation of the location parameters show changes in the density function.

With respect to profitability, the general question arises as to which financial ratio should be used in evaluating profit performance. The calculation of the return on equity is most appropriate from the perspective of shareholders. In contrast, from the viewpoint of all capital providers or the company itself, return on total assets and return on sales are more relevant. Deutsche Bundesbank's calculations, which are traditionally based on ROS, are much less open to interpretation, do not vary as greatly with firm size, and are less dependent on a firm's legal form, capital structure and accounting practices.[17]

Compared to 1990, the density function of gross ROS for corporations in the overall business sector showed a clear shift to the left in 1993 (see chart below and the table in annex 1).[18] The mean changed from 3.2% to 1.3%. The median decreased by one percentage point to 0.9% and the values for the first and third quartiles declined by similar amounts.

The shape of the distribution also changed: the standard deviation – the classic measure of dispersion – increased from 5.6 to 6.4. Before the cyclical downturn the distribution was right-skewed (y=2.6) while in the recession year it was practically symmetrical (y=-0.2).

---

[15] The slight cyclical downturn in 2003 is also not suitable for comparison. This is confirmed by comparing the distributions of gross ROS from 2001 and 2003, which differ only slightly.

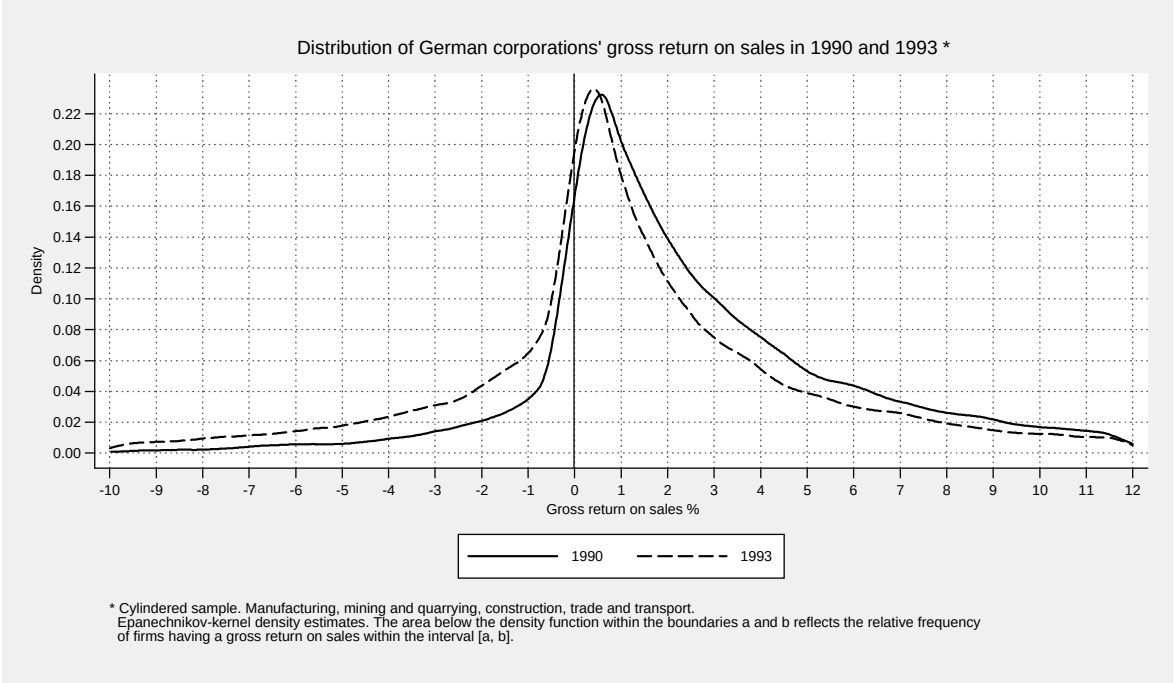
[16] See International Study Group on Exports and Productivity (2008).

[17] See Deutsche Bundesbank (2010b, p 20–21).

[18] A cylindered sample for the years 1990/1993 was formed in order to eliminate the effect of structural changes in the data. The aggregate used comprises enterprises from manufacturing (including mining and quarrying), construction, the retail trade and transport (excluding railways). Business-related services were not included due to insufficient data for earlier financial years.

Kurtosis also flattened markedly (κ=19.2 before the downturn and κ=9.2 in the recession year).[19]

All changes in the distribution parameters indicate a substantial deterioration in the annual results across the entire distribution spectrum. The proportion of enterprises incurring losses more than doubled, from 13.3% to 29.8%. Average gross ROS of enterprises making losses moved from –2.9% to –4.7%.



Source: Deutsche Bundesbank.

The shift in the distribution of gross ROS can also be observed in selected economic sectors (see annexes 1 and 2) with manufacturing, as a sector particularly sensitive to the business cycle, strongly affected. The mean decreased by almost three percentage points, from 4.2% to 1.3%, within three years. Effects of the decline were also clearly visible in the construction sector, in retail trade in motor vehicles and transport enterprises. Profits in auto sales fell to around zero (mean gross ROS 0.0%, median 0.2%). Overall, 42% of auto dealers recorded a loss. Other trade was affected to a lesser extent.

4. Comparison of 2007 and 1990

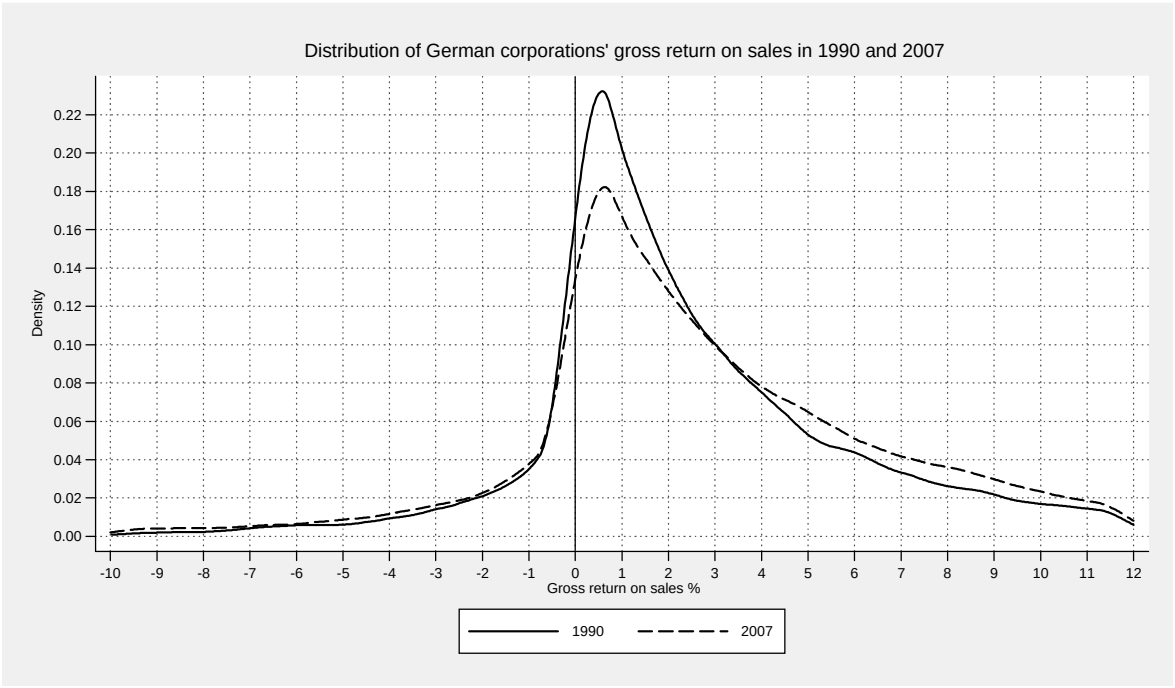
The distribution of gross ROS from 2007 is used as the starting point before the beginning of the most recent crisis[20] as the dataset for 2008 is on the one hand still incomplete (data for

[19] However the distribution remained significantly more pointed than a normal distribution (κ=3), which is not atypical for financial data.

[20] In order to use the same data preparation method for the comparison with the 1990 financial year, the results from a cylindered sample for 2006/2007 are used for the 2007 financial year.

smaller enterprises in particular are still to be reported).[21] On the other hand, 2008 data would already be "flawed" by the beginning economic downturn. Compared with 1990, the profitability of enterprises is much better overall. The mean was 3.7% in 2007, half a percentage point higher than in 1990. As illustrated in the chart below, the distribution has shifted partly to the right. Taken together this may indicate that although the shock was more pronounced this time, the ability to absorb it can be rated higher. However, the share of enterprises making a loss in the 2007 financial year was somewhat higher than in 1990. In addition, these enterprises recorded significantly higher average losses than in 1990.

From a sectoral point of view (see annexes 1 and 3), in particular the manufacturing sector and wholesale and retail trade (excluding motor vehicles) were in a slightly better starting position in 2007. By contrast, retail trade in motor vehicles and transport were in a worse starting situation, also reflecting structural weak points.



Source: Deutsche Bundesbank.

5. Interpreting the figures

As the economic downturn in the first half of the 1990s was much weaker than during the current economic and financial crisis, the decline in profitability from 1990 to 1993 should – at a first glance – only be regarded as a lower limit for the effects of the economic and financial crisis in the 2009 financial year. However, various factors make the historical comparison used here more difficult. Unquantifiable ambiguities have been caused by the change in raw data from the corporate balance sheet statistics (from rediscount operations as the only data source to the Financial Statements Data Pool with several sources[22]). In addition, the

[21] The extrapolated results for the 2008 financial year show a slight deterioration in profitability with respect to 2007. Therefore, the comparison of the data from 2007 with those from 1990 is likely to produce a less significant change than a comparison of 2008 and 1990 would.

[22] The Financial Statements Data Pool is a voluntary facility of the Bundesbank in cooperation with institutions of the banking industry as well as other institutions with extensive financial statements data. The purpose of this

structure of the business sector has changed over the last 20 years, for example as a result of increasing vertical and horizontal integration. The figures for the 2007 financial year may also change slightly over the course of 2010 as data input has not yet been finalised for this – albeit somewhat distant – year (experience shows that annual results with a somewhat poorer profitability situation are to be expected, resulting in a likely leftward shift in the distribution).

A comparison of the recessions from 1993 and 2009 is subject to limitations not only due to statistical reasons, but also due to economic reasons. For example, in the current crisis, big economic stimulus packages and specific countercyclical measures were launched to dampen second round effects of this extraordinary shock. Furthermore, labour hoarding took place, putting additional pressure via operating leverage on business earnings. The former makes a comparison for the construction and car sales sectors more difficult, at least as regards their endogenous cyclicality. From an economic perspective, the type of shock behind the deterioration in capacity utilisation as well as the length of the cyclical downturn also play a central role in an overall assessment and these at least partly differ between the two time periods analysed.

6. Evidence from consolidated data of large listed non-financial enterprises

6.1 Evidence from data available in early 2010

Consolidated quarterly results of large listed non-financial enterprises can offer an additional insight into the effects of the current economic crisis on the profitability of German enterprises.[23] Early in 2010 quarterly IFRS consolidated financial statements were available representing three quarters of 2009. Taking these data as an indicator, gross ROS decreased by 4½% from 6¼% to 1¾% in the first nine months of 2009 year-on-year (see table below).[24] However the group analysed predominantly includes internationally active enterprises which were particularly affected by the global financial and economic crisis and the massive collapse in global trade. From a time perspective, the bad news was concentrated in the fourth quarter of 2008 and the first quarter of 2009. The two subsequent quarters already saw profitability improve slightly, meaning that it is likely that the cyclical low was already overcome in the spring of last year.

6.2 Evidence from data available in the second quarter of 2010

In the middle of the second quarter of 2010, 2009 full year consolidated data of listed companies were available. The decrease year-on-year slightly improved because of the

---

facility is to bring together – in an anonymous form – the data of the institutions. In addition, the data pool is supplemented by financial statements which the Bundesbank obtains in connection with its refinancing operations as well as publicly accessible data from credit rating agencies. For the financial years prior to 1997, the financial statements submitted in the context of refinancing operations are the sole source of data for evaluations.

[23] When analysing the consolidated results other limitations must be taken into account, not least that they include business by foreign subsidiaries. Also, they are recorded according to IFRS whereas the extrapolated results are based only on results reported according to the German Commercial Code. In addition, the representativeness of the data could only be investigated on an approximate basis. For example, in the quarterly dataset currently available, manufacturing, with a two thirds share, is over-represented.

[24] The statistical measure used here is a weighted average.

better economic situation in the fourth quarter of 2009. However, the drop still amounted to more than three percentage points.

	%				Change in percentage points		
Return on sales*	**2006**	**2007**	**2008**	**2009**	**2007**	**2008**	**2009**
Consolidated accounts as of 30 September (nine-month data)	6.3	7.0	6.2	1.7	0.6	-0.8	-4.5
Consolidated accounts as of 31 December (yearly data)	5.6	6.5	4.8	1.6	0.9	-1.7	-3.2
Individual accounts: extrapolated results for corporations (yearly data)	3.7	4.5	3.8	not available yet	0.8	-0.7	.

* 68 large listed non-financial companies from DAX and MDAX without energy sector.

Source: Deutsche Bundesbank.

7. Conclusion

Corporate firm-level balance sheet data, widely used at national central banks, is of major importance when analysing the economic situation within the corporate sector. However, although showing comparative advantages vis-à-vis national accounts and completing information with respect to financial accounts, annual balance sheet data imply an information gap with regard to timeliness. This was in particular visible in the financial crisis. For this reason, indications from earlier economic downturns were used in order to estimate the decline in profitability in 2009.

If the recession in the first half of the 1990s is used as a benchmark to assess the severity of the decline in profitability in the 2009 financial year, a considerable movement downwards can be expected for average gross ROS in those sectors that were particularly affected by the recent financial crisis (ie manufacturing, wholesale trade and transport). Additionally, in order to fill the information gap consolidated quarterly data of listed non-financial enterprises offer some help. Deutsche Bundesbank is going to investigate further the potential of this data source that might also reveal structural differences in corporate finance behaviour between small and medium-sized entities and listed groups.

Annex 1

Distribution of gross return on sales in 1990, 1993 and 2007

	Overall business sector[1)]		
Distribution parameters	**1990**	**1993**	**2007**
Arithmetic mean	3.2	1.3	3.7
Standard deviation	5.6	6.4	8.7
Coefficient of variation	1.8	5.2	2.3
Skewness	2.6	-0.2	-0.4
Kurtosis	19.2	9.2	31.0
1st quartile	0.5	-0.5	0.5
2nd quartile (median)	1.9	0.9	2.4
3rd quartile	4.7	3.3	6.2
Share of companies with losses	13.3	29.8	15.4
Arithmetic mean of loss companies	-2.9	-4.7	-6.0
Standard deviation of loss companies	3.5	5.9	10.7
Number of companies	19,119	19,119	34,476

Selected economic sectors

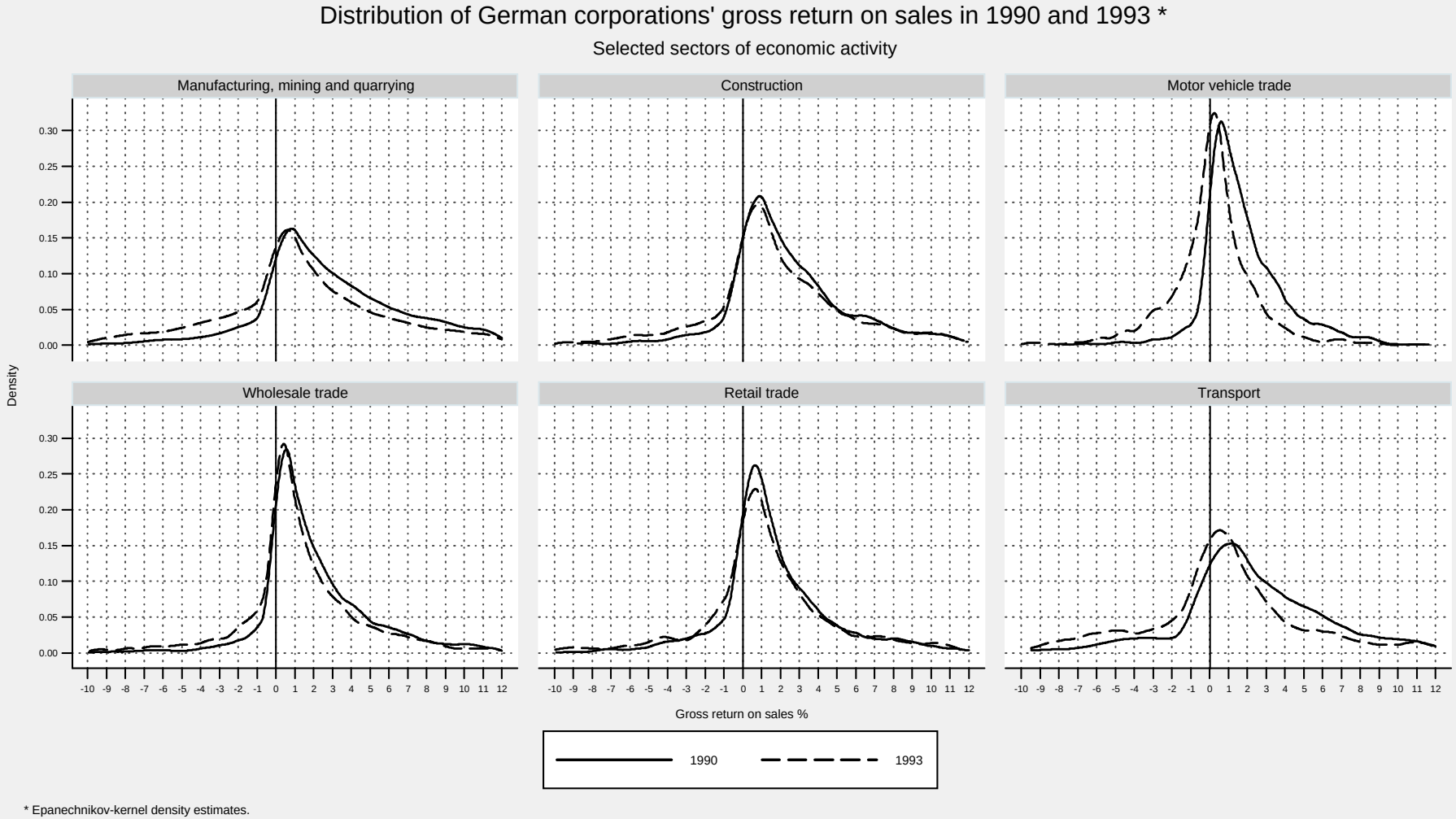
	Manufacturing, mining and quarrying			Construction			Retail trade in motor vehicles			Wholesale trade and commission trade			Retail trade (excluding motor vehicles)			Transport (excluding railways)		
Distribution parameters	**1990**	**1993**	**2007**	**1990**	**1993**	**2007**	**1990**	**1993**	**2007**	**1990**	**1993**	**2007**	**1990**	**1993**	**2007**	**1990**	**1993**	**2007**
Arithmetic mean	4.2	1.3	5.1	3.0	1.8	3.0	1.9	0.0	1.3	2.4	1.4	3.2	1.9	1.2	2.5	3.4	1.1	2.3
Standard deviation	6.6	7.8	9.3	5.3	5.6	7.6	2.7	3.1	4.5	4.3	4.7	7.0	4.3	4.8	7.0	7.0	8.2	12.9
Coefficient of variation	1.6	5.9	1.8	1.8	3.2	2.6	1.5	640.1	3.4	1.8	3.4	2.2	2.3	4.0	2.8	2.1	7.5	5.6
Skewness	2.1	-0.3	0.3	2.6	0.0	-1.0	5.0	-1.3	-1.5	3.0	0.0	0.2	2.1	-0.4	-0.8	2.8	0.6	-2.0
Kurtosis	13.9	6.7	21.3	19.9	9.9	36.0	79.2	17.8	61.8	28.7	13.5	34.6	22.8	10.3	28.4	19.3	7.6	28.1
1st quartile	0.6	-1.3	1.0	0.5	0.1	0.5	0.5	-0.9	-0.1	0.4	0.0	0.5	0.3	-0.1	0.3	0.4	-1.5	0.2
2nd quartile (median)	2.7	1.1	3.8	1.9	1.3	2.2	1.3	0.2	0.7	1.4	0.9	1.9	1.2	1.0	1.8	2.2	0.6	1.9
3rd quartile	6.4	4.4	8.4	4.3	3.8	5.3	2.7	1.1	2.4	3.5	2.8	4.8	3.1	2.8	4.5	5.4	3.3	5.2
Share of companies with losses	14.0	32.5	14.2	12.3	23.3	15.9	9.9	41.9	26.6	12.1	23.6	12.2	17.8	26.4	18.7	17.0	34.8	18.6
Arithmetic mean of loss companies	-3.3	-6.0	-6.7	-3.0	-4.4	-6.1	-1.5	-2.2	-2.4	-2.3	-3.3	-4.7	-2.7	-3.7	-4.9	-3.9	-5.7	-10.9
Standard deviation of loss companies	3.7	6.6	9.8	3.7	5.2	9.7	1.8	3.0	4.4	3.1	4.6	9.1	3.3	4.7	8.7	3.8	6.3	19.4
Number of companies	8,990	8,990	14,085	1,334	1,334	4,061	1,662	1,662	2,092	5,511	5,511	8,844	1,223	1,223	2,583	399	399	2,811
Share of overall business sector	47%		41%	7%		12%	9%		6%	29%		26%	6%		7%	2%		8%

Data basis: Cylindered samples 1990/1993 and 2006/2007 (as of 28 January 2010). Figures for 2006 not given, as they are not relevant for the analysis.

[1)] Manufacturing, mining and quarrying, construction, trade and transport (excluding railways).

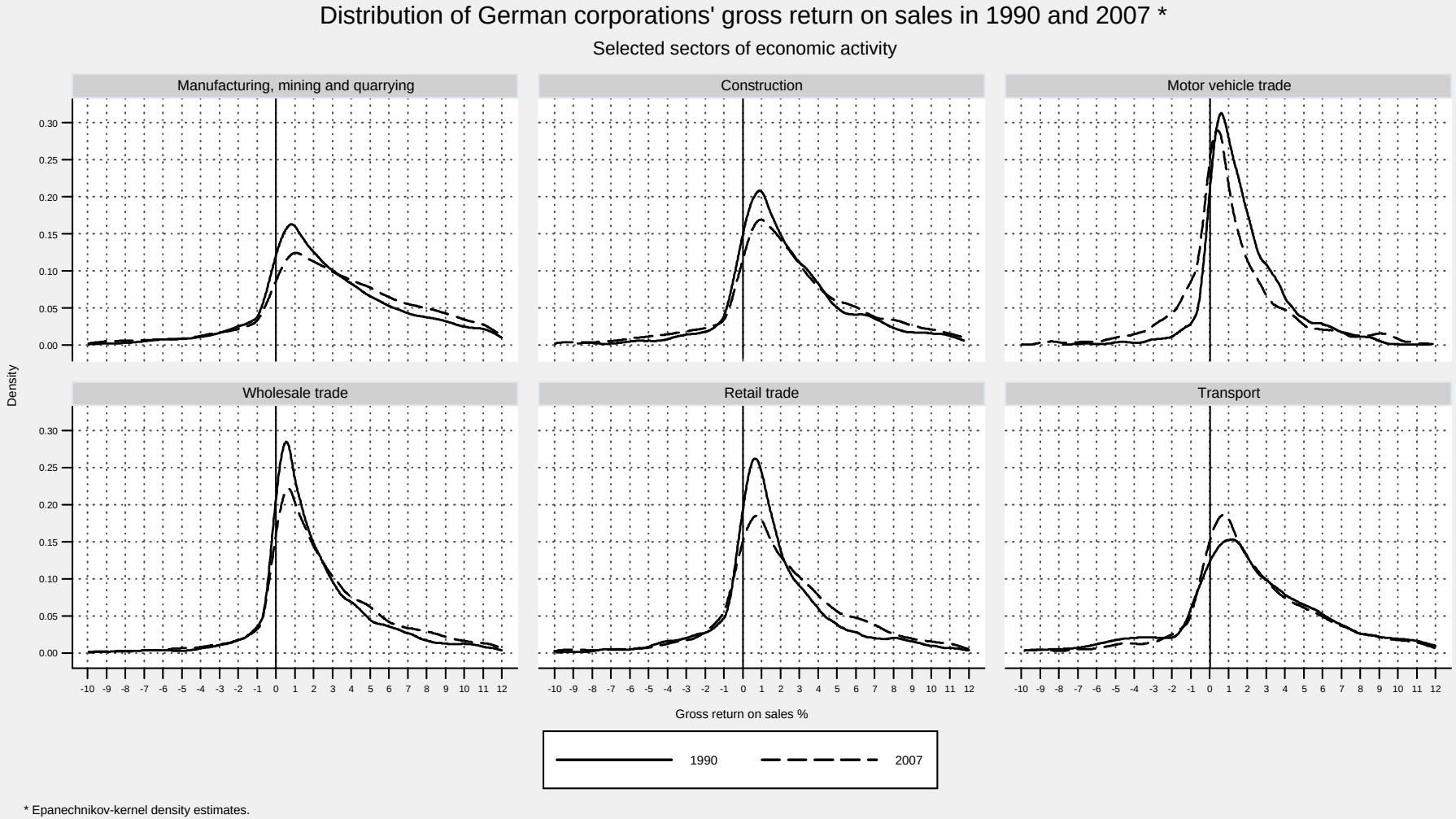
Source: Deutsche Bundesbank.

Annex 2



Source: Deutsche Bundesbank.

Annex 3



* Epanechnikov-kernel density estimates.

Source: Deutsche Bundesbank.

References

Deutsche Bundesbank (2006): *Financial Stability Review*.

--- (2009): *Financial Stability Review*.

--- (2010a): *Extrapolated data from financial statements of German enterprises from 1997 to 2008*.

--- (2010b, January): German enterprises' profitability and financing in 2008, in *Monthly Report*.

ECB (2010): *Financial Stability Review*.

ECCBSO, III WG on IFRS impact and CBSO databases (2008): *Non-financial corporations' quarterly databases*.

Eurostat (1996): *European System of Accounts, ESA 1995*.

International Study Group on Exports and Productivity (2008): Understanding cross-country differences in exporter premia, comparable evidence for 14 countries, *Review of world economics*, 144, 4, p 596-635.

Statistisches Bundesamt (2007): *Volkswirtschaftliche Gesamtrechnungen, Inlandsprodukt nach ESVG 1995, – Methoden und Grundlagen* –, Fachserie 18, Reihe S.22.

--- (2010): *Volkswirtschaftliche Gesamtrechnungen, Inlandsproduktsberechnung – Detaillierte Jahresergebnisse 2009*, Fachserie 18, Reihe 1.4, Stand: August 2010.

Micro-data as a necessary infrastructure – standardisation of reference data on instruments and entities as a starting point: need for a Reference Data Utility

Francis Gross[1]

I. The ECB's experience with the CSDB

The Centralised Securities Database holds micro-data (so far reference data, prices, income data, amounts outstanding) on around seven million instruments. It was conceived as an infrastructure serving the production of macro-economic statistics, and has now been in use as such for the past four years. Staff of the ECB and the 27 NCBs of the ESCB have online access to the CSDB, mainly for data quality management.

In the absence of comprehensive official sources, the CSDB is mainly fed by several commercial data providers. The CSDB had to rely on several sources for its data in order to reach the coverage required for the production of statistics, i.e. all instruments issued or potentially held by Euro Area residents. However, these sources overlap, as many instruments see data delivered by several sources. This offers an advantage as attributes omitted by one source might well be covered by another one. Conversely, it poses a larger challenge with those attributes that are delivered by more than one source: the CSDB must then select the value that will be stored. That process is called "compounding" and is conducted in a fully automated way, based on algorithms; indeed, the sheer size of the database and of the flows of data (e.g. two million prices per day) would not allow manual processing.

The development of the CSDB was made extremely challenging by the reality of the data delivered by the various providers. Data is characterised by diversity in data formats, taxonomies and definitions, by errors such as typos, by varying levels of maintenance (e.g. updating for changes) and by the use of diverse identifiers, both for instruments and for issuers. In that context, the mere identification of data sets representing the same instrument can be a challenge, let alone the identification of the true value of an attribute.

The experience with the CSDB revealed an industrial production process that has become a liability to a whole industry and to the authorities in charge of regulation, supervision and policy. Indeed, whenever an instrument is issued, relevant documentation (e.g. a prospectus) is used by many data vendors and market participants as a source for creating the data set on that instrument, which will be sold to their clients or used in their own processes. Each one of these data capture processes is conducted using the firm's own proprietary taxonomy, data model and format; each one with its own focus on the specific needs the data set should serve. Often enough, some discretion is left to the analyst on how to describe a specific attribute, for instance the name of the issuer – Deutsche Bank, DtBk, DB, etc. whereby DB could also stand for Dresdner Bank, Deutsche Bahn, or something else. Whereas human experts could deal with such data on the basis of their expertise, IT systems cannot, unless

---

[1] Directorate General Statistics, European Central Bank.

The views expressed in this paper are those of the author and do not necessarily reflect the views of the European Central Bank.

they become unduly complicated, i.e. expensive and unwieldy, for performing otherwise simple tasks.

Dialogue with many data experts in industry showed this experience to be the general rule. All organisations that use data in their processes need to do what is euphemistically called “data cleansing”. The practice can be striking when assessed with a mathematician’s mind. For instance, in a case where three sources provide three different values for a given attribute, consulting a fourth source of the same type cannot really provide certainty anymore, especially when terminology can vary too: the information is lost and the data needs to be produced again, directly from a credible source, for instance the prospectus. Nevertheless, in the absence of a better, affordable alternative, such processes are relied upon across the data community. One large European clearing house employs well over 100 people to read prospectuses in order to produce the basic data the market is not able to deliver in a reliable quality for their operations.

II. Motivation and drivers in the quest for better data

1. Measuring economy and finance: the context for a data strategy

Analysts and policy-makers in the economy and the financial markets need continuous measurement of the phenomena which they analyse and on which they act. A brief review of the act of measurement sets the context for designing a data quality strategy that could be useful in the context of the development of micro-data for large-scale analysis, as will likely be needed to support work on systemic risk.

A simple view of the measurement process underlies the analysis that follows. In that view, the first step of measuring a complex system such as financial markets consists in structuring that system with concepts represented in a terminology, usually a first source of divergence. That step is driven by one’s own theory of the system and is usually driven by economic theory, which can be another source of divergence. Next, elements of the system are identified and classified accordingly in the terminology, data is defined along these lines, collected and used to build statistics that feed analysis and support decision-making. This works better if theory is consistent and complete, if its underlying semantics are rigorous, and if the divergences are kept to a minimum across the communities involved in the process.

In the practice of data management and financial statistics, a number of limiting factors are at work. Firstly, the underlying theory cannot be complete, as it often lags innovation in markets that move faster than theory and methodology can; witness the limitations we experience in measuring derivatives. The theory and its language can also not be as rigorous as mathematics, given that it tries to deal with a complex, uncertain reality and is thus in constant flow and subject to many debates and interpretations. We therefore have a gap between a data practice rooted in mathematics, which would thus require rigorous discipline, and a “messy” theory underlying it. Secondly, policy- and decision-making require a continuous flow of statistics: there will be no time for pause to rebuild statistical or data systems. Thirdly, data collection is sometimes perceived as expensive, thus sometimes resisted or subject to compromise on quality. Fourthly, data collection systems are slow to change, whereas the reality they serve to measure can change fast. These few factors illustrate why micro-data cannot be perfect, and they will guide towards identifying possibly promising areas where focused effort could yield valuable improvement.

2. The reality we face: the Tower of Babel again, this time with data

Over the decades, many have grown accustomed to low quality in data and have grown to accept it as a given: “market data has always been bad, and it will always be bad”. Low

quality in data cannot be overcome quickly, but developments in recent years indicate that that attitude is not sustainable and that action is needed. These developments can be broadly linked to two drivers, technological development and globalisation, which seem irreversible, and the crisis has acted as a catalyst in revealing the limits to our data practices.

Technological development and globalisation have led to the coalescence of organisations, processes and systems in the financial system into a single global web, in which data flows without borders, each one of them being exposed to myriads of data sources, which often carry contradictory data on the same object. The number of data sources has also kept growing alongside these developments; whereas efforts at standardisation have developed alongside, their success was limited by the comparatively low energy invested in them compared with the dynamic growth of the markets and data sources. As a result, each data source tended to develop its own "data dialect", in order to serve local needs and constraints. In summary, the need for ever larger data pools collides with increasing fragmentation of the data landscape; this is reminiscent of the Tower of Babel, but this time with data.

3. Obstacles to change in data practices

Addressing the data challenge is rendered more difficult by two factors. Firstly, the very existence of the "data problem" is not even known to the majority of users; most simply rely on the statistics and databases put at their disposal, believe that statistical methods will ultimately give them good aggregates from whatever quality of data material, or have become used to accepting weak data as a given, as fatality. Secondly, the interconnected nature of the "data problem" results in a "first mover disadvantage" for any individual market participant who might try to improve the situation on their own: if the first investor in a new standard is alone in moving, he will have spent money for no gain.

Therefore, little of significance is happening: on the one hand, the usually low-profile standards community is trying to promote the adoption of usually limited standards, which is made difficult by the weight of legacy in many user organisations, whereas on the other hand an industry has grown up which competes to offer palliatives, such as "data cleansing", which tries to extract the truth from various divergent versions of data on the same object. Whereas that is often the only economically viable solution available, strictly speaking, once data offers more than one value for the same item, the information is lost and only producing the data again, from the source, will provide certainty.

4. "Horizontal" transparency versus "vertical" transparency

Another type of obstacle to better data rests on the commonly held belief that disclosure is sufficient to guarantee transparency. This is true for a single item, such as a security, which can be fully described and made transparent by a public prospectus; that type of transparency could be called "vertical" transparency. "Vertical" transparency is a necessary condition for transparency, but it is by far not sufficient. Indeed, the analyst interested in a market as a whole needs to grasp the behaviour of large sets of items, for instance a combination of instruments, legal entities and their portfolios; that requires another type of transparency, which could be called "horizontal" transparency.

"Horizontal" transparency requires (possibly large) pools of standardised data fit for processing in IT systems. It cannot result from the availability of even millions of prospectuses or other documents in natural language, whether on paper or in electronic format, which need to be accessed individually.

"Horizontal" transparency is a necessary condition for enabling the kind of analysis that will be required to fulfil the mission of preserving financial stability, be it for analysing market developments or for monitoring the positions of entities or groups. Progress in IT leads to ever more "horizontal" transparency work being based on simulation models, increasingly of

the sort based on micro-data, which allow finer and more flexible analysis than those based on reported aggregates. “Horizontal” transparency is as good as the data that supports it.

“Vertical” transparency is generally ensured by laws that enforce disclosure on instruments (e.g. the European Commission’s Prospectus Directive). Some “horizontal” transparency is delivered through legally enforced reporting of aggregates (e.g. financial reporting of companies), but the production of micro-data, for instance reference data on financial instruments and legal entities, required for “horizontal” transparency is generally left to industry.

5. Reference data, the technical workhorse of micro-data processing

Usually, industry produces reference data on instruments and entities (i.e. the descriptive data of a more stable nature), which is used for creating “horizontal” transparency, from the information disclosed under “vertical” transparency. It is that production process that is at the heart of the preoccupation of this paper.

Reference data represents the infrastructure for identifying, describing, classifying, labelling and organising other micro-data, which is usually the more interesting and sensitive data for policy analysis or business processes. Reference data is usually public, largely stable over time and non-sensitive.

Reference data is per definition unequivocal and supports communication between systems and their users, as well as between businesses and institutions. It must therefore be unique for all users, to allow reliable reference.

In practice, however, as described above reference data is of low quality and often fails in its mission, because usually many versions of the same data item circulate among users, and none of them can be trusted. Sometimes also, reference data is just not available or its use is made difficult by intellectual property considerations.

6. The crisis has highlighted the need to address data quality at a higher level

The crisis has shown that shocks to the financial system can propagate fast and in unpredictable ways, and that swift, decisive action is required from the authorities. Also, the “flash crash” of 6 May on Wall Street has demonstrated that financial markets can skid out of control very quickly in ways no human can understand anymore.

The systemic risk analysts will need the best technical infrastructure they can get to address these challenges. Better micro-data, fit for flexible, near-time and large-scale analysis, is part of that infrastructure and probably a necessary starting point for any further progress.

Significant improvements in data practices cannot be expected to emerge from the markets. These are far too complex, fragmented and competitive, and focused on other concerns to converge anytime soon on the stable and strict discipline required for large-scale improvements in data quality.

In the USA, the recently passed Financial Stability Act of 2010 (also named Dodd-Frank Bill) addresses that same need by establishing the Office of Financial Research (see box below). The approach chosen there is based on data standardisation imposed through regulation and enforcement where needed.

7. Ad-hoc data collection: another function that depends on good reference data

A necessary condition for the financial stability agencies to fulfil their mission resides in the ability to run fast, ad-hoc collections of micro-data that yield pools of high-quality data immediately fit for analysis in large-scale IT systems to assess market developments with potential implications for systemic risk.

Such ad-hoc data collection will always be necessary, given the complex nature of the financial system, which guarantees by definition that unexpected developments will occur, for which the required data will not have been collected in advance.

The effectiveness and efficiency of ad-hoc data collection depends on the quality of data available: it is easier to collect high-quality additional attributes on a class of instruments on the basis of a complete, high-quality register of that class. In the absence of such a register, the ad-hoc data collection will deliver weak results, which affects the quality, reliability and timeliness of subsequent analysis.

8. Industry needs better data, too

Generally, business processes and ICT systems are not good at handling “data dialects”, so their growth has seen the emergence of costly “data cleansing” activities, conducted both by users and by specialised companies; also the ECB’s complex CSDB is a good illustration of such a “data cleansing” operation. Moreover, the collision between “data dialects” hampers automation and drives cost up. So, for instance, the reality of the vision of “Straight Through Processing” (STP) in banks remains the discussion about “STP rates” and the employment of many to fix failed transactions.

In industry, same as in the public institutions, low data quality at source impacts the whole downstream value chain, creating excess costs and quality losses all along, hampering internal transparency of organisations and increasing their operational risk.

Meanwhile leaders in the IT industry recognise that data quality, especially data standardisation, is becoming the decisive roadblock to effective use of the ever growing power of information technology, be it by industry or authorities.

Many in industry now realise and accept that improvement in data quality will happen for all or for none, and that real progress will require legal compulsion to impose across the market the rigour and discipline which are needed for reliable implementation of data standards, and which the market itself will not be able to deliver.

9. Single source or multiple sources for reference data?

The discussion on whether data should come from a single source or from multiple sources seems to be immanent to the field; the answer probably depends on the nature of the data. It can indeed be beneficial to hear several independent and differing views on a matter of opinion or valuation, or to examine several independent modelling approaches to a complex analytical question. However, where information is unequivocally set, for instance in a prospectus or a contract, it would seem safer to rely on a single electronic source, which would be used by all parties. This is especially attractive for reference data, now that technology makes it possible at low cost, in principle even globally so.

In practice, it remains sad to see that unequivocally and exactly defined information, such as the basic reference data on financial instruments and legal entities, is de facto destroyed through the independent production and circulation of many, often different, incompatible and contradictory data sets on the same information by data vendors who compete in the market. Such differences usually result from the use of different terminologies and definitions, from errors or from diverse levels of maintenance of the data. This is the case, for instance, for basic reference information contained in the prospectus of a financial instrument or the same about a legal entity.

10. The long way to better data needs to begin with a feasible first step

After having been allowed to grow for several decades, the micro-data challenge has become pervasive, and it can be expected that it will require some time to solve. Therefore, a feasible first step is required to start.

The decision to take such a first step should not necessarily be contingent on the whole route being carefully mapped out in advance. Indeed, the complexity of the problem, the number of stakeholders and the time needed for implementation make it impossible to do so credibly in the context of ongoing change in markets and technologies. Much rather, the nature of the problem is more conducive to taking a first step, and to learning from it for the subsequent steps. Subsequent steps will anyway be taken in the new context created by the previous steps.

Such a first step should be designed to be credibly feasible. It should thus focus on a limited yet significant area that is relatively free of “political” ballast and deep-rooted obstacles. The measure should be implementable at low cost, designed to deliver fast benefits for all stakeholders and be market neutral. It should also be designed from the outset with a potential for further growth, in reach and depth, and to provide opportunities for learning and experimenting. Ideally, it would also foster positive developments beyond its formal reach, for instance by acting as a “crystallisation germ”, offering to industry a fixed anchor towards which to converge for effective standardisation beyond the reference data it covers. In that sense, it would reduce the “first mover disadvantage” mentioned above.

Such a measure would likely depend on rigour and discipline among a large group of market participants, which might require legal compulsion. In turn, legal compulsion that serves all market participants could provide a wonderful opportunity for market authorities to develop a showcase for cooperative regulation, a credible win-win proposition. Success could bolster the credibility of authorities in their missions to strengthen market transparency, to improve oversight and to control systemic risk while improving market infrastructure.

Finally, such a measure would need to be integrated into the existing data ecosystem as a basic infrastructure that facilitates the development and work of other data collection mechanisms positioned at a higher level.

A measure that fulfils all these criteria could be built around the basic reference data mentioned above. In that spirit, the article introduces below a sketch of the possible concept of an international Reference Data Utility.

III. The concept of a Reference Data Utility

The idea of a data utility is quite natural and has been floated many times across the data community. The initial idea of the Reference Data Utility (RDU) presented below emerged four years ago from the ECB’s experience with the CSDB. It was initially shelved as too difficult to implement. It was revived as the crisis revealed the need to improve data and seemed to offer a rare opportunity for the kind of consensus for reform such an infrastructure would require.

That idea has been discussed and refined in numerous conversations and conferences with ESCB colleagues, in Statistics and beyond, and with many throughout the financial industry and the regulatory and policy community, in Europe and the USA, especially people involved in the data supply chain and the downstream functions.

I would like to thank all who contributed for their patience, support and candour, and for their constructive contributions; these were indispensable for the mere continuation of that exploration as well as for the emergence of a concept that might now stand a better chance of seeing an implementation one day.

1. "Thin Utility": an infrastructure focused on basic reference data

An RDU would focus on the most basic reference data on financial instruments and legal entities, the kind that is needed by virtually all data users: identification, basic description, interrelations and classifications, as well as, for legal entities, a manned electronic address – the latter could for instance be used to support quick and efficient large-scale ad-hoc data collection by other repositories. Hence a "thin" utility.

2. A single, strategic infrastructure shared by all stakeholders

Reference data on financial instruments and legal entities is needed by all stakeholders, private or public, in financial markets and beyond. Moreover, in daily operations, data flows through the systems and between entities regardless of its origin. Therefore, the coexistence of versions of the same data under several standards will always lead to collisions and local fixes, hence to new breeds of the same data and ultimately confusion.

A single standard on reference data that serves all needs should be the goal. An RDU could serve that goal if it was designed from the outset to offer basic, high-quality reference data on financial instruments and legal entities to all stakeholders, public or private, of course within legal limits, for instance concerning confidentiality.

The development, governance and operation should thus be conceived to involve these stakeholders in an appropriate manner.

3. Legal compulsion

The production of high-quality reference data requires rigour and discipline in the adherence to the reporting and maintenance process and in the application of the data standard. With a high number of market participants involved, this can only be obtained through legal compulsion, as many in the industry recognise.

The need for legal compulsion for reference data standardisation is now acknowledged by most in the industry, recognising that it would provide legal certainty for standard-driven investment and a level playing field for all stakeholders. Many, including some major data vendors, now see reference data as a commodity and a public good that should be held in a public infrastructure. Moreover, industry-driven standardisation has largely failed so far and shows no credible promise in the absence of a dominant party who could impose its practice as de facto industry standard, and in view of the "first mover disadvantage" that would affect any institution being the first to invest in a new standard, hoping that the others would follow.

In the USA, that legal compulsion has now been created by the recently passed Financial Stability Act, which establishes the Office of Financial Research (OFR).

The **Office of Financial Research** (OFR) has been established by the Dodd-Frank Bill recently passed in the USA. The OFR will be an independent entity within the Treasury; its Director will be appointed by the President of the USA for a term of six years.

It will provide technical support to the newly established Financial Stability Oversight Council.

The OFR will have two main entities: a Data Centre and an Analysis and Research Centre.

The Data Centre will collect, among others, reference data on instruments and entities, as well as data on transactions and positions. The OFR will have the power to issue standards and to enforce reporting.

In Senate hearings it has been made clear that the OFR will need international solutions in data standardisation, including on reference data. Indeed, for its analysis on systemic risk and financial stability it will also need to process data on cross-border transactions and positions, i.e. involving instruments and entities based abroad.

4. International reach is required, global reach should be the goal

The riskiest developments in financial markets are likely to be surprising ones, which will require agility (i.e. flexibility and speed) in the tools used to analyse them. Furthermore, the global nature of financial markets and of potential crises or threats to financial stability would suggest the need for analytical tools with the same reach. Macro-economic analysis of financial market developments based on micro-data seems to be a promising avenue in that respect, but it requires data on transactions and positions involving instruments issued abroad and entities based abroad. Such data must be of the same quality as the data concerning purely local instruments and entities. Hence global coverage must be the goal for a Reference Data Utility.

In the course of globalisation, the financial industry has seen the emergence of organisations and processes that are increasingly international and data intensive. Here as well, an international RDU would be good, a global one better.

The European Commission has long ago launched initiatives to improve Europe-wide access to data on entities in the field of business registers. That goal would be facilitated by an international RDU. The debate in the USA has also clearly shown an awareness of the need for internationally standardised reference data for the OFR to succeed. For instance, Gov Daniel Tarullo from the Federal Reserve Board indicated in the Senate Hearing on the Dodd Bill (later the Financial Stability Act) in February that international solutions will need to be sought for data standardisation.

5. A single Reference Data Utility should be the goal

Data quality would require a single RDU; technology makes it possible. However, building such a single RDU harbours legal and organisational challenges.

Therefore, ease of implementation could lead to envisaging national or regional RDUs. A large number of such national, regional or sectoral registers already exist, especially in the field of business registers. Practice shows that such fragmentation is exactly what needs to be overcome, as is documented by numerous initiatives that aim at progressively linking existing registers, not least by the European Commission and CESR. These efforts have so far proved to be slow in their development, at best. One reason might well be that the organisations concerned have very diverse missions, legal backgrounds, technical legacy, limited resources and probably little intrinsic incentive to change. Even Eurostat's Eurogroups Register uses data from a commercial provider, rather than assembling data from national business registers.

Moreover, it is easy to imagine that several, networked RDUs working in parallel on the same standard would unavoidably be exposed to different situations, which could lead them to diverge in their interpretations of the standard, thus to develop local "data dialects", which even if based on the same standard would defeat the purpose.

Finally, parallel RDUs could see overlaps and gaps between their respective coverage.

That suggests that the goal of a single RDU is the one really worth pursuing, as a fragmentation would likely add to the problem it intends to alleviate.

6. A design concept that could reconcile global reach of an RDU with national law

Assuming a single RDU with global reach and backed by legal compulsion, a theoretically feasible design concept could be reached by separating the functions of a technical nature from the functions with a legal character, e.g. enforcement.

Under that design concept, the technical functions would be performed by an International Operational Entity (IOE) with a purely technical focus and without legal powers, whereas in each legal constituency the legal powers and obligations could be conferred upon a relevant local authority. The two components could be linked by a service agreement, under which each participating local authority would outsource the technical conduct of data collection, storage and distribution, as well as the coordination of standards design work, to the IOE.

Such a design concept would enable a modular growth of the RDU's geographical coverage from an initial base. Legal constituencies could join individually, at their discretion. The operation of an RDU could thus start with a smaller number of participants. Chances of success would be larger if the initial participation could represent an attractive critical mass.

Such a design concept could also serve a European solution and could be "upward compatible" to a broader international one.

7. An International Operational Entity

The International Operational Entity (IOE) would perform the technical operations of the RDU on behalf of the national authorities that are mandated by their national law to enforce that data collection at the national level. The IOE would do so under a service agreement passed with the national authorities of all participating countries. It would be designed to operate as lean as possible, to reduce its impact on existing activities in the industry while leveraging them for better reference data.

To ensure acceptance, the IOE would need to operate as a non-profit, self-financing entity, leaving profit opportunities offered by the data supply chain to the private sector. The IOE would work under a business model, a legal form and governance which are yet to be analysed. These parameters should be designed to support the credibility of the IOE's technical competence, market neutrality, efficiency, global reach and acceptability in the market. In that respect, it might be useful to associate in the governance of the IOE a round of well-known international institutions, which would represent market authorities, governments and industry.

The IOE's revenue could be derived from a combination of sale of reference data and registration fees from reporters, whereby the latter could be less well accepted.

In order to fulfil its design objectives, the IOE would use as much as possible existing services from existing suppliers. So, for instance, production and maintenance of RDU data would be conducted by external parties acting in a competitive market, in which providers would offer their services to data reporters (issuers and entities) who would make their "make or buy" decision and possibly select a provider. In order to keep control of data quality, the IOE would accept data sets only from analysts it certifies. Analyst certification would, in turn, rest on analyst training on the RDU's published methodology and standards; such training could also be performed by a competitive market.

The tasks of the IOE could encompass running the RDU's daily operations as well as the development and management of its infrastructure, both technical and organisational.

Running the RDU's daily operations would consist in (1) receiving, storing and distributing reference data on legal entities and financial instruments, (2) running the quality feedback process between data users, data producers and national authorities, which also facilitates quality enforcement by the national authorities (more below) and (3) running the commercial and administrative processes of the RDU, depending on the business model chosen.

Developing and managing the RDU's infrastructure would consist in (1) developing the coverage of data in the RDU to new asset classes or attribute classes through dialogue with the relevant communities: data users, standard designers, technologists, lawmakers and national authorities, to identify new needs and feasibility, (2) developing the geographical coverage of the RDU, (3) steering the development of standards for its data, (4) managing

and developing the IOE's supply chain and its analyst community and, (5) possibly, to foster and sponsor relevant research into data.

8. Design of the RDU's supply chain

Whereas the major part of the data supply chain around the IOE would be left to industry, operating in a competitive market, a monopolistic core limited to essential functions of a utility is recognised as necessary to help embody consistent implementation of a standard.

Whereas data sets would be produced for, delivered to and maintained in the RDU by a competitive industry, the IOE would ensure that each data set is produced once only and that for each data set a single analyst, certified by the IOE, is identified as responsible. The IOE would act as an obligatory point of passage for each data set and would thus offer a unique point of reference to users worldwide for each data set covered, with access through a website.

Such design would enable the Utility to combine the benefits of competition and those of a one-stop-shop. It would also be central to the concept of a lean, user-driven data quality assurance process.

9. Data quality management process

A lean IOE would not employ staff to check data quality. Instead, quality data should be delivered in the first place by the certified analysts who produce it on behalf of the legally responsible reporting agents, either issuers of financial instruments or legal entities.

A community-centric data quality management process could be imagined, which would require very few specialised staff and would rest on feedback from users to the certified analyst through the RDU's website. The principle would foresee that in case of wrong data, users noticing the error could go to the webpage of the data item in the website of the RDU and click the "quality button" of the item, which would create a message automatically addressed to the responsible analyst. In that message, the user could convey their observation, which would lead to correction for all, at the centre.

The message would be copied to a compliance centre of the IOE, from where, failing timely repair, it would be forwarded to the national authority in charge of the reporting agent's compliance, from where the enforcement process could start.

10. Incremental growth of coverage: start feasible and develop from there

The scope covered by the Thin Utility would begin from a small but quickly feasible base with categories of instruments, entities and attributes that are immediately useful to many, thus it would deliver immediate value at low risk; all involved would collect experience in those first steps that would feed further development. The value provided from the start would ideally generate demand for broader coverage. Coverage would then grow from there, over time, driven by demand and feasibility.

11. Data coverage: financial instruments

The scope of instruments covered could start with debt and equity and progressively grow to cover for instance derivatives, perhaps also OTC at some point. The RDU could also grow to cover the basic reference data of ABS and individual loans, at least those involved in securitisation.

Attributes covered for financial instruments would need to encompass an identifier, basic technical descriptive attributes, some uncontroversial classifications e.g. for statistical

purposes, and some interrelations e.g. who is the issuer, what instruments the asset backs, or which assets back it.

The scope of instruments and attributes covered would be determined in a process of dialogue between the stakeholders, which would be managed by the IOE.

12. Data coverage: legal entities

Coverage of legal entities could be determined through a similar mechanism as for instruments.

Attributes related to legal entities would cover the same categories as for instruments: an identifier (see next paragraph), basic technical descriptive attributes, some uncontroversial classifications e.g. for statistical purposes, and some interrelations e.g. what other entity owns it, which ones it owns (within the limits of confidentiality rules), what instruments it issued.

Data about a legal entity could also be imagined to encompass an electronic address manned by a manager responsible for the entity. Such an electronic address could serve two purposes that are not readily served today. Firstly, it could serve for data collection from Special Purpose Entities (SPEs), which are usually very difficult to approach as many have no operational staff, but whose reporting would be essential, for instance to achieve reliable FDI statistics. Ideally, legal compulsion on the SPE could be used to elicit reporting even from such managers based outside the legal constituency in which the SPE is based. Secondly, such an electronic address in the RDU could be used to run large-scale ad-hoc data collection from many entities in a very lean fashion, through a query sent from the RDU (see below).

13. Build on existing standards, cooperate with ISO

An RDU would, as much as possible, build on existing standards and established practices, such as the ISIN code for identifying instruments, and the ISO process for designing standards. It would add momentum to developments that have so far stalled, such as the creation of a standard entity identifier. Indeed, the mere involvement of the ECB and the Federal Reserve in the discussion about data standards and a utility has revived ISO efforts in that very field. By leveraging and catalysing existing infrastructure and resources, the creation of a utility would require relatively little invention.

Conversely, the recently strengthened focus on data standardisation in the data community has led the ISO Technical Committee to review the standard that established the BIC, the Bank Identifier Code, which is now called the “Business Identifier Code”, which opens the way for its development into a universal entity identifier.

14. Ad-hoc data collection: serving financial stability and systemic risk control

Large-scale ad-hoc collection of micro-data could well become central to systemic risk analysis and to financial stability work. For such collections to be useful, it might become essential to avail of a capability to quickly collect, in a targeted way, large pools of data immediately fit for large-scale processing, i.e. standardised. Such data might need to cover well-defined attributes on all instruments in given classes from all entities in certain categories.

An RDU could allow sending a relevant query to the electronic address of each entity concerned. Knowing the complete population of instruments and entities to be surveyed, it becomes easier to reduce cost and increase speed through well-controlled sampling.

That approach could also support the collection of very confidential attributes, whereby the query sent to entities from the RDU would ask for data to be delivered for instance to the (national) supervisory authority entitled to hold such data. The data could be treated there, for instance anonymised and aggregated, and then transmitted to the analysts of financial stability authorities or other authorities that need them.

Such flexible, fast, low-cost and targeted collection of high-quality data fit for large-scale processing is not possible today.

IV. Positioning of a Reference Data Utility

An RDU would appear as a new entity in a complex "data ecosystem".

The RDU would be positioned in the data supply chain upstream of other data repositories or operations, public and private, and provide them with the basic reference data on financial instruments and legal entities that they need to conduct their business, which can be to collect, organise, distribute and/or analyse more specific or dynamic data, for instance specific transaction data or position data.

1. Positioning of an RDU versus issuers of financial instruments

Issuers of financial instruments would be faced with the legal obligation to deliver and maintain in the RDU reference data on the instruments they issue.

The legislators in many countries have long recognised that well-functioning financial markets and investor protection need to be ensured by legislation. So far, that is done by enforcing disclosure by issuers of information on individual financial instruments, for instance by enforcing the publication of a prospectus for certain types of instruments.

As mentioned above, that practice guarantees transparency at instrument level ("vertical" transparency). That "vertical" transparency is itself limited by the fact that updates to certain aspects of prospectuses are usually done through "corporate action" messages that need to be reconciled with the prospectus information, a task only a few organisations can conduct. Prospectuses themselves are usually not updated.

Investor protection and market stability also require "horizontal" transparency, i.e. the visibility of the behaviour of larger sets of instruments and investors taken as a whole, and their interaction with other asset classes or groups. "Horizontal" transparency requires the availability of data fit for analysis in large-scale IT systems; it is useful only if reasonably near-time.

Therefore, the case for investor protection could justify that issuers of financial instruments be required to provide, alongside documents that support "vertical" transparency, the data required for "horizontal" transparency, and to maintain it up-to-date. Some of that data, such as transaction data, is generated on a daily basis by the marketplace, whereas another part, reference data, needs to be produced and would be stored in an RDU.

The costs of producing and maintaining reference data in an RDU would be a legitimate component of the issuer's cost of doing business, but would represent a very limited share of this cost. Just compare the cost of setting up a prospectus, which goes into the tens and hundreds of thousands of euros, with the cost of a few hours of an analyst's time over the life of an instrument.

For many issuers, who are also data users, these costs should be (more than) balanced by the benefits from better reference data throughout their operations. However, these benefits will not be easy to account for explicitly.

2. Positioning versus data providers as clients of an RDU

The RDU would be positioned as a commodity provider, delivering in a standardised electronic format reference data that represents information unequivocally known.

Commercial data providers, who today produce their own reference data or assemble it from various specialised companies or from other sources could choose to simplify their sourcing by becoming clients of the RDU. Thereby they would shift from high-cost in-house production of low-quality reference data to buying a low-cost, high-quality commodity. Such outsourcing and moving to higher layers of the value chain would represent a move that is very common in the development of many industries. Data vendors could then focus on the cutting edge of the data business.

For the clients of existing data providers, this would represent a significant quality improvement in the reference data delivered to them, perhaps associated with a small decrease in prices. Furthermore, that improvement in reference data could provide the basis for significant improvements in these clients' process performance, firstly, because processes that use data from commercial data providers would face fewer data-induced failures (STP rates could increase), and secondly, because data interchange between organisations would be easier if their data sources used the same reference data. Such improvements would of course reduce costs and operational risks in the processes that benefit. They might also allow simpler design of certain IT systems, a further opportunity for reduction of cost and operational risk.

3. Positioning versus data providers as suppliers of an RDU

The entities required to submit data to the RDU and to maintain it there could either do that for themselves or take recourse to services offered by organisations specialised in the field of data. These could be either the established commercial data providers or other organisations, such as CSDs or established registers, which would be well placed to produce data for the RDU.

For such data suppliers, producing data for the RDU could represent a new business line and source of revenue.

4. Positioning versus clients of commercial data providers

In theory the RDU would be a commodity provider mainly supplying to industrial clients such as commercial data providers and larger public or commercial data operations. Yet, it cannot be excluded that certain data users would choose to source reference data directly from an RDU, especially those who build in-house solutions from basic components. The majority of users of commercial data services should however be expected to continue seeking package or turn-key solutions wherever possible. In that sense, the emergence of an RDU should not disrupt the business of commercial data providers in a significant way.

5. Positioning versus public sector data users (e.g. registers, statistics)

An RDU could be a source of standardised, high-quality basic reference data for public sector data users (business registers, credit registers, administrative databases, etc.), which they could use either as an input into their databases or as a benchmark for their data quality management. In that role, an RDU would serve as a commodity provider and not otherwise interfere in the execution of these users' missions.

Sourcing reference data from an RDU would however relieve these users from the tedious task of producing or collecting their own reference data, at least within the scope covered by the RDU, and would allow them to focus their resources on tasks with higher value addition.

Providing high-quality, standardised reference data to such public functions would allow these to more easily exchange and combine their data where they need to, for instance for combined analysis, or it would enable their users to do so. As an example, it would become much easier to combine micro-data from different sources, for instance data on securities holdings, on securities issuers and on transactions, to understand the dynamics of a given market. An RDU could also serve public authorities to conduct swift ad-hoc collection from market participants of micro-data not yet available, at a level of quality that would make them fit for near-time, large-scale processing. Such capabilities would be important for analysis serving functions that monitor financial stability or systemic risk. The potential process is described above.

6. Positioning versus the ESCB's Centralised Securities Database (CSDB)

The CSDB would certainly source its reference data for financial instruments and issuers from the RDU, once available. That would improve data quality on the attributes covered and lift some of the limitations on data usage that result from contracts with commercial data providers. It could also reduce costs and simplify the operation of the system by reducing the need for compounding data from various sources and saving costs on data quality management throughout the ESCB.

7. Positioning versus standards bodies

The RDU would put significant weight on cooperating with standards bodies, first and foremost the International Organisation for Standardisation, ISO, who design, among others, standards for data on financial instruments and legal entities.

For an RDU, this would guarantee that standards it applies are designed by all stakeholders who wish to contribute, including industry.

For the ISO, it would ensure that the design of standards for financial data would attract more attention, thus more active participation from stakeholders, which could strengthen the quality of standards and their acceptance in the stakeholders' community.

8. Positioning in the data standardisation process at large

An RDU would offer standardised data on a limited scope of attributes, with data collection based on legal compulsion. However, standards would be designed to cover a broader scope of data than that covered by the RDU. It could thus be expected that the existence of a core body of highly standardised reference data would provide systems and process designers with a solid anchor of standardisation towards which to converge. That could encourage them to apply the same standards more broadly, beyond the confines of the RDU's scope. Especially designers who build new systems could see an opportunity to adopt data standards backed in their core by the RDU, which could result in a broader migration towards standards.

In that sense, the RDU could be a germ of crystallisation for broader data standardisation across the financial system.

Session 4 C

Marrying analytical methods and frameworks with data sources

Chair: Charles Thomas, Board of Governors of the Federal Reserve System

Papers:

Applying *CoVaR* to measure systemic market risk: the Colombian case
Mauricio Arias, Juan Carlos Mendoza and David Pérez-Reyna, Bank of the Republic

On measures for illustrating credit risk assessments: the case of heat maps, risk matrices and cubes
Jenny Dickson, Sveriges Riksbank

Alternative measures of liquidity on the Chilean government fixed income market
Nicolás Álvarez Hernández and Luis Antonio Ahumada, Central Bank of Chile

Applying *CoVaR* to measure systemic market risk: the Colombian case

Mauricio Arias, Juan Carlos Mendoza and David Pérez-Reyna[1]

Introduction

Negative shocks suffered by individual financial institutions can easily propagate and affect other entities. Due to this, measuring and analyzing the phenomena derived from systemic risk has been a common interest among policy makers. Moreover, since the recent financial crisis, this analysis has gained even more importance.

Systemic risk may not be analyzed only by using individual risk measurements of institutions. Herding behavior by financial entities may cause a high exposure to negative systemic events, even if individually all institutions have low risk measurements. Additionally, the risk assumed by a systemic institution may cause negative spillovers not internalized in risk requirements. To deal with these issues, several papers have approached systemic risk from different perspectives, according to what authors perceive is more relevant to their analysis.

For Rochet and Tirole (1996) systemic risk is materialized when a bank's economic distress propagates to other economic agents linked to that bank through financial transactions. This paper studies whether the flexibility offered by decentralized interbank transactions can be maintained, while the corresponding financial authority can be protected against undesired rescue operations. If not, centralizing interbank systems would be more efficient in terms of liquidity allocation and prudential control. In particular, the authors analyze the "too big to fail" policy: proper authorities bail out a bank with short positions in the interbank market because the bank's distress may affect solvent lending banks.

According to Furfine (2003), there are two types of systemic risk: 1) the risk that a financial shock causes a set of markets or institutions to simultaneously fail to function efficiently; and 2) the risk that failure of one or a small number of institutions will be transmitted to others due to explicit financial linkages across institutions. To analyze contagion, Furfine estimates it by examining federal funds exposures across US banks, which are used to simulate the impact of exogenous failure scenarios. This paper concludes that, although the exposures are not large enough to cause a great risk of contagion, illiquidity could pose a threat to the banking system.

For Acharya (2009) systemic risk, defined as joint failure risk, arises from the correlation of banks' assets returns. To analyze this, the author considers a model in which banks invest in risky assets in various industries. The investment decision determines the correlation among banks' assets, which, in case it is high enough, results in a rising exposure to systemic risk. The paper concludes that the effect of regulation of banks' optimal investment decisions

[1] The authors thank Dairo Estrada and the staff of the Financial Stability Department at the Banco de la República (Central Bank of Colombia) for valuable comments. The views expressed in this paper are those of the authors and do not necessarily reflect those of the Banco de la República, nor of its Board of Directors. The authors are solely responsible for any errors or omissions.

The authors are, respectively, Head of Analysis and Information of the Research and Development Department at the Financial Superintendence of Colombia, Specialized Professional of the Financial Stability Department at the Banco de la República and Economics PhD student at the University of Minnesota. Corresponding e-mail: fmarias@superfinanciera.gov.co, jmendogu@banrep.gov.co, perez236@umn.edu

deserves careful scrutiny: requirements should depend both on banks' joint risk and on their individual risk.

On the other hand, Allen and Gale (2000) address systemic risk from a liquidity risk perspective. They find that the resilience of the interbank market to adverse liquidity shocks depends on the market's structure. Similarly, Saade Ospina (2010) analyzes the Colombian interbank collateralized market. He develops a centrality index using cooperative game theory and concludes that when the interbank network is disconnected, bid ask spreads are farther apart and their volatility is higher. This implies that banks are more exposed to liquidity market risk under this scenario.

Nonetheless, systemic risk has not been analyzed yet in Colombia from a market risk perspective. The exposure of Colombian financial institutions to this risk has increased since 2009 as lower rates and slower credit dynamics have caused asset restructuring. Treasury bond holdings and volatility in yields reached levels similar to those observed by mid 2006, when a setback in this market caused the most important losses during the past decade. In the context of the model proposed by Acharya (2009), this behavior has increased the correlation of the different entities' assets, especially among commercial banks, which could cause a higher systemic risk. Due to these reasons, it is imperative to analyze market risk dependence among Colombian commercial banks to identify which institutions have a high contribution to systemic risk.

The objective of this paper is to analyze market risk dependence among Colombian financial institutions in order to identify institutions with the highest contribution to systemic risk. We follow the definition of *CoVaR* introduced by Adrian and Brunnermeier (2009), which is measured as the Value at Risk (*VaR*) of a financial institution conditional on the *VaR* of another institution. In this way, if *CoVaR* increases relative to *VaR*, so does spillover risk among institutions. By defining the difference between these measures as $\Delta CoVaR$, we can estimate the contribution of each institution to systemic risk.

Additionally, since $\Delta CoVaR$ is not necessarily symmetric (that is, the contribution that institution *i's VaR* has to institution *j's* market risk does not necessarily equal the contribution of *j's VaR* to *i's VaR*), this measure can be used to analyze the risk across the Colombian financial system. We focus on the public debt portfolio of financial entities and define the portfolio of the financial system as the aggregate public debt holdings of these institutions. Results suggest that risk codependence among entities increases during distress periods.

As mentioned by Adrian and Brunnermeier (2009), one advantage of *CoVaR* is that it can be applied with any other tail measure to analyze other risks. For instance, Chan-Lau (2008) follows a similar approach and assesses systemic credit risk by measuring default risk codependence among financial institutions through an analysis of CDS spreads of 25 financial institutions in Europe, Japan and the US.

Also, Gauthier et al (2010) compare $\Delta CoVaR$ and four other approaches to assign systemic capital requirements to individual banks based on each bank's contribution to systemic risk. The authors conclude that financial stability can be enhanced substantially by implementing a system perspective on bank regulation.

The remainder of this paper is structured as follows: section 1 describes the specification of the model used. In section 2 we analyze the Colombian Treasury Market. Section 3 shows the main results. Finally section 4 includes the concluding remarks.

1. Methodology

To study the systemic market risk contribution of each entity it is important to analyze the risk codependence among financial institutions in the context of a high market risk exposure

scenario. Several methodologies have been used to measure systemic risk and risk codependence. Hartmann et al (2001) and Chan-Lau et al (2004), for instance, used extreme value theory for this purpose. However, a common problem of this methodology is that a large amount of data is needed because only tail observations are used.

An adequate way to measure market risk codependence is through quantile regression.[2] This methodology provides a more extensive analysis than ordinary least squares in the sense that it estimates the relationship among random variables under different quantiles. For this reason, it can be used to estimate the risk codependence among financial institutions under different risk scenarios. Additionally, this is a methodology that can be easily estimated with a large number of independent variables.

In general, the estimation of quantile regression consists in minimizing the sum of residuals, weighted asymmetrically by a function that depends on the quantile τ. That is, the τ regression quantile, $0 < \tau < 1$, can be represented as a solution of the following expression:

$$\min_{\beta} \sum_{t} \rho_{\tau}(y_t - f(x_t, \beta)) \qquad (1)$$

Where *y* is the dependent variable, $f(x_t, \beta)$ is a linear function of the parameters and the variables used to explain the behavior of *y*, and ρ_τ is the weight assigned to each observation, depending on the analyzed quantile τ. Specifically Koenker and Bassett (1978) propose the following representation of equation (1):

$$\min_{\beta}\left[\sum_{t\in\{t:y_t \geq f(x_t,\beta)\}} \tau|y_t - f(x_t,\beta)| + \sum_{t\in\{t:y_t < f(x_t,\beta)\}} (1-\tau)|y_t - f(x_t,\beta)|\right] \qquad (2)$$

In this paper we measure how the risk level of a financial institution *j* is affected by the risk level of another financial institution *i* or by the whole financial sector. Following Chan-Lau (2008), equation (2) is estimated with:

$$y_t = Risk_{j,t} \qquad (3)$$

$$f(x_t, \beta) = \beta^{\tilde{R}}_{j,\tau}\tilde{R} + \beta_{ji,\tau}Risk_{i,t}$$

Where $\mathbf{Risk_{it}}$ denotes an indicator that measures the market risk of entity *i* in *t*. For this purpose we use the daily *VaR* of entity *i's* TES portfolio, with a weekly frequency. $\beta_{ji,\tau}$ is a vector of parameters, which indicate risk codependence between *i* and *j* for quantile τ. These parameters were estimated for different quantiles in order to analyze if the risk codependence between any two entities or sectors increases under higher levels of risk.

In addition, we consider a matrix with exogenous variables that can affect the market risk level (R). R contains different aggregate risk factors that are used to explain the evolution of TES prices and its market risk, such as inflation expectations, weekly stock market returns and exchange rate returns, the slope of the yield curves, weekly credit growth, EMBI+ for Colombia, VIX, five-year CDS for Colombia and the Colombian interbank rate. To avoid multicollinearity, we estimated the principal components that explain 80% of the volatility of the standardized variables in R. The resulting vectors ($\tilde{R}$) were used in the quantile regressions. In this sense $\beta^{\tilde{R}}_{j,\tau}$ can be understood as the effect of these exogenous variables over entity *j's* market risk on τ quantile, given *i's* market risk.

The estimation process required the calculation of 1360 regressions for banks: for each of the 16 Commercial Banks (CB) we calculated a regression against each other bank's *VaR*, and against an aggregate *VaR* for the banking sector, for five different quantiles. Similarly,

[2] This methodology was proposed by Koenker and Bassett (1978).

we estimated 210 regressions for Pension Funds (PF), due to the fact that we analyzed six PF and an aggregate *VaR* that comprised the market risk of the PF sector. Finally, we calculated an aggregate *VaR* for each consolidated sector of other Credit Institutions: Financial Corporations (FC), Financing Companies (CFC), and Financial Cooperatives (Coop). We did the same for each sector comprised in the other Non-Banking Financial Institutions (NBFI): Brokerage Firms (BF), Insurance Companies (Ins) and Hedge Funds (HF), and for the whole Financial System (FS). Then, we estimated 360 regressions among each sector of the financial system. The main results are shown in section 3.[3]

Additionally, to extend the systemic risk analysis, Adrian and Brunnermeier (2009) proposed a conditional risk codependence measure, or co-risk measure, which they denoted *CoVaR*.[4] $CoVaR_{\alpha}^{j|C(i)}$ stands for the VaR_{α} of entity *j* conditional on the VaR_{α} of entity *i.* That is,

$$P\left(X^{i} \leq VaR_{\alpha}^{i}\right) = \alpha$$

$$P\left(X^{j} \leq \left[CoVaR\right]_{\alpha}^{j(i)} \middle| X^{i} = \left[VaR\right]_{\alpha}^{i}\right) = \alpha$$

Where X^{i} stands for weekly returns of the TES portfolio of entity *i*. A more general way to define $CoVaR_{\alpha}^{j|C(i)}$ is:

$$CoVaR_{\alpha}^{j|C(i)} = \left\{VaR_{\alpha}^{j} \middle| VaR_{\alpha}^{i}, R\right\}.$$

In this sense, equation (2), taking into account (3), represents the estimation of $CoVaR_{\alpha}$ by quantile regression. In order to calculate entity *i's* contribution to entity *j's* VaR_{α}, Adrian and Brunnermeier (2009) suggest the following expression:

$$\Delta CoVaR_{\alpha}^{j|C(i)} = CoVaR_{\alpha}^{j|C(i)} - VaR_{\alpha}^{j}, \qquad (4)$$

Where $\Delta CoVaR_{\alpha}^{j|C(i)}$ is the increase of *j's* market risk if entity *i's* market risk is considered. Taking into account (3), equation (4) can be expressed as:

$$\Delta CoVaR_{\alpha}^{j|C(i)} = \beta_{j|i,\alpha}^{R} R + \beta_{j|i,\alpha} VaR_{\alpha}^{i} - VaR_{\alpha}^{j}.$$

The same analysis can be made between sectors and the financial system. In this sense, we can study the increase in the market risk of a sector or the whole financial system when the *VaR* of an entity is considered. This increase is the systemic market risk contribution.

2. TES Market and Data Analysis

Colombian Treasury Bond (TES) holdings account for over 20% of Colombian GDP: on March 2010 they reached approximately 120 trillion (t) Colombian Pesos (COP), or USD 60 billion (b), of which near to 45% were owned by the financial system. Figure 1 shows TES exposure by major entities in the Colombian financial system.[5] It can be seen that TES exposures of financial institutions have displayed an increasing trend since late 2008. Also, PF and CB have the highest share of these bonds in the financial system. In particular, by

---

[3] Regressions were estimated with 360 weekly observations for the mentioned variables, with data from February 14th, 2003 to January 1st, 2010.

[4] For a detailed explanation of the definition and properties of *CoVaR* see Adrian and Brunnermeier (2009).

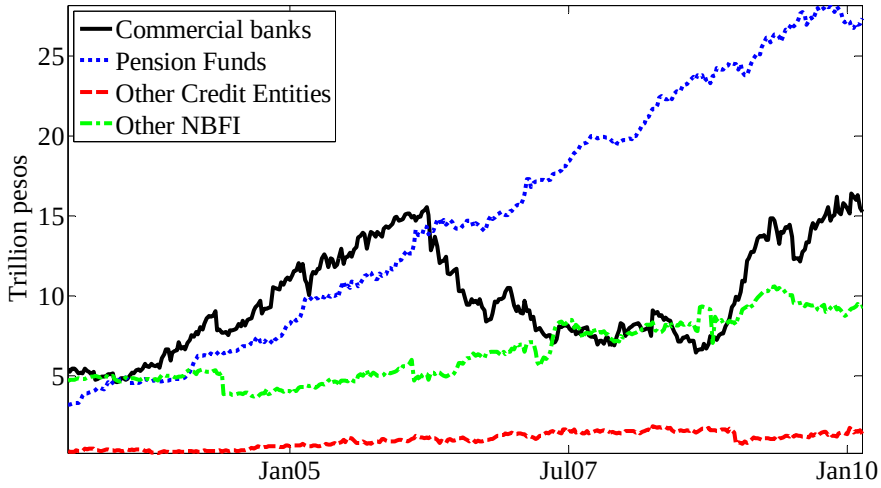
[5] Credit institutions classify their investments as negotiable, available for sale, and those kept until maturity. Only the first two classes are subject to changes in market value. This corresponds to over 60% of total TES holdings. Figure 1 shows TES holdings in these classes.

December 2009 the TES exposure of both PF and CB was close to its historic maximum. By this date almost 33% of the above entities' investment portfolio was exposed to Colombian Treasury Bonds (COP 27.1 t).

With respect to CB, by late 2009 their TES exposure (COP 16.4 t) was over 10% of their loan portfolio. This amount was greater than the exposure of these entities to Colombian public debt by mid 2006, when a setback in the public debt market caused the most important losses during the past decade. This crisis was not only observed in the public debt market: the stock market was also affected, as the weekly returns of the Colombian Stock Market General Index (IGBC) show (Figure 7 in Appendix B, Panel B).[6]

Figure 1:

TES Exposure



Source: Banco de la República.

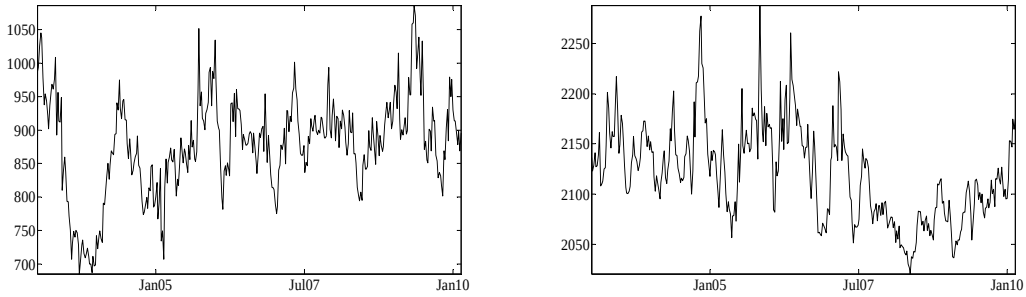
To study the TES exposure among the 16 CB and the six PF analyzed in this paper, a Herfindahl-Hirschman Index (HHI) was estimated (Figure 2). In this way, CB TES exposure can be considered as less concentrated than PF exposure, since the former's HHI is 887, on average, while the latter's is 2121. The difference in the HHI for CB and PF may be due to the number of analyzed entities of each type, and to the fact that there are two PF whose average TES exposure share of the total has been over 50%.

[6] The intervention rate of the Banco de la República (BR) increased from 6% to 8.75% between May 2006 and one year later.

Figure 2:

Herfindahl-Hirschman Index for TES Exposure

A. Commercial Banks **B. Pension Funds**



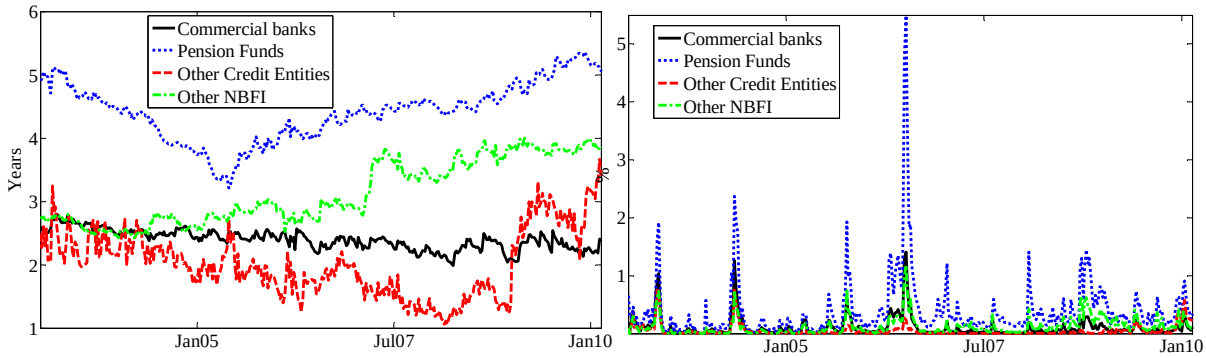
Source: Banco de la República.

It is important to mention that CB have portfolios with lower duration than PF, due to their different liability maturity. While the CB TES portfolio has consistently had a duration of around 2.5 years, the TES portfolio duration of PF reached 5.0 years in February 2010. On the other hand, the duration of the TES portfolio of other Credit Entities and other NBFI reached 3.4 and 3.8 in February 2010, respectively (Figure 3, Panel A). Although a higher duration indicates a more elevated interest rate risk, this difference among portfolio compositions across the term structure does not necessarily imply different exposures to market risk shocks. For this reason, we also analyze the *VaR* of the portfolios.

Figure 3:

TES Portfolios

A. Duration **B. 99% *VaR***



Source: Banco de la República.

Figure 3, Panel B, shows the daily 99% *VaR* for the TES portfolio for each type of financial entity.[7] It can be seen how the TES crisis of 2006 was reflected in a relatively high *VaR* for every type. Nonetheless, the exposure of the PF TES portfolio to market risk was especially high. Moreover, although the recent international financial crisis also affected financial entities, their portfolios were not as exposed to market risk as during 2006.

[7] *VaR* was estimated following the methodology explained in Martínez and Uribe (2008).

VaR estimations were used to calculate the *CoVaR* of different financial entities, as is explained in section 1. Additionally, in order to incorporate idiosyncratic risk into the analysis, other variables were used in the estimation (matrix $\bar{R}$ in (3)).[8]

3. Results

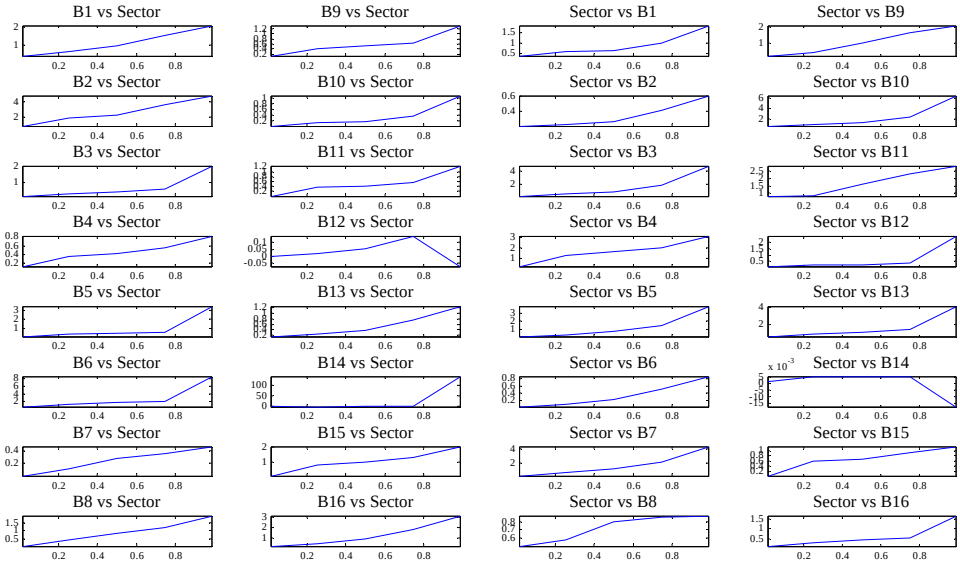
Risk codependence relations were estimated using quantile regressions for commercial banks, pension funds and different sectors within the Colombian financial industry. This approach is useful to estimate the systemic relations for processes determined by important changes in their volatility through time.[9]

In addition, high quantiles correspond to exercises where observations located in the right tail of the distribution are used to determine the risk codependence according to equation (3). Therefore, extreme observations materialized only in particular periods of time that can be considered as periods of crisis, are highly weighted in the estimation of this model. On the other hand, low quantiles represent the average state of an economy, due to the fact that the model weights in a similar way observations above and below the quantile.

High risk codependence between entities can be observed through $\beta_{i|s,\tau}$ defined in equation (3). Figure 4 presents the evolution of this parameter for CB across different quantiles and regressions estimated between each bank and the whole banking sector. Each graph corresponds to the particular $\beta_{i|s,\tau}$ obtained in each of the regressions evaluated on five different quantiles.

Figure 4:

Risk Codependence Among Commercial Banks



Source: Authors' estimations.

---

8 Appendix B shows the different variables used and their dynamics since 2003. The variables used are inflation expectations, weekly stock market returns and exchange rate returns, the slope of the yield curves, weekly credit growth, EMBI+ for Colombia, VIX, five-year CDS for Colombia and the Colombian interbank rate.

9 Quantile regressions were estimated using $\tau \in \{0.01, 0.25, 0.5, 0.75, 0.99\}$.

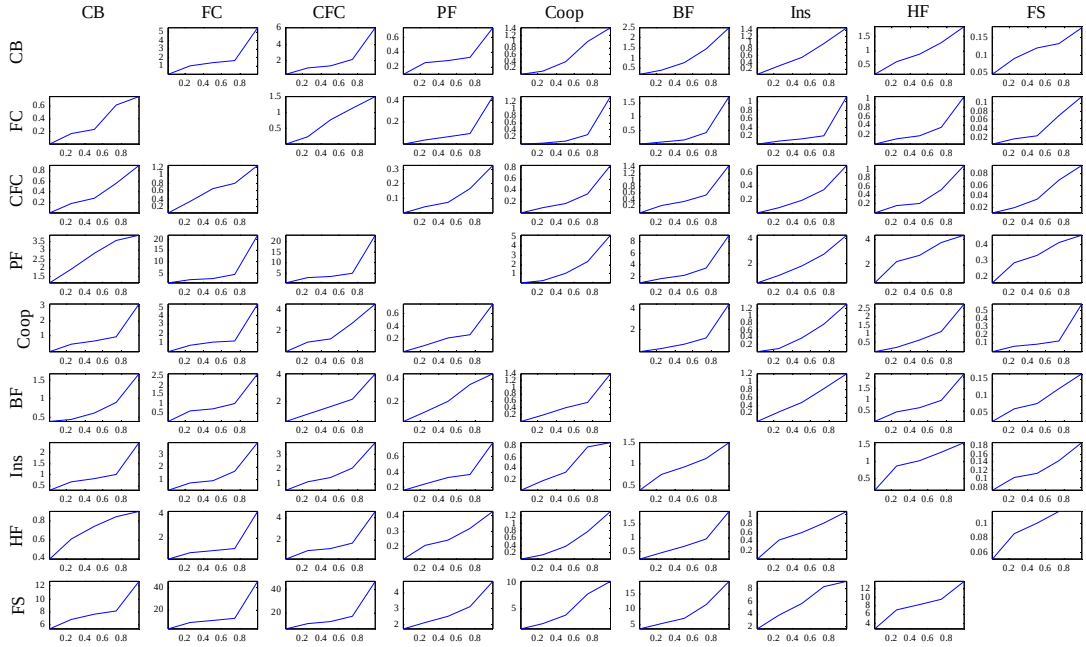
From these results, it can be claimed that $\beta_{1|i,\tau}$ increases as τ increases as well. This suggests that the correlation between different agents' market risk becomes larger during distress periods which are represented by higher quantiles. In addition, it is important to notice that this behavior is observed in both directions: the contribution of each bank to the system's market risk increases in stress periods as does the effect of systemic market risk on each entity's particular risk during the same events.

Nonetheless, agents' contributions to systemic market risk are different in size. In particular, banks 7, 10 and 13 show the most significant contribution to systemic market risk per *VaR* unit, taking into account the magnitude of each $\beta_{1|i,\tau}$.

These increasing tendencies for $\beta_{1|i,\tau}$ are also observed among pension funds (Figure 6 in Appendix A) where $\beta_{1|i,\tau}$ expands as higher quantiles are considered in the regressions. In addition, this is the same behavior that can be observed in the analysis of the financial sector. In Figure 5 each graph corresponds to the quantile regressions estimated for the market risk of the row-sector as a function of the macroeconomic variables and the *VaR* of the column-sector.

Figure 5:

Risk Codependence Among Financial Sectors



Source: Authors' estimations.

Although the size of $\beta_{1|i,\tau}$ can suggest the magnitude of the contribution of each entity to the systemic market risk, $\Delta CoVaR_{\alpha}^{(i)}$ represents a more robust method to estimate this measure, due to the fact that $\Delta CoVaR_{\alpha}^{(i)}$ estimates the exact contribution of each entity to systemic market risk. Table 1 presents the results obtained for this indicator on CB for τ = 0.99. Values included in the left column correspond to the system's contribution to the market risk of each individual bank, while the right represents the opposite relation: the contribution of each bank to systemic market risk. In this sense, the former permits us to identify the most vulnerable entities to systemic market risk while the latter presents the entities that contribute the most to the system's risk.

According to these results, it can be claimed that commercial banks display heterogeneous behavior regarding their contribution to systemic market risk. While there are several banks which are not significantly affected by the sector's market risk (for instance, banks 4, 7, 9, 10, 11, 13 and 14), there are others which are more affected by it (banks 6, 12 and 16). Moreover, only two entities have an important contribution to the system's market risk that can be considered significantly elevated. It is important to notice that the most vulnerable entities are not those which present the highest contribution to the sector's systemic market risk. Table 4 in Appendix A shows similar results for PF.

Table 1:

Conditional Risk Codependence Among Commercial Banks

	CB vs Sector	Sector vs CB
CB1	0.14%	0.05%
CB2	0.16%	0.02%
CB3	0.09%	0.28%
CB4	0.02%	0.08%
CB5	0.07%	0.18%
CB6	0.95%	0.13%
CB7	0.03%	0.28%
CB8	0.07%	0.25%
CB9	0.03%	0.34%
CB10	0.02%	0.39%
CB11	0.03%	0.03%
CB12	0.27%	1.68%
CB13	0.04%	0.14%
CB14	0.00%	2.48%
CB15	0.18%	0.11%
CB16	0.28%	0.79%

Source: Authors' estimations.

According to the $\Delta CoVaR^{i|}_{q,t}$ estimated for the financial system (Table 2), it can be inferred that FC, Coop and HF are the sectors that contribute the most to systemic market risk. Nonetheless, Table 2 presents the codependence results observed during the last week of 2009, which is a period when these entities registered a higher increase in *VaR* than the rest of the sectors. It can also be claimed that Coop are the most vulnerable entities to the systemic market risk and, in general, to the market risk of the other sectors.

Table 2:

Conditional Risk Codependence Among Financial Sectors

	CB	FC	CFC	PF	Coop	BF	Ins	HF	FS
CB	0.00%	1.35%	0.33%	0.17%	0.51%	0.01%	0.09%	0.29%	0.10%
FC	0.13%	0.00%	0.13%	0.12%	0.12%	0.13%	0.16%	0.12%	0.11%
CFC	0.02%	0.33%	0.00%	0.09%	0.08%	0.01%	0.08%	0.13%	0.06%
PF	0.14%	5.07%	0.31%	0.00%	1.14%	0.12%	0.52%	1.10%	0.11%
Coop	0.88%	2.51%	1.11%	1.51%	0.00%	1.16%	1.20%	1.05%	0.50%
BF	0.00%	0.92%	0.04%	0.06%	0.59%	0.00%	0.25%	0.45%	0.10%
Ins	0.54%	1.24%	0.60%	0.39%	0.56%	0.66%	0.00%	0.59%	0.44%
HF	0.00%	1.00%	0.03%	0.01%	0.15%	0.01%	0.04%	0.00%	0.01%
FS	0.85%	13.08%	1.31%	1.97%	3.85%	1.06%	1.62%	2.19%	0.00%

Source: Authors' estimations.

We estimated the historical average conditional risk codependence of the financial system with the purpose of reducing the effect of high changes of *VaR* on $\Delta CoVaR^{i|}_{q,t}$. This average allows us to identify which are the most vulnerable and systemic entities in terms of market risk, across the sample. Table 3 presents these results, which also suggest that FC and Coop are the sectors with the highest contribution to the system's market risk. Nonetheless, this contribution is not as high as that observed in Table 2.

Table 3:

Historical Conditional Risk Codependence Among Financial Sectors

	BAN	CF	CFC	PF	COOP	COM	INS	FID	FS
BAN	0.00%	0.24%	0.29%	0.16%	0.30%	0.16%	0.19%	0.13%	0.07%
CF	0.15%	0.00%	0.15%	0.17%	0.22%	0.22%	0.20%	0.14%	0.14%
CFC	0.10%	0.16%	0.00%	0.11%	0.14%	0.11%	0.12%	0.11%	0.07%
PF	0.35%	1.07%	0.98%	0.00%	1.15%	0.87%	0.53%	0.42%	0.20%
COOP	0.68%	0.80%	0.54%	0.73%	0.00%	0.64%	0.62%	0.63%	0.46%
COM	0.20%	0.43%	0.21%	0.17%	0.33%	0.00%	0.18%	0.24%	0.13%
INS	0.38%	0.38%	0.37%	0.29%	0.40%	0.39%	0.00%	0.32%	0.24%
FID	0.15%	0.28%	0.26%	0.17%	0.28%	0.21%	0.21%	0.00%	0.14%
FS	1.31%	2.90%	1.80%	1.24%	2.49%	1.69%	1.11%	1.10%	0.00%

Source: Authors' estimations.

This particular behavior presented by FC and Coop can be explained by the dynamic portfolio composition of these entities. They are financial institutions which permanently modify the composition and the size of their investments in TES. Therefore, they present a high volatility in their portfolios' returns compared to other sectors with bigger and more stable portfolios. In consequence, results suggest that sectors with high levels of volatility generate more systemic market risk than entities with bigger positions in these investments. In this way, institutions with a higher share in the TES market could have a higher systemic market risk contribution if their portfolio becomes more dynamic.

4. Concluding Remarks

In Colombia market risk increased significantly during 2009. However, this risk has not yet been analyzed from a systemic perspective. The objective of this paper was to analyze market risk codependence among Colombian financial institutions using *CoVaR* estimations. For this, quantile regressions were calculated, and Δ *CoVaR* was used as a measure of systemic market risk contribution.

Results suggest that risk codependence increases during distress periods. This is a general result that can be observed among commercial banks, pension funds, and between different types of financial institutions. In this way, entities which have a higher contribution to systemic market risk should be carefully monitored to avoid negative externalities caused by larger correlations. Also, regulation should consider the systemic contribution when designing risk requirements to minimize the adverse consequences of possible herding behavior.

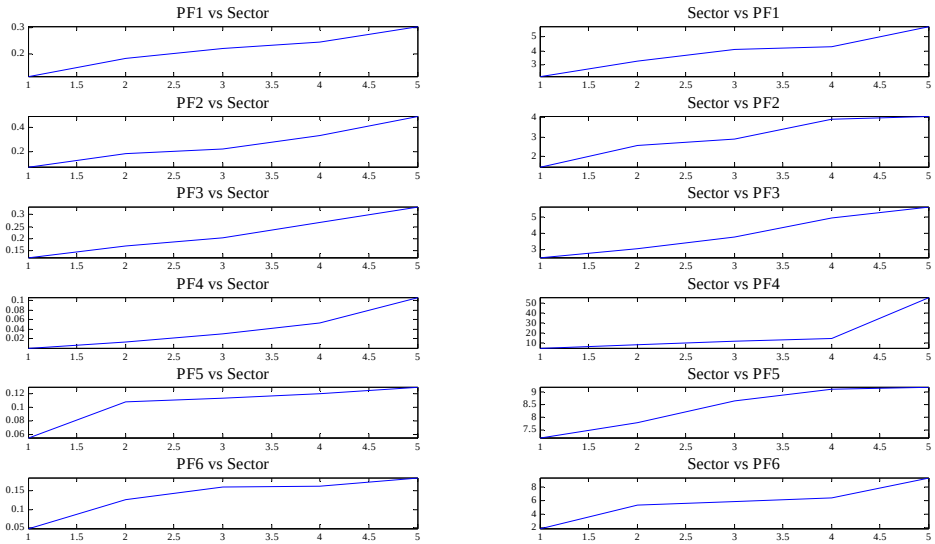
According to Δ *CoVaR* estimations, FC and Coop are the sectors that have the highest contribution to systemic market risk. Nonetheless, it is important to mention that there are some caveats that should be considered. This measurement is highly sensitive to current changes in *VaR* estimations. Therefore, entities with higher changes in their portfolio returns appear to be more systemic than those with more stable returns and bigger positions in these investments. Additionally, since the analysis is based on quantile regressions, Δ *CoVaR* does not explain the specific channel by which the risk of one entity affects another entity's risk measurement. In this way, Δ *CoVaR* can only be interpreted as a codependence measurement. Improvements in the estimations to overcome these and other shortcomings are left for future analysis.

Appendices

A Additional Results

Figure 6:

Risk Codependence Among Pension Funds



Source: Authors' estimations.

Table 4:

Conditional Risk Codependence Among Pension Funds

	PF vs Sector	Sector vs PF
PF1	0.05%	0.55%
PF2	0.78%	0.20%
PF3	0.29%	0.02%
PF4	0.16%	2.79%
PF5	0.12%	0.01%
PF6	0.63%	0.75%

Source: Authors' estimations.

B Dynamics of Variables Used for PCA Estimation

Figure 7, Panel A, shows the interbank rate, which follows closely the intervention rate of BR. In May 2006 BR began a monetary contraction by raising its intervention rate from 6% to 10% during a time span close to two years. Due to the financial crisis, this rate was lowered from 10% to 3.5% in less than one year, beginning in December 2008. This behavior had a positive effect on the public debt market, as the TES index return shows in Figure 7, Panel B. This figure also shows that the TES crisis in 2006 and the recent international financial crisis had a significant negative effect on the Colombian stock market.

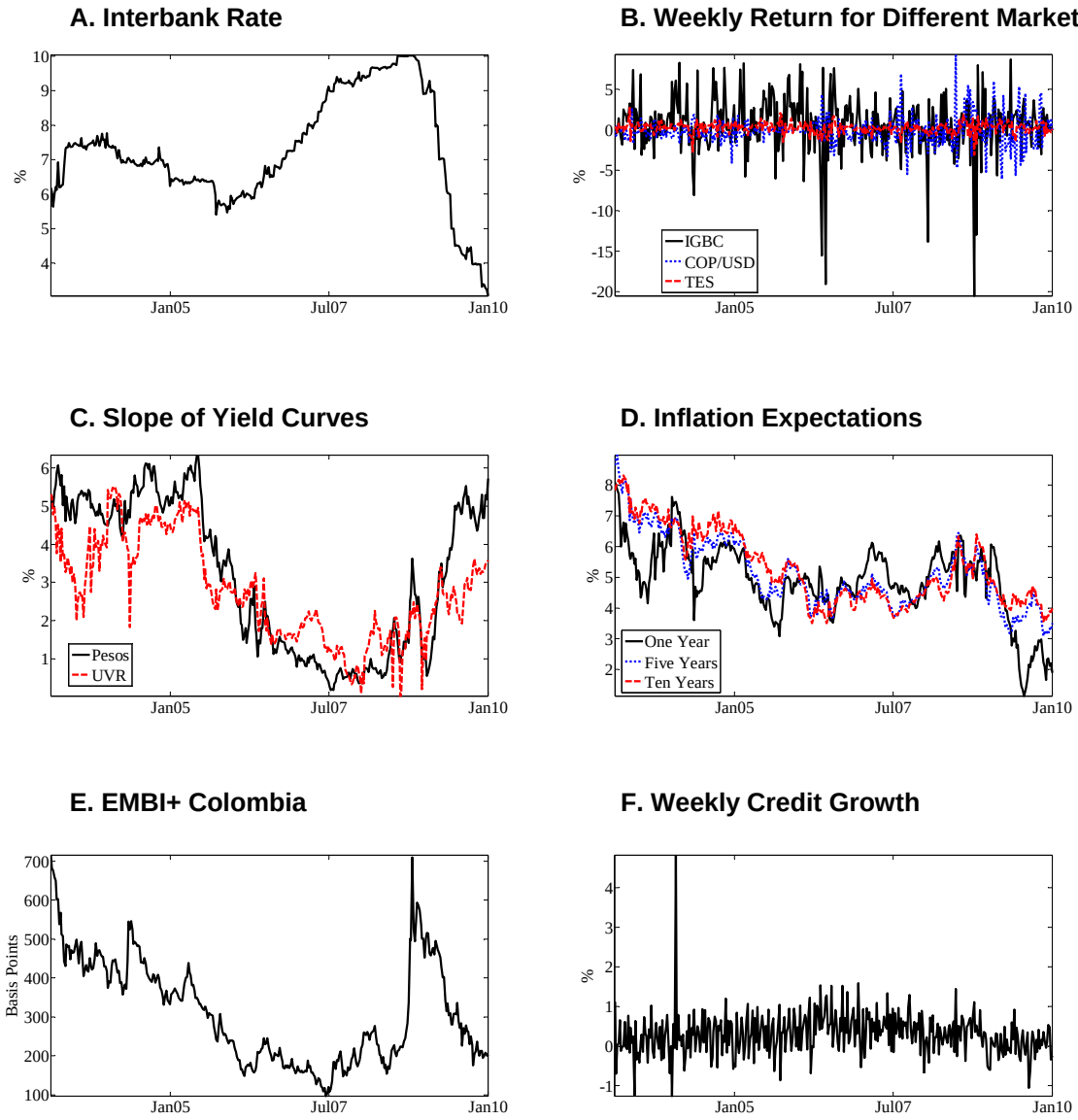
By comparing panels A and C of Figure 7 it can be concluded that periods of monetary expansion match with periods of steep yield curves. This is observed both in the COP-denominated TES yield curve and in the inflation-linked TES (UVR) yield curve. On the other

hand, periods with an increasing intervention rate have occurred at the same time that yield curves have flattened. Additionally, by analyzing the difference between these two yield curves, inflation expectations can be estimated. Panel D of Figure 7 shows that they have a decreasing trend in the analyzed period.

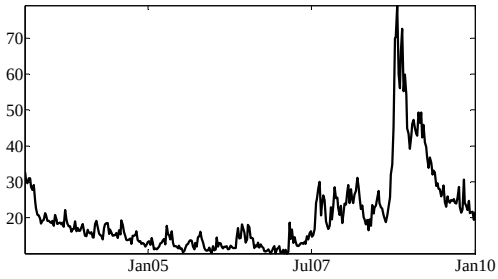
Panel F of Figure 7 shows the weekly growth of the credit stock. On average, credit has increased 0.3% each week. However, it has had a relatively high standard deviation of 0.5%. In particular, in the last week of January 2004 credit grew over 4% with respect to the previous week. During 2009, however, the average weekly credit growth was 0.03%, showing the slower dynamics the credit stock had due to the economic turndown of Colombia during that year. Finally, panels E, G and H of Figure 7 show the EMBI+ for Colombia, VIX and five-year CDS for Colombia, respectively. The dynamics of these indexes have been closely related since the beginning of the recent financial international crisis. In particular, the bankruptcy of Lehman Brothers was reflected in a historic increase in the three indexes.

Figure 7:

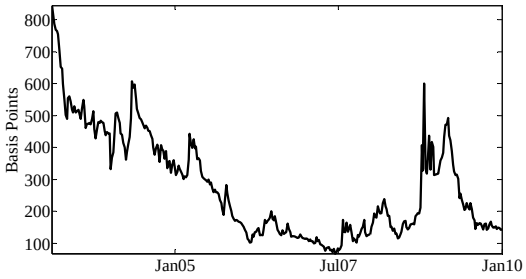
Variables Used for PCA Estimation



G. VIX



H. Colombia five-year CDS



Source: Banco de la República, Bolsa de Valores de Colombia (Colombian Stock Market), Reveiz and León Rincón (2008), Bloomberg.

References

Acharya, V. V. (2009). “A Theory of Systemic Risk and Design of Prudential Bank Regulation”, *Journal of Financial Stability*, 5, pp. 224-255.

Adrian, T. & Brunnermeier, M. K. (2009). “*CoVaR”*, *Staff Reports* 348, Federal Reserve Bank of New York.

Allen, F. & Gale, D. (2000). “Financial Contagion”, *Journal of Political Economy*, 108 (1), pp. 1-33.

Chan-Lau, J. A. (2008). “Default Risk Codependence in the Global Financial System: Was the Bear Stearns Bailout Justified?”, http://www.bcentral.cl/conferencias-seminarios/seminarios/2009.htm.

Chan-Lau, J. A., Mathieson, D. J. & Yao, J. Y. (2004). “Extreme Contagion in Equity Markets”, *IMF Staff Papers*, 51 (2), pp. 386-408.

Furfine, C. H. (2003). “Interbank Exposures: Quantifying the Risk of Contagion”, *Journal of Money, Credit and Banking*, 35 (1), pp. 111-128.

Gauthier, C., Lehar, A. & Souissi, M. (2010). “Macroprudential Regulation and Systemic Capital Requirements”, *Working Paper* 2010-4, Bank of Canada.

Hartmann, P., Straetmans, S. & de Vries, C. G. (2001). “Asset Market Linkages in Crisis Periods”, *Working Paper Series*, 71, European Central Bank.

Koenker, R. W. & Bassett, Jr., G. (1978). “Regression Quantiles”, *Econometrica*, 46 (1), pp. 33-50.

Martínez, O. & Uribe Gil, J. M. (2008). “Una aproximación dinámica a la medición del riesgo de mercado para los bancos comerciales en Colombia”, *Temas de Estabilidad Financiera*, 31, Banco de la República (Central Bank of Colombia).

Reveiz, A. & León Rincón, C. E. (2008). “Índice representativo del mercado de deuda pública interna: IDXTES”, *Borradores de Economía*, 488, Banco de la República (Central Bank of Colombia).

Rochet, J. C. & Tirole, J. (1996). “Interbank Lending and Systemic Risk”, *Journal of Money, Credit and Banking*, 28 (4), pp. 733-762.

Saade Ospina, A. (2010). “Aproximación cuantitativa a la centralidad de los bancos en el mercado interbancario y su relación con el riesgo de liquidez”, *Master’s thesis*, Universidad de los Andes, Colombia.

On measures for illustrating credit risk assessments: the case of heat maps, risk matrices and cubes

Jenny Dickson[1]

"Everything should be made as simple as possible, but not simpler."

Albert Einstein

1. Introduction

Credit risk is the most important of banks' financial risks. As far as the largest Swedish banking groups are concerned, 60 per cent of their assets consist in lending to the public. Consequently, measures for mitigating credit risk are of significant importance for banks in their risk management. During the financial crisis, credit risk in the financial system has become of focal importance for central banks to assess and manage. A precondition for central banks being able to promote a safe and efficient payment system[2] is that they have executed the necessary assessment of credit risk in the system. The assessment, in turn, requires access to relevant data. Further, as a result of banks' credit portfolios becoming increasingly diversified in terms of both asset types and geography the ability to assess, illustrate, and communicate credit risk has become more complex and challenging[3].

The purpose of this paper is to describe different novel ways of illustrating the Riksbank's assessment of the credit risk in the Swedish banking system and contribute to assessing systemic risk originating from different categories of borrowers and regions and thus different institutional settings. The different ways of illustrating this risk can be described as "models" in the shape of a risk matrix as well as a risk cube, or alternatively labelled, heat map. It is worth mentioning that the purpose of the paper is not to elaborate on the reasoning behind the assessment but rather to explain a manner in which to simplify an illustration of the assessment and an approach for helping keep track of the development of the different variables that are determining credit losses.

2. Model

2.1 Credit risk matrix (2x2)

The point of departure for the illustration is the expected loan losses (EL) for borrower category $_i$ and region $_j$, calculated as a product of the banks' exposures (E), the probability of default (PD), and the expected level of loss given default (LGD); see equation (1).

$$EL_{ij} = E_{ij} \times PD_{ij} \times LGD_{ij} \quad (1)$$

---

[1] Sveriges Riksbank, Financial Stability Department, Macroprudential Division, SE 103 37 Stockholm, Sweden. E-mail: jenny.dickson@riksbank.se. The views expressed herein are solely the responsibility of the author and should not be interpreted as reflecting the views of the Executive Board of Sveriges Riksbank.

[2] Example of the case of the Riksbank; as spelled out in The Sveriges Riksbank Act, Chapter 1, Art. 2.

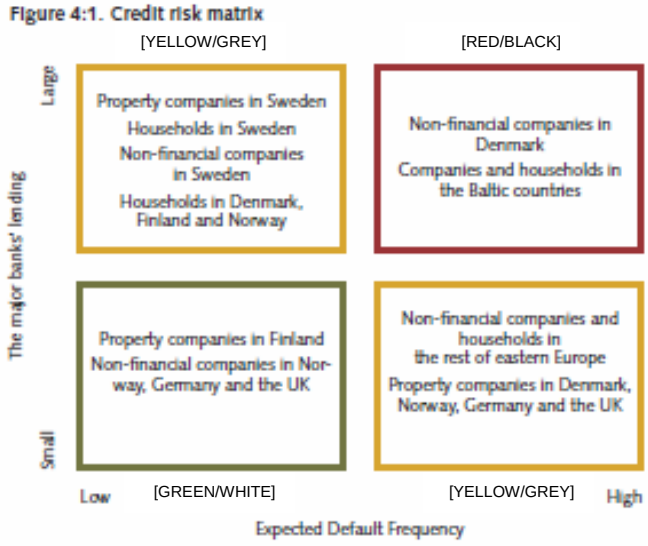
[3] E.g. as much as 50 per cent of the Swedish bank groups' lending goes to borrowers abroad.

Ex-ante borrower default, the variables of largest interest need to be 1) the probability that the borrower will default, 2) how much of interest this default is for the bank in question, i.e. the potential impact of the default, and finally 3) at default, the size of the losses, i.e. conditional on the probability of default, the impact of the default will amount to the product of the loan volume and the loss ratio at default.

Figure 1 illustrates the two-dimensional type of credit risk matrix that was applied in the Riksbank's Financial Stability Report (2010). The purpose of the figure is to illustrate an overview of the credit risk assessment of the Riksbank. The two dimensions applied are the major banks' lending to the different categories of borrowers on the y-axis and the borrowers' expected default frequency (EDF/PD) on the x-axis.

Figure 1

Credit risk matrix; two-dimensional, two levels (2x2)



Source: Sveriges Riksbank, 2010, "Financial Stability Report 2010:1" (figure 4:1)

The size of the different variables serves as an indication of why a certain category of borrower in a certain region is of interest from a financial stability perspective. For example, it explains why the Riksbank analyses the credit quality and debt servicing ability of the Swedish property sector because this sector represents a proportionally large part of the banking system's total lending, even though, due to its rather limited probability of default, it may not be as alarming from a financial stability perspective. The Swedish property sector does hereby represent a potential threat to the financial stability of the Swedish financial system due to "the size of its E", and is therefore categorised as "yellow" and therefore high on the y-axis. Similarly, this is why the Riksbank has previously analysed borrowers in Ukraine; the Swedish banks' lending to Ukrainian borrowers has not been that large, but the exposure has been subject to a high probability of default, i.e. far to the right on the x-axis.

Likewise, when particular asset markets come under pressure, such as the property market, it is usually of interest to track the impact of this development on the LGD-parameter in the loss equation. Another aspect of the matrix is development over time; depending on which of the variables is changing or needs to be acted upon, the different borrower categories in each region may migrate between boxes of varying importance.

The quality of a two-dimensional approach is its simplicity in providing an overview of the credit risk in a banking system. At closer scrutiny, however, one may start to wonder about the more quantitative requisites behind the "small" and "large" exposures as well as the "low"

and “high” PD, and consequently which “colour of attention” the portfolio in question should have. Thus, *the two-dimensional matrix may be “simpler than possible”, too simple*.

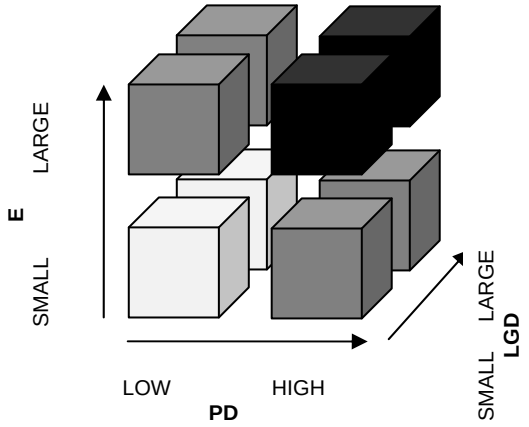
To conclude, attempts have been made to develop the risk matrix by adding more dimensions and levels. An explanation of these will be given in the following.

2.2 Credit risk cube (2x2x2)

In the credit risk matrix, no specific attention is being paid to the LGD in equation (1), i.e. the third parameter in the credit loss equation. In order to illustrate also the impact of the LGD in the credit risk assessment, a third dimension may be added to the figure and heat map. This may be illustrated as in ***figure 2***, a three-dimensional, two-level “credit risk cube”.

Figure 2

Credit risk cube; three-dimensional, two levels (2x2x2)



In order to make the illustration more granular and the valuing of “severity” more quantitative and thereby transparent, the rest of the example will be given by a three-level cube. That is, three levels of size of exposures, probability of default, and loss given default; 3x3x3.

2.3 Credit risk cube (3x3x3)

Tables 1-3 describe the particular quantitative levels according to which the different credit loss variables are to be labelled “low”/”small”, “medium”, or “high”/”large”.

Table 4 illustrates a risk appetite or tolerance that means that specific borrowers should be subject to a “credit risk alert” (red) from a systemic bank risk perspective, that is, on the aggregate level, only if and when the probability of default is “medium” or “high” (that is, larger than or equal to 1 per cent; see table 1). Such requisites for a “credit risk alert” status depend on the level of risk aversion of the assessor, such as a central bank. Accordingly, it is subject to the extent to which low/small, high/large exposures, probabilities of default, and loss given default should be weighted against each other, i.e. if e.g. a high exposure per se is more alarming than a high probability of default or loss given default.

Figure 3 illustrates the sum of tables 1-4, the total “credit risk alert”, depending on the level and combination of each credit risk variable in equation (1). That is, out of the 27 different combinations (3x3x3 boxes) each specific exposure (in turn subject to the granularity of the credit risk assessment) belongs to a specific one.

Table 1

PD (EDF)

High:	>10 %
Medium:	1–10 %
Low:	<1 %

Table 2

E; size of lending volume (individual bank/four large banks, x4)

Large:	>100 billion SEK/>400 billion SEK
Medium:	10–100 billion SEK/40–400 billion SEK
Small:	<10 billion SEK/<40 billion SEK

Table 3

LGD

Large:	>10 %
Medium:	1–10 %
Small:	<1 %

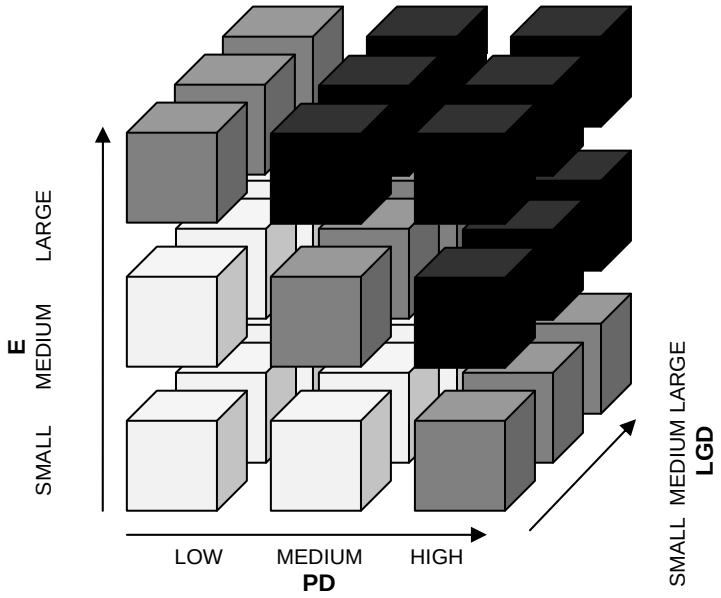
Table 4

“Credit risk alert”

Highly probable and severe loss
Medium probability and severe loss
Not probable, no severe loss

Figure 3

Credit risk cube; three-dimensional, three levels (3x3x3)



3. Example

Assumptions behind the “credit risk cube” in this example include LGD of the different categories of borrowers being identical irrespective of bank and region. That is, the LGD is sector-specific but not country- or bank-specific. Further, the EDF as a proxy for the actual PD of each borrower’s credit in each bank’s portfolio is primarily an indication of the credit quality of the different borrowers and is thereby not specified for the different banks’ borrowers and exposures in question. Additionally, no attention is being paid to the provisions already made by the banks for potential future losses in the different credit portfolios.

Table 5 describes the borrower categories and regions used in the example to which the banks are exposed. For simplification and for illustrative purposes, the example only takes into account the categories and regions on which the Riksbank has data available on EDF and LGD through Moody’s KMV CreditEdge. That is, not all of the categories of borrowers and regions described in figure 1 are included.

Table 6 and ***figure 4*** sum up the credit risk assessment according to the three different credit risk variables in equation (1) and the different “credit risk alert” requisites.

Table 5

Borrower categories *i* and regions *j*

Region $_j$	Category $_i$	Borrower abbreviation
Sweden	Non-financial corporations	SENF
	Property companies	SEPR
Norway	Non-financial corporations	NONF
	Property companies	NOPR
Denmark	Non-financial corporations	DKNF
	Property companies	DKPR
Finland	Non-financial corporations	FINF
	Property companies	FIPR
Germany	Non-financial corporations	DENF
	Property companies	DEPR
UK	Non-financial corporations	UKNF
	Property companies	UKPR

Table 6

"Credit risk alert"

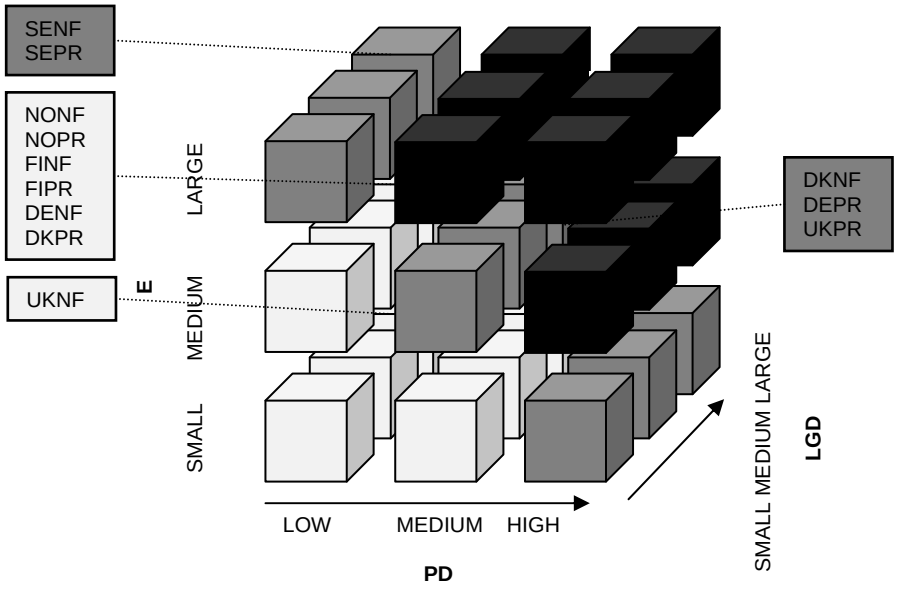
Aggregate, four major banks

Borrower	E (small, medium, large)	PD (low, medium, high)	LGD (small, medium, large)	"Credit risk alert"
SENF	Large	Low	Large	
SEPR	Large	Low	Large	
NONF	Medium	Low	Large	
NOPR	Medium	Low	Large	
DKNF	Medium	Medium	Large	
DKPR	Medium	Low	Large	
FINF	Medium	Low	Large	
FIPR	Medium	Low	Large	
DENF	Medium	Low	Large	
DEPR	Medium	Medium	Large	
UKNF	Small	Low	Large	
UKPR	Medium	Medium	Large	

Note. Subject to addition and in order to illustrate the loss absorption capacity of the banking system or individual banks, another column could be added with, e.g. Tier 1 capital ratio, or core-Tier 1 capital ratio for each exposure and borrower category. Note that in this particular example, the assessment of e.g. PD for each borrower category is simplified and not all aspects are taken into consideration, which explains why some borrower categories in the example may not be on as high a "credit risk alert" as depicted in figure 1.

Figure 4

Credit risk cube; three-dimensional, three levels (3x3x3)



4. Model elaborations; subject to development

- The example is based on illustrating an assessment of the four major Swedish bank groups together (see table 2 for separating size of lending volumes) and the sources of credit risk as threats to the stability of the whole financial system. An alternative or supplement to this approach would be to apply it for each of the banks individually. This is due to the fact that each of the major banks is seen as systemically important and every risk each of them is exposed to consequently is a potential risk to the financial system as a whole.
- The “low/small”, “medium”, “high/large” grading of the different variables could be subject to further scrutiny and should be modified to suit each banking system.
- A relevant point of departure in deciding on the relevance of each borrower category would be to calculate the Tier 1 ratio for each borrower for every bank. As a measure of the loss absorption capacity of the banks, this could serve as a supplement to separating the different exposures and borrowers according to size of exposure or size of lending. Additionally, each bank’s lending to the different categories of borrowers could be measured as a proportion of the bank’s total lending, as a means for deciding on the borrower’s relevance from a “credit risk alert” perspective.

5. Concluding remarks

As is usually the case when data need to be analysed and explained, the most suitable approach depends on the purpose of what is to be explained. Consequently, the level of sophistication when applying figures such as the ones described above when illustrating different assessments will vary. Sometimes, a simpler model or figure is to be preferred, and sometimes a more granular and transparent one is needed. From the central bank perspective, the 2x2 matrix may be sufficient for describing and motivating the analysis of bank credit portfolios and the debt servicing ability of borrowers. The 3x3x3 cube may on the other hand provide better understanding of the underlying analysis.

References

Handelsbanken, Nordea, SEB, Swedbank, 2010, reports.

Moody’s KMV CreditEdge Plus, http://www.creditedge.com/ (subscription).

Sveriges Riksbank, 2010, “Financial Stability Report 2010:1”.

The Sveriges Riksbank Act, 2010, “Lag (1988:1385) om Sveriges riksbank – as from 1 June 2010”.

Alternative measures of liquidity on the Chilean government fixed income market

Nicolás Álvarez Hernández[1] and Luis Antonio Ahumada[2]

Differences in long-term swap spreads measures monetary and fixed income markets, both in nominal and in real terms, have been very volatile and even negative in recent periods, since the data began to be registered four years ago. Various authors have attributed the discrepancies to some economic factors that have an impact on the degree of liquidity in these markets. This article empirically tries to identify changing conditions in the liquidity of these markets using high-frequency data from several sources. The validity of such hypothesis could help to build alternative liquidity indicators for central bank benchmark markets.

1. Introduction

Swap spreads in monetary and fixed income markets, typically defined as the difference between fixed-float swap derivatives interest rate contracts and the market interest rate of bonds issued by the central bank with similar maturities, are considered a proxy of funding liquidity conditions. Closely related measures of break-even inflation are typically used as indicators of inflation expectations for future periods. In both cases, the use of fixed-float swap derivatives interest rate contracts to extract information on the Chilean monetary market is relatively recent.[3] Its development has been attributed to a number of observable factors, such as the impediments created by current tax regulation that imposes a tax on capital gains for bond trading. This regulation created a disincentive for foreign investment in the domestic monetary market and eventually led to development of the alternative swap market (Alarcón and Malandre, 2008), along with a number of administrative barriers that also preclude foreign investment in the central bank instruments market. These authors argue that these barriers do not allow offshore agents to fully arbitrage differences between physical bond market rates and the swap rates, although there is no concrete evidence in this regard.[4]

After the subprime crisis, several studies attempted to identify the factors behind the sharp increase in the Libor-OIS spread and its counterpart in other developed markets. These factors are, basically, funding liquidity risk and counterparty risk, or a proxy of credit risk among large financial institutions, which are usually motivated by arbitrage models of interest

[1] Central Bank of Chile, Financial Stability Division, Agustinas 1180, Santiago 8340454, Chile, e-mail: nalvarez@bcentral.cl

[2] Central Bank of Chile, Financial Stability Division, Agustinas 1180, Santiago 8340454, Chile, e-mail: lahumada@bcentral.cl

[3] Registries of interest rates from these derivatives operations at the central bank date back to January 2005.

[4] There are no official records of trading volume, but inter-dealer brokers operating in the Chilean market have estimated the size of the peso swap market at about 3 trillion pesos, on average, per month. They indicate that around 10 local banks (the local banking system has 25 banks) and a similar number of foreign banks, operating mainly in the New York market, participate in the peso and inflation-linked swap market, with each group representing nearly half of the trading activity.

rates. Taylor and Williams (2008) found that the main driver of the deterioration in financial conditions was associated with an increase in counterparty risk and, to a much lesser extent, with funding liquidity risk.

The purpose of this article is to identify whether the traditional factors mentioned in the literature had a significant impact on our measures of financial conditions in the monetary market and the swap-fixed income market. The article briefly reviews the current and past literature on the subject, which to date refers only to international markets. Then we present some evidence on the behavior of swap spreads in the Chilean market and discuss the results of the estimation exercise.

2. Literature review on liquidity measures in developed markets

An earlier contribution to this topic was provided by Brown et al (1994), who relate swap spreads with various measures of credit (counterparty) risk and hedging costs of market-makers. They find that swap spreads are a function of a coupon bias and TED spread expectations. Grinblatt (1995) models swap spreads as a compensation for a liquidity yield associated with holding treasury notes, defined as a convenience yield. The yield in this case depends on short-term rates and a liquidity advantage of holding long positions in treasuries during tight market conditions. Credit risk is found to be less important in explaining swap spreads. Duffie and Singleton (1997) showed that changes in swap spreads are related to changes in counterparty and liquidity risk. More recently, Liu et al (2006) found results similar to those of Duffie and Singleton: ie swap spreads are characterized by a persistent liquidity process and a mean reverting default process.

There are also several articles that try to identify the influence of liquidity and credit risk premia on the short-term Libor-OIS spread and similar measures in other developed countries. The interest in understanding the behavior of the Libor-OIS spread increased markedly after the sharp increase in the spread at the onset of the crisis. Taylor and Williams (2008) found that during the subprime crisis counterparty risk emerged as an important factor in the surge in the Libor-OIS spread, while liquidity risk played a minor role. Their results generated an intense debate, because others questioned the result on liquidity risk. However, they present the high correlation observed between secured (Libor-Repo spread) and unsecured (Libor-OIS) funding as evidence that liquidity was less of a problem in the interbank market. Similar results are obtained by Hui et al (2009) in the sense that, prior to the crisis, funding liquidity risk was the main determinant in swap spreads, but when the crisis was in place, counterparty risk was also an important factor.

3. Evidence on swap spreads in the Chilean markets

A number of stylized facts are worth mentioning about swap spreads measures in the Chilean case. First, it has been noticed that up until the end of 2007, swap spreads in pesos and in contracts linked to past inflation showed a persistent negative trend (see Graph 1). There is also no significant premium for longer-term contracts and no significant difference in the volatility pattern (see Table 1).[5]

[5] For a detailed description of the Chilean swap markets, see Varela (2007) and Sotz and Alarcón (2007).

Table 1. Summary statistics of swap spread measures

	Pre-Crisis				Post-Crisis			
	mean	sd	min	max	mean	sd	min	max
Swap-Spread 5y	17	25	-36	70	-26	30	-83	52
Swap-Spread 10y	24	32	-44	100	-35	26	-80	28
Prime-Swap 3m	36	20	0	100	49	48	-20	300
Prime-Swap 6m	42	19	0	90	74	51	10	300
Prime-Swap 12m	57	21	20	110	91	57	0	330

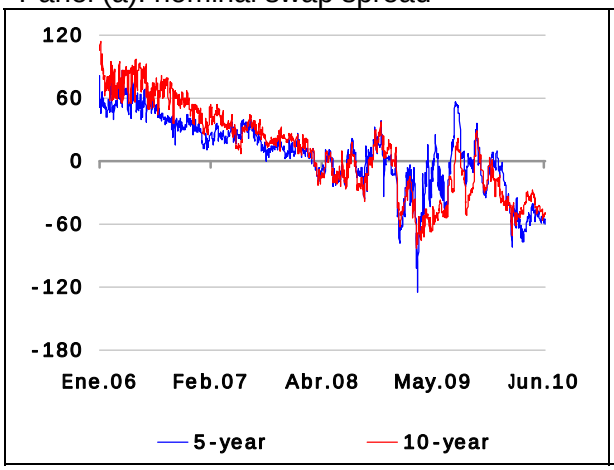
Source: Authors' calculations.

The behavior changed in 2008, around the time of the bankruptcy of Bear Stearns. Swap spreads started to oscillate around zero for nominal contracts and set below zero for inflation-linked contracts. This behavior presents a puzzle since it implies that bank counterparty risk is lower than rates on central bank paper that is supposed to be risk-free or, instead, that is viewed as a lower bound for pricing instruments at the terms. The negative values of swap spreads were observed until the end of 2008, a feature that was peculiar to the Chilean derivatives markets and to Greece. However, since 2009, swap spreads in Spain and even the United Kingdom have shown negative values at similar maturities (see Graph 2). In the case of these European countries, a plausible explanation for the negative values has been the large deficits incurred in the attempt to rescue their financial systems, which, in turn, has had a negative impact on interest rates on government securities.[6] In contrast, in the Chilean case the dynamic has been more of changes in the swap rates, explained by some authors as due to the lack of financial integration in the fixed income market because of a number of tax issues and the low stock of central bank instruments, which had led foreign investors to prefer to take positions in the curve through the swap market.

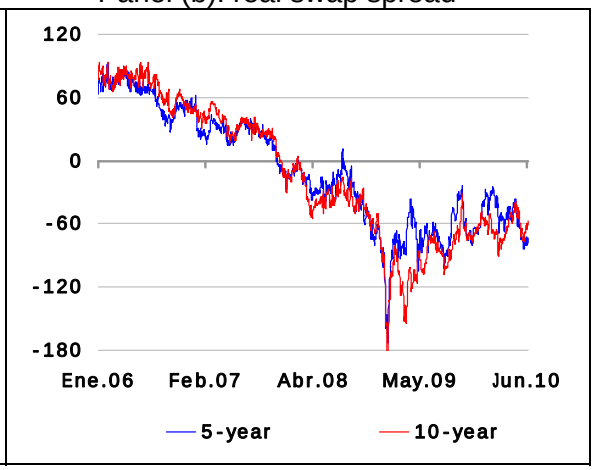
Graph 1
Chilean swap spreads

Basis points; updated as of June 2010

Panel (a): nominal swap spread



Panel (b): real swap spread



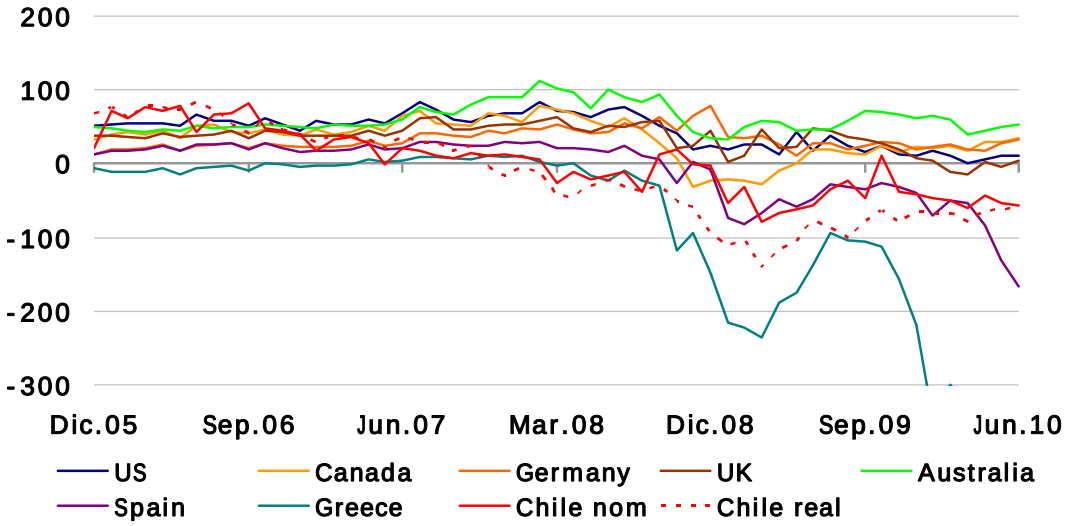
Source: Central Bank of Chile and Bloomberg.

[6] Preliminary panel cross-country regression shows that the fiscal deficit is a significant factor in explaining the negative values in swap spreads.

Graph 2

International comparison: 10-year swap spread

Basis points; updated as of June 2010



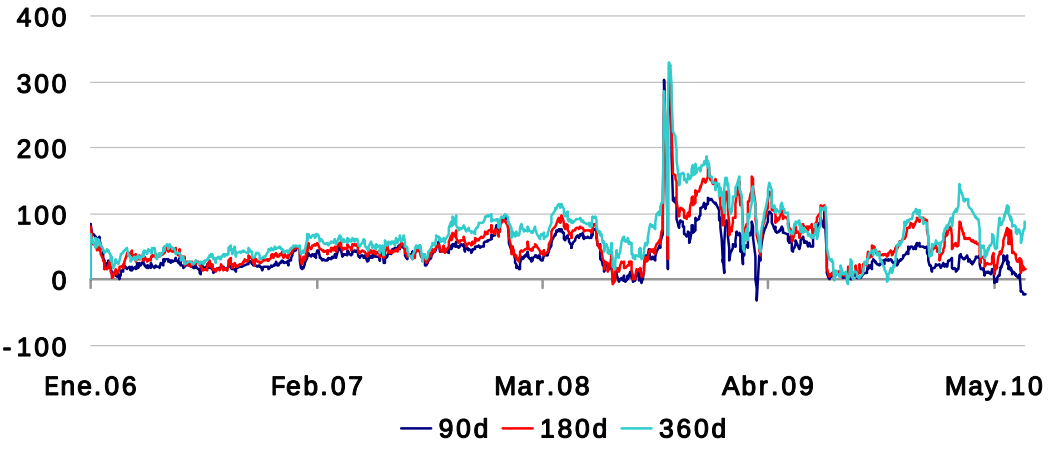
Source: Central Bank of Chile and Bloomberg.

With respect to swap spreads for maturities of a year or less we use what we call the prime-swap spread, which is negotiable at 90, 180 and 360 days. The prime rate corresponds to time deposit rates paid by banks to pension funds, mutual funds and other banks. It is the Chilean equivalent of the Libor rate quoted in developed markets, since there is only a daily interbank market in Chile. The prime-swap spread has shown high volatility when compared to its international equivalents, in particular after the bankruptcy of Lehman Brothers (see Graphs 3 and 4). Also, before the crisis there were no sizeable distinctions between contracts at different maturities (also see Table 1), suggesting a liquidity premium was not very relevant. However, after the crisis, in particular after the second semester of 2009, this changes, and there is, on average, a 25 basis point difference between the 90-day prime-swap spread and the 180-day contract, even though the central bank put in place a standing facility for 180-day repos using central bank instruments and banks' time deposits as collateral.

Graph 3

Chilean prime-swap spread

Basis points; updated as of June 2010

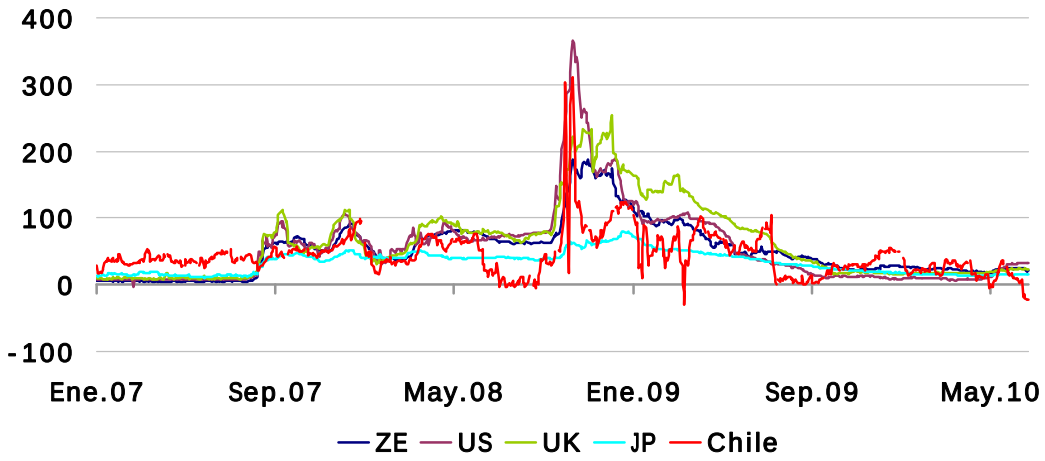


Source: Central Bank of Chile and Bloomberg.

Graph 4

International comparison: Libor-OIS three-month spread

Basis points; updated as of June 2010



Source: Central Bank of Chile and Bloomberg.

4. Empirical evidence on determinants of swap spreads

The estimation of swap spreads at different maturities is required to explore the volume of transactions in each market, to control for potential lack of trading liquidity at particular points in the curve. As a result, we estimate only the behavior of swap spreads for nominal 10-year maturities, and six-month maturities in the case of the prime-swap spread, which undoubtedly are the deepest and most active markets.

The model estimation adopted the following general specification,

$$y_t = \alpha + \beta_1 y_{t-1} + \beta_2 x_t + \beta_3 z_t + \varepsilon_t \qquad (1)$$

where y_t takes the following definitions:

$$swap\ spread = r_{0,10}^{SPC} - r_{0,10}^{BCP} \qquad (2)$$

$$prime - swap = i_{0,6}^{dp} - i_{0,6}^{SPC} \qquad (3)$$

The variable x_t comprises the set of determinants of interest for the different measures of swap spreads: (i) funding liquidity in the interbank market, proxied by the spread between daily interbank rates and the monetary policy rate;[7] (ii) banking counterparty risk, proxied by the spread of bank senior and subordinated bonds over a central bank benchmark of similar duration; and (iii) trading liquidity, proxied by the ratio of transactions of the corresponding instrument to the total stock of the same instrument, which in the case of the definition of swap spreads in equation (2) includes treasury and central bank instruments.

[7] The motivation for including this variable is to control for liquidity pressures in the interbank market that could eventually be transmitted to these other markets. Despite the active participation of the central bank through repo transactions and the existence of a 25 basis point upper and lower bound, there are periods when the interbank rate diverges significantly from the monetary policy rate.

The variable z_t contains several control factors, including the Libor USD-OIS spread, to control for liquidity pressures in international markets; the VIX index, to control for global volatility; and a set of dummy variables to control for the term facility implemented by the central bank from July 2009 to May 2010.It has been noted that the term facility helped to tighten prime-swap spreads right after its introduction. We also included a dummy variable that takes into consideration the period after the bankruptcy of Lehman Brothers; it has a value of 1 from the second week of September 2008 until the second week of December 2008, and zero elsewhere. Data are sampled weekly.

The results for the estimation of the prime-swap spreads suggest that counterparty risk in the Chilean case is not important, especially not when interacted with the crisis dummy (see Table 2). Trading liquidity also seems to be insignificant, except during the crisis when it takes a positive value, suggesting that during that period an increase in the volume in time deposits caused an incremental increase in the spread. It is important to notice that during the second semester of 2008 and for most of 2009, pension funds, which at some point represented 35% of total banking time deposits, substantially decreased their positions in time deposits and expanded their positions in foreign investment. It is also important to highlight that during more turbulent periods, such as the third quarter of 2008 and the second quarter of 2010, pension funds did come back to the local time deposit market.

Table 2. Estimation Result for 6 month Prime-Swap spread

Variable	[1]	[2]	[3]	[4]	[5]
Lag 1	0.83	0.80	0.79	0.71	0.65
	9.88 (***)	9 (***)	8.56 (***)	5.96 (***)	5.23 (***)
Lag 2	-0.2	-0.3	-0.2	-0.1	-0.2
	-3.62 (***)	-3.55 (***)	-3.29 (***)	-1.8 (*)	-2.29 (**)
Spread (Libor-Ois) 6m	0.2	0.1	0.1	0.1	0.2
	1.18	1.07	1.41	1.38	1.86 (*)
Dummy Subprime Crisis	14.1	13.3	57.6	-47.5	-60.5
	0.76	0.71	0.62	-0.44	-0.61
VIX	-0.1	0.3	0.2	0.1	0.2
	-0.08	0.7	0.59	0.34	0.55
Lag Spread (Tib-Tpm)		0.2	0.3	0.3	0.3
		1.6	2.07 (**)	1.6	2.04 (**)
Crisis Interaction - Lag Spread (Tib-Tpm)		5.5	2.9	-0.5	0.3
		1.1	0.7	-0.2	0.1
Counterparty risk			0.1	0.1	0.0
			1.7	1.4	0.8
Crisis Interaction - Counterparty risk			-0.3	-0.2	-0.2
			-0.6	-0.5	-0.4
Trading Liquidity				511	386
				1.5	1.2
Crisis Interaction - Lag Trading Liquidity				5,698	5,738
				1.6	1.76 (*)
Pension Fund - Bank Deposits exposure					-46.9
					-3.17 (***)
Constant	13.7	9.8	2.3	-3.0	753
	1.6	1.4	0.4	-0.4	3.14 (***)
R-sq	0.75	0.75	0.75	0.77	0.78
Observations	225	225	225	222	221

T-statistic in parenthesis significance at 1% (***), 5% (**), and 1% (*)

On the other hand, the interbank-monetary policy rate spread is significant in two specifications. This suggests that liquidity pressures in this market might have been transmitted to longer-term monetary markets. Moreover, the Libor-OIS spread is also significant in specification [5], suggesting that concerns about access to adequate funding liquidity, either locally or internationally, were more relevant than the worsening credit risk

profile of domestic banks. This finding is consistent with the fact that the solvency of the Chilean banking system has never been put under strain since the beginning of the crisis.

The results for the 10-year swap spread are not very different from those for its short-run equivalents (see Table 3). There is a high and significant degree of persistence in the spread.[8] Although the crisis dummy is significant in specification [1], it is not robust to further changes in the estimation. Also, its interaction with counterparty risk, trading and funding liquidity risk is not significant. Unlike the previous results, counterparty risk by itself is significant in two specifications, [2] and [3]; however it loses its relevance when we control for the stock of central bank bonds available in the market. In fact, the swap spread can be explained quite well by its own lags. This finding possibly suggests that this market has been relatively immune to all the turbulence caused by the international crisis. The interbank spread was not significant under any specification, which could be explained by the facts that the capital requirements for entry into the swap market are very low, and that, at the end of the contract, only differences in interest rates are compensated.

Table 3. Estimation Result for 10 year Swap Spread

Variable	[1]	[2]	[3]	[4]
Lag 1	0.65	0.63	0.63	0.60
	8.74 (***)	8.23 (***)	8.26 (***)	8.04 (***)
Lag 2	0.25	0.23	0.23	0.20
	3.48 (***)	3.16 (***)	3.14 (***)	2.63 (***)
Spread (Libor-Ois) 3m	0.04	0.07	0.08	0.06
	1.24	2.03 (**)	2.05 (**)	1.39
Dummy Subprime Crisis	12.8	6.51	-86.26	-98.2
	1.99 (**)	0.53	-0.79	-0.88
VIX	-0.46	-0.75	-0.72	-0.54
	-2.7 (***)	-3.9 (***)	-3.59 (***)	-2.36 (**)
Counterparty risk		0.07	0.08	0.05
		2.72 (***)	2.74 (***)	1.6
Crisis Interaction Counterparty risk		0.06	0.16	0.17
		0.7	1.0	1.1
Trading Liquidity			-18.0	-29.9
			-0.9	-1.4
Crisis Interaction - Trading Liquidity			463.1	523.8
			0.8	0.9
Banks - Government bonds exposure				-16.1
				-1.6
Constant	7.2	4.1	4.1	232.1
	2.37 (**)	1.0	1.0	1.6
R-sq	0.91	0.91	0.91	0.91
Observations	208	208	204	204

T-statistic in parenthesis significance at 1% (***), 5% (**), and 1% (*)

[8] Traditional unit-root tests reject the null hypothesis of non-stationarity in the swap spread variables.

5. Final comments

This paper represents the first attempt to identify whether counterparty and funding liquidity risk have played a role in the evolution of swap spreads in the Chilean monetary and fixed income markets. The results suggest that counterparty risk was not very relevant during the most turbulent periods since August 2007, at least in the monetary market for funding liquidity. This result is consistent with the resilience shown by the domestic banking system throughout this entire period. In contrast, funding liquidity pressures in the overnight interbank market, despite active central bank involvement, seems to increase funding pressures in the market where most banks obtain funding from institutional investors.

These preliminary results show that, if there is any funding liquidity risk in swap spread markets in the Chilean market, its identification is a task that remains pending. Traditional factors used in the literature to explain the evolution of swap spreads play a relatively minor role, given the high persistence in the swap spread itself. It is important to bear in mind that swap markets in Chile are relatively recent and, therefore, there are not official statistics for the level of activity in these markets.

6. References

Alarcón, F and N Malandre (2008): "Onshore Spread and Swap Spread: Chilean Money Market Liquidity Indicators." Irving Fisher Committee, 2009 (*IFC Bulletin 33)*.

Brown, K, WV Harlow and DJ Smith (1994): "An empirical analysis of interest-rate swap spreads", *Journal of Fixed Income* 3, 61–78.

Duffie, D and KJ Singleton, (1997): "An Econometric Model of the Term Structure of Interest Rate Swap Yields", *Journal of Finance* 52(4): 1287–321.

Grinblatt, M (1995): "An Analytic Solution for Interest Rate Swap Spreads", Working Paper 9-94, Anderson School of Management.

Hui, CH, H Genberg and TK Chung (2009): "Funding liquidity risk and deviations from interest-rate parity during the financial crisis of 2007–2009", Working Paper 13/2009, Hong Kong Monetary Authority.

Liu, J, F Longstaff and R Mandell (2006): "The market price of risk in interest rate swaps: the roles of default and liquidity risks", *Journal of Business*, vol 79, no 5.

Sotz, C and F Alarcón (2007): "Mercado Swap de Tasas de Interés y Expectativas de TPM e Inflación", *Economía Chilena* 10(2): 97–102.

Taylor, JB and JC Williams (2008): "A Black Swan in the Money Market", *Federal Reserve Bank of San Francisco Working Paper* 2008-4, April 2.

Varela, F (2007): "Mercados de Derivados: Swap de Tasas Promedio Cámara y Seguro Inflación", *Estudios Económicos Estadísticos* N°56, Banco Central de Chile.

Session 5 A

The use of surveys to remedy data gaps

Chair: Alberto Karlen, Central Bank of Argentina

Papers:

Denoised least squares forecasting of GDP changes using indexes of consumer and business sentiment
Antonis A Michis, Central Bank of Cyprus

The usage of surveys to overrun data gaps: Bank Indonesia's experience
Hendy Sulistiowaty and Ari Nopianti, Bank Indonesia

The SNB survey on loan quality: a qualitative survey in a quantitative "suit"?
Hilmar Hoffmann, Swiss National Bank

Denoised least squares forecasting of GDP changes using indexes of consumer and business sentiment

Antonis A Michis[1]

1. Introduction

Several studies in the economic literature have examined the usefulness of leading indicators in forecasting GDP changes. The two main sources of information used in this direction are (a) indexes of consumer and business sentiment and (b) monetary and financial data. Consumer and business sentiment indexes are based on sample surveys conducted by both national statistical services and industry groups who survey consumer and business expectations about the economy and individual income. Monetary and financial data usually consist of variables such as the stock market index, money supply, interest rates and yield curves.

The empirical results regarding the predictive ability of indexes of consumer and business sentiment have not been clear. For example, Howrey (2001) reports that indexes of consumer confidence sharpen predictions but provide little gain compared to distributed lag models in forecasting GDP and Bram and Ludvigson (1998) report that although information on consumer confidence improved forecasts, this was by a statistically insignificant amount. Similar results were reported by Fan and Wong (1998) regarding the predictive capacity of consumer sentiment indexes for consumption. Garcia-Ferrer and Bujosa-Brun (2000) find, on the contrary, that qualitative survey data improves forecasting of industrial turning points in OECD countries. And Huth, Eppright and Taube (1994), Easaw and Heravi (2004) and Easaw, Garratt and Heravi (2005) find that consumer sentiment indexes are useful predictors of household consumption.

These mixed results further support the view that different indicators tend to perform differently in different countries and in different times (Emerson and Hendry 1996). And Evans (2003) argues that, when relying on historical data, no method is likely to work without adjustment and that enhanced methods of calculating leading indicators should play a more important role in the future.

In this article I propose one such adjustment through the use of a modern denoising method that can effectively remove measurement errors from survey data. Such errors are inherent in consumer and business sentiment indexes that are based on sample surveys and are therefore subject to sampling and nonsampling errors (Thompson 2002: 5). In a related study, Van Oest and Franses (2008) emphasize that net changes in confidence may be largely driven by the different respondent samples over time and do not always represent real changes in confidence for the entire population. In addition, the consumer sentiment index in a given country generally exhibits several irregular short-term cyclical fluctuations attributed to several factors that are not necessarily related to the economy and that further disturb its predictive capacity (Lemmens, Croux and Dekimpe 2007). Such factors can include, for example, the political climate in the country (see Garner 1981) and events that

[1] Central Bank of Cyprus, AntonisMichis@centralbank.gov.cy.

The opinions expressed in this paper are those of the author and do not necessarily reflect the views of the Central Bank of Cyprus or the Eurosystem.

inspire national pride (e.g., performance in international sporting events) or national sorrow (e.g., a natural disaster).

Oller and Tallbom (1996) considered the problem of forecasting with noisy data and proposed a flexible exponential smoothing approach in order to construct entirely new business-cycle indicators. The authors considered both measurement errors and irregular quarter-to-quarter changes in the underlying indicators as being meaningless noise in the data. They also emphasized that the design of business tendency surveys is compromised between getting a fast reply and being highly accurate; therefore such surveys are subject to measurement errors. In this article the problem of noisy consumer and business tendency data is addressed with wavelets. Previous research on wavelets by Yogo (2008) employed wavelet analysis in order to decompose economic time series into trend, cycle and noise, while Clar, Duque and Moreno (2007) applied wavelet filtering in order to seasonally adjust several consumer and business survey indicators.

Measurement errors in the independent variables of linear regression models lead to inconsistent coefficient estimates. One solution for the inconsistency problem was proposed by Cai, Naik and Tsai (2000) in the form of denoised least squares. Denoising of the data with wavelets is performed first, then in a second stage the regression model is estimated with the ordinary least squares method. In this study the denoised least squares method is used in order to provide consistent coefficient estimates and forecasts in models for GDP changes that use consumer and business sentiment indexes as predictors. In addition, I show that wavelet denoising can also provide efficient coefficient estimates in regression models that explain consumer sentiment index variations. Empirical applications are provided with data on the US economy.

2. Wavelet denoising

Wavelets are orthonormal sets of functions whose shape, as the name suggests, is like a little wave. They have compact local support but decay quickly to zero elsewhere. Wavelets can provide approximations of both stationary and nonstationary time series. They are particularly effective for time series characterized by abrupt changes, spikes and periodic cycles. Consumer and business sentiment indexes are characterized by such features. These important properties have inspired several applications of discrete wavelet transforms in economics (see Crowley 2007). The wavelet approximation of an observed time series is similar to the Fourier transform and has the following form:

$$\chi_t = \sum_{k \in Z} c_{j_0,k} \phi_{j_0,k}(t) + \sum_{j \in Z} \sum_{k \in Z} g_{j,k} \psi_{j,k}(t)$$

where Z is the set of integers. This is an orthogonal decomposition that involves J time-scales (where, $j = 1,...,J$) with $k \in Z$ coefficients at each scale. The set of father (φ) and mother (ψ) wavelets that form an orthonormal basis are defined as:

$$\phi_{j_0,k}(t) = 2^{-j_0/2} \phi(2^{-j_0} t - k) \text{ and } \psi_{j,k}(t) = 2^{-j/2} \psi(2^{-j} t - k)$$

and their respective scaling and wavelet coefficients are:

$$c_{j_0,k} = \int_R \chi_t \, \phi_{j_0,k}(t) \, dt \text{ and } g_{j,k} = \int_R \chi_t \, \psi_{j,k}(t) \, dt .$$

For a discrete time series, the discrete wavelet transform is used. In order to obtain the vector of wavelet coefficients w, the $1 \times T$ vector of noisy data χ is multiplied by an appropriate $T \times T$ wavelet matrix W (whose elements depend on a specific wavelet family):

$$w = W\chi$$

The vector of wavelet coefficients consists of different sub-vectors, each of length 2^j ($j = 1,...,J$), which represent different resolution levels of the data. For a dyadic length time series with monthly sampling frequency the first resolution level captures frequency variation with a duration of 2–4 months. Analogously, the second resolution level captures variation of 4–8 months, the level 3 resolution captures variation of 8–16 months and so on, up to level *J*.

Since the data contain measurement errors (noise) this will also be transferred to specific wavelet coefficients. Donoho and Johnstone (1994, 1995) proposed a soft thresholding rule in order to remove the noisy wavelet coefficients associated with the highest frequencies (short-term cyclical fluctuations) and construct noise free estimates of the original data vector χ. In the first stage, the following thresholding rule is applied to the data:

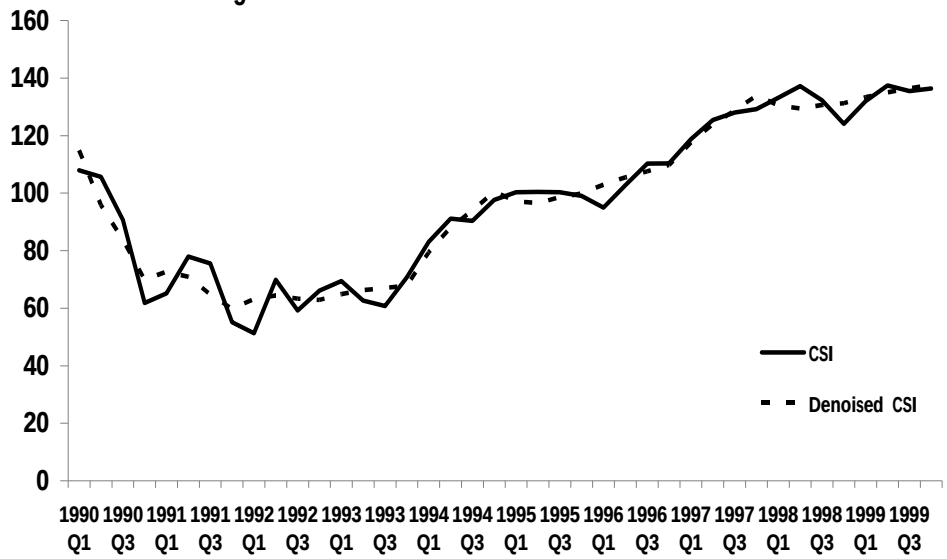
$$\hat{w} = \begin{cases} \text{sgn}(w)(|w| - \tau) & if\ |w| \geq \tau \\ 0 & if\ |w| < \tau \end{cases} \text{ where } \text{sgn}(w) = \begin{cases} +1 & if\ w > 0 \\ 0 & if\ w = 0 \\ -1 & if\ w < 0 \end{cases}.$$

This rule pushes all coefficients towards zero, but when their magnitude is smaller than the threshold τ, which defines the level of noise in the data, they are set to zero. The resulting wavelet coefficients $\hat{w}$ are free from noise. In the second stage, an inverse wavelet transform is applied to the vector $\hat{w}$ in order to obtain noise free estimates of the original data vector χ as follows:

$$\hat{\chi} = W^{-1}\hat{w}$$

Obviously, the choice of the threshold is critical, and this subject is extensively researched in the statistics literature. In the empirical applications of this article I use the universal threshold, $\tau = \hat{\sigma}_\tau \sqrt{2 \log N}$, proposed by Donoho and Johnstone (1994), where $\hat{\sigma}_\tau$ is the standard deviation of the wavelet coefficients at the finest level of detail. In all the applications in this article the Daubechies least asymmetric family of wavelets was used with a filter of length 10. Figure 1 exhibits the original and denoised values of the US consumer sentiment index published by the Conference Board for the period 1990–1999 after eliminating the two finest levels of wavelet coefficients associated with the highest frequencies in the data. Wavelet denoising produced a smoother signal that preserved the main characteristics of the index but removed noise and short-term irregular variation from the data. This is consistent with the findings of Van Oest and Franses (2008), who report that monthly changes in consumer confidence are not often large. Furthermore, wavelets are particularly effective in handling time series with abrupt changes, spikes and periodic cycles which frequently characterize the consumer sentiment index.

Figure 1 US consumer sentiment index: 1990–1999



Source: Conference Board.

In subsequent sections I use regression models that include consumer and business sentiment indexes as variables. In Section 3 wavelet denoising has been applied only to the dependent variable that represents the consumer sentiment index while in Section 4 wavelet denoising has been applied to three independent variables that concern the consumer sentiment index, the index of homebuilders' sentiment and the index of manufacturing activity in the United States.

3. Determinants of the consumer sentiment index

The economic determinants of the consumer sentiment index are studied in psychological economics (Kantona 1975), where regression models are usually used in order to test several hypotheses and identify possible causal links with the index. Garner (1981) formed several regression models in this direction and confirmed that a small set of objective variables explains most variations in the index. Using similar variables for the US economy for the period 1990–2000, and after careful specification testing, I estimated the following model for the consumer sentiment index:

$$\log CSI_t = a + \beta_1 \log INFLATION_t + \beta_2 \log GDP_t + \beta_3 \log UNEMPLOYMENT_t \quad (1)$$

where *t* is the time subscript, *CSI* is the consumer sentiment index published by the Conference Board, *INFLATION* is the percentage change in the consumer price index, *GDP* is gross domestic product and *UNEMPLOYMENT* is the harmonized unemployment rate. The CSI data were obtained from the publications of the Conference Board, while data for the other variables were obtained from the OECD statistical database.

When the dependent variable in a linear regression model is measured with error, the ordinary least squares (OLS) estimator provides inefficient estimates. It is possible, however, to improve the efficiency of the coefficient estimates in a model like (1) by first applying wavelet denoising to the dependent variable, then estimating the equation with the OLS method. In order to formally present the efficiency gains associated with wavelet denoising, consider the classical linear regression model satisfying all the Gauss-Markov assumptions:

$$y_i^* = \beta_1 + \sum_{j=2}^{k} \beta_j x_{ij} + \varepsilon_i$$

where y^* is the dependent variable, x_{ij} are the $k-1$ explanatory variables (*j* = 2,...,*k*), ε_i is the error term with variance $Var(\varepsilon) = \sigma^2$ and there are *N* observations available ($i = 1,...,N$). Also assume that the dependent variable is measured with error according to the following model:

$$y_i = y_i^* + r_i$$

where y is the observed dependent variable, y^* is the underlying true signal and r is the additive measurement error with properties, $E(r_i) = 0$, $Var(r_i) = \omega^2$ and $Cov(r_i, r_m) = 0$, $\forall i \neq m$. If the estimated model is based on the observed dependent variable, the OLS estimator of the coefficient vector will be inefficient since the model becomes:

$$y_i = \beta_1 + \sum_{j=2}^{k} \beta_j x_{ij} + u_i$$

with new error term $u_i = \varepsilon_i + r_i$, which results in higher variance for the least squares estimator of the coefficient vector (see Davidson and MacKinnon 2004: 312–313). The error variance-covariance matrix will now be:

$$E(uu') = \Omega = \begin{bmatrix} \sigma^2 + \omega^2 & 0 & ... & 0 \\ 0 & \sigma^2 + \omega^2 & ... & 0 \\ ... & ... & ... & ... \\ 0 & 0 & ... & \sigma^2 + \omega^2 \end{bmatrix}$$

where $u = (u_1,...,u_N)'$.

In order to estimate the true dependent variable vector y^* and obtain a more efficient estimator, wavelet denoising is applied to the dependent variable as described in the previous section such that:

$$\hat{y} = Wy = y^*$$

and the model becomes:

$$\hat{y}_i = \beta_1 + \sum_{j=2}^{k} \beta_j x_{ij} + \tilde{u}_i$$

with error level $\tilde{u}_i = \varepsilon_i < u = \varepsilon_i + r_i$ and $Var(\tilde{u}_i) < Var(u_i)$.

In order to empirically test the proposed procedure the coefficients of model (1) were estimated with and without wavelet denoising of the dependent variable. The results are

included in Table 1. The coefficients estimated for the model with wavelet denoising on the dependent variable are included under column DLS1. Wavelet denoising has significantly reduced the standard errors of all the coefficients and improved the overall model fit. The respective coefficient values are similar in both cases and have the expected signs. Unemployment in particular had a strong negative influence on the consumer sentiment index for the period examined.

Table 1 Coefficient estimates for CSI regressions

No wavelet denoising

Coefficient	OLS	St. errors	t-value
INTERCEPT	3.83	4.36	0.88
INFLATION	-0.04	0.05	-0.76
GDP	0.32	0.46	0.69
UNEMPLOYMENT	-1.34	0.22	-6.20
R-square	0.90		

Wavelet denoising of the dependent variable

Coefficient	DLS1	St. errors	t-value
INTERCEPT	1.33	2.76	0.48
INFLATION	-0.04	0.03	-1.22
GDP	0.57	0.29	1.94
UNEMPLOYMENT	-1.19	0.14	-8.72
R-square	0.95		

4. Forecasting GDP changes using indexes of consumer and business sentiment

In this section I use consumer and business sentiment indexes in order to forecast US GDP changes. The difference when compared to the previous section is that wavelet denoising is now applied to the independent variables of the regression model. Wavelet denoising is necessary in this case because measurement errors in the independent variables lead to inconsistent coefficient estimates (see Davidson and MacKinnon 2004: 313) and, as a consequence, to inaccurate forecasts. In order to demonstrate this, consider the linear regression model $y = X\beta + \varepsilon$ where X is the $(N \times k)$ matrix of k independent variables and $\varepsilon \sim N(0, \sigma^2 I)$. The prediction error in this case is (see Steward and Gill 1998: 78):

$$f = y_f - \hat{y}_f = y_f - X_f \hat{\beta}$$

The subscript f denotes future (out of sample) values of the variables and $\hat{\beta}$ is the OLS estimator of the coefficient vector. It is assumed that the same model holds for both the within sample and the future periods as follows:

$$y_f = X_f \beta + \varepsilon_f \qquad (2)$$

and the future values of the independent variables in X_f are known with certainty. If the future error term has the following properties: $E(\varepsilon_f) = 0$, $\text{var}(\varepsilon_f) = \sigma^2 I$ and $\text{cov}(\varepsilon, \varepsilon_f) = 0$, the prediction error becomes:

$$f = X_f(\beta - \hat{\beta}) + \varepsilon_f$$

This expression shows that the prediction error consists of two components: (1) the error due to the difference between the estimate of the coefficient vector and its true value; and (2) the random disturbances in the future period. Consequently, when the coefficients are inconsistently estimated from noisy data, the associated forecasts will also be inconsistent and the prediction error large.

When the future values of the independent variables are not known a priori but have to be estimated, an additional source of uncertainty is introduced into the model and the forecast error will be even higher. In order to demonstrate this let the estimated future values of the independent variables be characterized by the forecast error ν_f such that $\hat{X}_f = X_f + \nu_f$. In addition assume that $E(\nu_f) = 0$, $\text{var}(\nu_f) = \sigma^2 I$ and $\text{cov}(\nu_f, \varepsilon_f) = 0$. Then the forecast error becomes:

$$f = X_f(\beta - \hat{\beta}) - \nu_f \hat{\beta} + \varepsilon_f .$$

This expression will also lead to higher forecast error variance for the model (see Tashman, Bakken and Buzas, 2000). Further, it should be expected that the forecast error, ν_f, will be even higher when the data based on which the forecasts were generated are subject to measurement errors. By applying wavelet denoising to the independent variables in this case, more accurate forecasts of their future values can be generated and the coefficients of the model can be estimated consistently, which will also lead to more accurate forecasts of the dependent variable and lower forecast error variance for the model. The denoised least squares (DLS) estimator and the exact conditions under which it provides consistency in linear regression models were proposed by Cai, Naik and Tsai (2000) for cases when the independent variables are measured with error.

To estimate a model for GDP changes with consumer and business sentiment indexes as predictors, the DLS estimator proceeds in two stages. In the first stage, wavelet denoising is applied to the indexes in order to remove measurement errors, and in the second stage the model is estimated with OLS. In order to empirically test the forecasting performance of the DLS estimator in comparison to OLS, I estimated the following model for the US economy using quarterly data for the period 1990–1999:

$$DGDP_t = a + \beta_1 CSI_{t-1} + \beta_2 NAHB_{t-2} + \beta_3 NAPM_{t-1} + \beta_4 NAPM_{t-2} + \beta_5 LEAD_{t-2} . \qquad (3)$$

DGDP is the percentage change in the real GDP, *CSI* is the consumer sentiment index published by the Conference Board, *NAHB* is the index of homebuilders' sentiment, *NAPM* is the index of manufacturing activity of the national association of purchasing managers and *LEAD* is the monetary component of the index of leading indicators (stock prices, changes in the real money supply and yield spread). The variables were obtained from Evans (2003: 474–478), who used a similar model specification but incorporated two lags for each independent variable. The specification in (3) was preferred because it provided a better fit to the data and better forecasting performance.

Two versions of the model were estimated. The first version included first differences of all the independent variables, and the coefficients were estimated with OLS. In the second version the coefficients were estimated with DLS (included under the DLS2 column) and wavelet denoising was applied to the variables *CSI*, *NAHB* and *NAPM*. In the case of *CSI*,

wavelet denoising was applied to the two finest (resolution) levels of wavelet coefficients, while for the other two variables wavelet denoising was applied to the three finest levels of wavelet coefficients, since the indexes exhibited short-term irregular variation at the respective frequencies. The results from the two estimation procedures are presented in Table 2 (lagged periods are in parentheses). By removing measurement errors from the data and isolating the information content of the indexes that is relevant to GDP, wavelet denoising has significantly improved the R-square of the model and the statistical significance of all the coefficient estimates. Only the coefficients for *NAPM*(1) and *LEAD*(2) are not statistically significant at the 95% significance level; however, their level improved considerably compared to the OLS case.

This improvement is also reflected in the out of sample forecasts generated with each method. The four quarters of 2000 were kept for out of sample evaluation. For the independent variables forecasts were generated with ARIMA models as in Clar, Duque and Moreno (2007), which were then inserted in model (2) in order to forecast GDP changes. The forecasting results are included in Table 3. DLS provided better forecasts and a significantly reduced mean squared forecast error (MSFE) compared to OLS, successfully predicting the reduction in the GDP growth rate in quarter 3.

Table 2 Coefficient estimates for DGDP regressions

No wavelet denoising

Coefficient	OLS	St. errors	t-value
INTERCEPT	0.71	0.12	5.96
CSI(1)	0.01	0.01	0.67
NHBM(2)	0.01	0.02	0.65
NAPM(1)	-0.01	0.03	-0.39
NAPM(2)	-0.02	0.03	-0.47
LEAD(2)	0.27	0.23	1.17
R-square	0.12		

Wavelet denoising of the independent variables

Coefficient	DLS2	St. errors	t-value
INTERCEPT	0.65	0.09	7.57
CSI(1)	0.05	0.02	3.18
NHBM(2)	0.08	0.04	2.14
NAPM(1)	0.10	0.07	1.61
NAPM(2)	-0.20	0.11	-1.83
LEAD(2)	0.16	0.13	1.24
R-square	0.49		

Table 3 Comparison of LS and DLS predictions for GDP changes

Quarter	Actual	OLS	DLS2
2000: Q1	0.58	0.91	1.03
2000: Q2	1.39	0.83	1.12
2000: Q3	0.33	0.80	0.36
2000: Q4	0.47	0.81	0.53
MSFE		0.18	0.04

5. Conclusions

Consumer and business tendency surveys are characterized by sampling and nonsampling errors that result in measurement errors in the corresponding indexes of consumer and business sentiment. This deteriorates their predictive capability for GDP changes since it leads to inconsistent coefficient estimates when they are used as independent variables in linear regression models. It also leads to inefficient estimates when they are used as dependent variables in models that aim to identify the determinants of the consumer sentiment index. The denoised least squares method can improve econometric estimation in both cases by effectively applying wavelet denoising to the indexes and then using the OLS estimation framework as the best linear unbiased predictor. Wavelet denoising is particularly effective when the time series are characterized by abrupt changes, spikes and periodic cycles that frequently characterize consumer and business sentiment indexes.

References

Bram J. and Ludvigson S. (1998) Does consumer confidence forecast household expenditure? A sentiment index horse race. FRBNY Economic Policy Review, June.

Cai Z., Naik P.A., Tsai C-L. (2000) Denoised least squares estimators: an application to estimating advertising effectiveness. Statistica Sinica 10: 1231–1241.

Clar M., Duque J-C., Moreno R. (2007) Forecasting business and consumer survey indicators – a time-series models competition. Applied Economics 39 (20): 2565–2580.

Crowley P.M. (2007) A guide to wavelets for economists. Journal of Economic Surveys 21 (2): 207–267.

Davidson R. and MacKinnon J.G. (2004) Econometric Theory and Methods. Oxford University Press: New York.

Donoho D.L. and Johnstone I.M. (1994) Ideal spatial adaptation by wavelet shrinkage. Biometrika 81: 425–455.

Donoho D.L. and Johnstone I.M. (1995) Adapting to unknown smoothness via wavelet shrinkage. Journal of the American Statistical Association 90: 1200–1224.

Easaw J.Z., Garratt D., Heravi S.M. (2005) Does consumer sentiment accurately forecast UK household consumption? Are there any comparisons to be made with the US? Journal of Macroeconomics 27: 517–532.

Easaw J.Z. and Heravi S.M. (2004) Evaluating consumer sentiments as predictors of UK household consumption behaviour. Are they accurate and useful? International Journal of Forecasting 20: 671–681.

Emerson R.A. and Hendry D.F. (1996) An evaluation of forecasting using leading indicators. Journal of Forecasting 15: 271–291.

Evans M. (2003) Practical Business Forecasting. Blackwell Publishing: Oxford.

Fan C.S. and Wong P. (1998) Does consumer sentiment forecast household spending? The Hong-Kong case. Economic Letters 58: 77–84.

Garcia-Ferrer A. and Bujosa-Brun M. (2000) Forecasting OECD industrial turning points using unobserved components models with business survey data. International Journal of Forecasting 16: 207–227.

Garner A.C. (1981) Economic determinants of consumer sentiment. Journal of Business Research 9: 205–220.

Howrey E.P. (2001) The predictive power of the index of consumer sentiment. Brookings Papers on Economic Activity.

Huth W.L., Eppright D.R., Taube P.M. (1994) The indexes of consumer sentiment and confidence: leading or misleading guides to future buyer behaviour. Journal of Business Research 29: 199–206.

Kantona G. (1975) Psychological economics. Elsevier: New York.

Lemmens A., Croux C., Dekimpe M. (2007) Consumer confidence in Europe: United in diversity? International Journal of Research in Marketing 24: 113–127.

Oller L-E. and Tallbom C. (1996) Smooth and business cycle indicators for noisy Swedish data. International Journal of Forecasting 12: 389–402.

Stewart J. and Gill L. (1998) Econometrics, 2nd edn. Prentice Hall Europe.

Tashman L.J., Bakken T., Buzas J. (2000) Effect of regressor forecast error on the variance of the regression forecasts. Journal of Forecasting 19: 587–600.

Thompson S.K. (2002) Sampling, 2nd edn. John Wiley & Sons: New York.

Van Oest R. and Franses P.H. (2008) Measuring changes in consumer confidence. Journal of Economic Psychology 29: 255–275.

Yogo M. (2008) Measuring business cycles: a wavelet analysis of economic time series. Economic Letters 100: 208–212.

The usage of surveys to overrun data gaps: Bank Indonesia's experience

Hendy Sulistiowaty and Ari Nopianti

I. Introduction

The global economic recession that triggered in late 2007 in the United States seriously affected the global economy in 2008. The catastrophe has spread worldwide, and to both advanced and emerging countries. Various stock markets around the world have fallen sharply, thus causing a massive impact on large financial institutions. Turbulence in the US financial market has created a vicious circle between financial markets worldwide and the real sector. In response to the situation, several aggressive policies have been adopted at the global level to promote economic recovery. Governments around the world have also launched fiscal stimulus plans with strong efforts to alleviate their economic condition.

The global crisis has caused atrophy of world economic growth. Data from the World Economic Outlook (WEO) showed that in 2007 the world economy still grew 5.2%. However in 2008 growth in the world economy decelerated to 3.0% and contracted to –0.6% in 2009. The contraction has been experienced in many countries especially in advanced economies due to the increasing integration of the global economy and the deepening of the crisis effect. In 2009, only a few countries showed positive growth although it was lower than previous years, such as India, China, and some ASEAN countries including Indonesia. It seems that although central banks and governments have used wide-ranging policy tools to support the economy, no rigorous improvement of sentiment signal has yet been given. However, it is also realized that the restoration will need go through a difficult transition period.

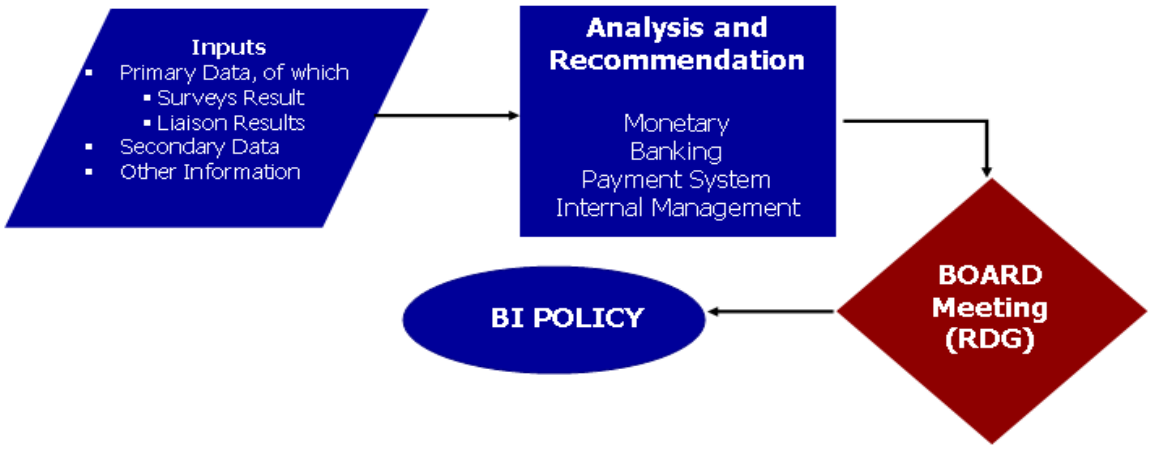
The effect of the global crisis in Indonesia started in the last quarter of 2008. The rupiah exchange rates weakened and touched the lowest level at Rp12.151/USD in November 2008 or depreciated by 31% compared to January 2008. The pressures on the rupiah exchange rate came from the mounted balance of payments deficit, fueled by unfavorable development in the current account and capital financial account. This condition also led to slower economic growth in Indonesia. In the third quarter of 2008, the economy was still amounting to 6.2% growth (yoy). However, in the fourth quarter of 2008, the global financial turmoil began to bear down on Indonesia's economy, followed by slowing of economic growth to 5.3% (yoy) in the fourth quarter of 2008. Indonesia's economy in 2008 was still able to record 6.0% growth, but the crisis itself has generated a 4.5% deceleration in Indonesia's economic growth.

With regard to the central bank perspective, Bank Indonesia (BI) has one main objective i.e. to establish and maintain rupiah stability. Concerning the global downturn, BI has been keeping a close watch on the financial market turbulence and the impact on Indonesia's economy. Given the high level of uncertainty that persists in the economic environment, it is indispensable for monetary policy formulation to be supported by a number of economic indicators and information. Therefore, BI requires more progressive statistics data and information than that issued by official institutions. Since the official economics data are not available to be used as supporting data immediately, BI conducts some surveys on a regular or ad hoc basis as a source of supplementary information on macro or micro economic conditions to obtain early indicators respecting national economic movements earlier than official data.

II. Bank Indonesia surveys

As monetary authority, Bank Indonesia sets up the framework and implements prerequisite monetary policy to achieve and maintain the stability of rupiah value. In order to support the Board of Governors in formulating the monetary policy, BI needs additional information which was obtained from the surveys. Under the provisions of Bank Indonesia Act No. 23/1999 as amended by Act No. 3/2004, BI conducts surveys to assess information concerning the current economic situation as well as its projection.

The Mechanism of Monetary Policy Formulation



The outcome of the surveys is periodically reported to the Board of Governors and several departments in Bank Indonesia. It is also published on Bank Indonesia's website, therefore respondents and external stakeholders are able to utilize the survey's results. Some surveys are conducted regularly by Bank Indonesia such as the Business Survey, Consumer Survey, Banking Survey, Retail Survey, etc. However, BI can also conduct some ad hoc surveys to assess particular issues related to financial market conditions and economic activities. During the global financial crisis, BI conducted Banking Surveys and some ad hoc surveys to collect information concerning the impact of the crisis on the financial sector and the real sector.

II.1 Banking survey

During the global financial crisis, the Banking Survey became more important as a tool to obtain early information for monetary and credit development analysis. It is a quarterly survey which covers 48 banks in Jakarta that provide 80% of national total credit. The respondents are selected by a stratified purposive sampling method and classified based on their total assets into: (i) Large Bank with total assets of more than Rp25 trillion; (ii) Middle Bank with total assets between Rp4 trillion and Rp25 trillion; and (iii) Small Bank with total assets of less than Rp4 trillion. The main purposes of this survey are predominantly to obtain information about the current quarter conditions and the expectation for the next quarter as well as the whole year conditions.

The Banking Survey provides Bank Indonesia with the latest development regarding: (i) the banking policy in funding and deposit lending; (ii) the effectiveness of BI's monetary policy transmission mechanism; and (iii) some additional information related to the banking sector's condition which is already reported in Banking Monthly Reports. Some indicators generated

by this survey which are important for analyzing financial system conditions are: (i) sectoral loans development; (ii) sources and disbursement of funds; (iii) deposit and lending rates; and (iv) projection of outstanding credit growth. In addition, this survey also accommodates a certain number of ad hoc questions dealing specifically with financial market issues. Questionnaire forms are sent by mail, facsimile and email. Since 2008, the questionnaires have been distributed to the banks through an online system. The questionnaire is distributed to respondents in the first week at the end of the quarter and returned back to BI a week before the end of the quarter. The response rate of this survey is considerably high, on average above 90%. In the meantime, the report on the Banking Survey is published in the first week after the reporting quarter.

Data are classified into quantitative and qualitative types. Qualitative data are processed by the weighted net balance method and pooling method. The weighted net balance method is calculated by multiplying the respondent's answer with each segment of loan (totally 100%), then calculating the difference between the percentage of respondents claiming "increase" and the percentage of respondents answering "decrease" (used to be known as net balance). Pooling method means that the percentage of the majority answers compare to total respondents. Meanwhile, quantitative data is processed by using the simple average method.

For Bank Indonesia, the key important sources of early data which are necessary to assess the impact of the global financial crisis are provided by the Banking Survey. Therefore, during the crisis, Bank Indonesia required banks to provide some additional information through three periods of the Banking Survey which were conducted in Quarter IV-2008, Quarter I-2009 and Quarter II-2009. Some additional questions related to the global financial crisis include: (i) the impact of the global crisis on the banks' business activities; (ii) which indicators are most affected by the crisis; (iii) the impact of the crisis on the banks' Non Performing Loans (NPL); (iv) the types of credits that suffered the most from the increase of NPL; and (v) the projection of growth in lending.

II.2 Ad hoc surveys

Aside from regular surveys, BI also conducts some ad hoc surveys. The topics of these ad hoc surveys depend on the current economic conditions or some important issues that could generate a negative impact on Indonesia's economy. Every year we conduct four to five ad hoc surveys by using the phone survey method. Respondents of the surveys are wide-ranging, from individuals to companies/institutions. During the period of crisis in 2008 to 2009 we conducted three ad hoc surveys to capture early information regarding the impact of the crisis on the real sector.

The first survey was conducted in November 2008; the topic was "The Impact of Global Economy Crisis to the Real Sectors." The respondents were selected by using purposive sampling which covered 80 companies in several economic sectors i.e. agriculture, mining, manufacturing, construction, trade, and transportation sectors. The survey asked about companies' business situation, capacity utilization, the usage of labor, financial condition, and the impact of exchange rate depreciation on external as well as domestic demand. Data collected were processed by the net balance method, simple average, and pooling system.

The second survey was "Exports and Imports of Non Oil and Gas Performance in Quarter I-2009 and 2009." This survey was carried out from February to March 2009 and involved 317 export companies (covering 29% of non oil and gas export values). They were selected by the purposive sampling method. The data collected were processed by using the net balance, weighted average, and pooling method.

The third survey was conducted from May to June 2009 mainly to obtain information concerning how the financial crisis was affecting companies' employment conditions. Respondents of this survey embraced 256 companies in several sectors (agriculture, mining,

manufacturing, construction, and trade). Respondents were selected by purposive sampling from middle to large companies. The data were processed by the simple average and pooling method.

III. The survey results

As explained in the previous section, to analyze monetary and credit development as well as the real economic activities, Bank Indonesia requires some data and information. Data from official institutions typically come with a time lag, as a result data and information obtained from surveys become more important to fill data gaps and preserve prompt information to policy makers. In this section, we will discuss the information obtained through the surveys during the crisis and the conditions of the financial sector and the real sector based on data.

III.1 The financial sector

In general, the impact of the global crisis on commercial banks could be minimized due to conservative characteristics of Indonesia's banking. The sources of funds mainly came from deposits, which were placed mainly in the form of credit or securities such as government bonds. However, the integration of the domestic financial sector into the global financial market may be problematic. Pressure from the global financial crisis that emerged in the fourth quarter of 2008 until the first quarter of 2009 destabilized the domestic financial sector. Based on the Banking Survey in the fourth quarter of 2008, the majority of respondents (96.7%) claimed that the global financial crisis was having an impact on banking activities. This indication was confirmed by some data such as tight liquidity in the interbank money market as a result of banks' preference to hold liquidity and limit their interbank transactions. Moreover, weak external demand had caused banks' asset quality to deteriorate as reflected in increasing Non Performing Loans (NPL).

III.1.1 Credit growth

In 2009 the annual growth rate of credit to the private sector declined substantially. The dramatic drop in credit growth was indicated by the Banking Survey in the fourth quarter of 2008. Respondents stated that the banking activity most affected by the crisis was lending activity, followed by money markets and lending rates, and tightening liquidity. The main factor behind the deceleration of loan expansion was less production and trade activities due to a substantial decline in domestic demand and weakening household purchasing power. Tightening liquidity which created pressure on the money market rate and banking lending rates also took a significant role in the deceleration in loan growth.

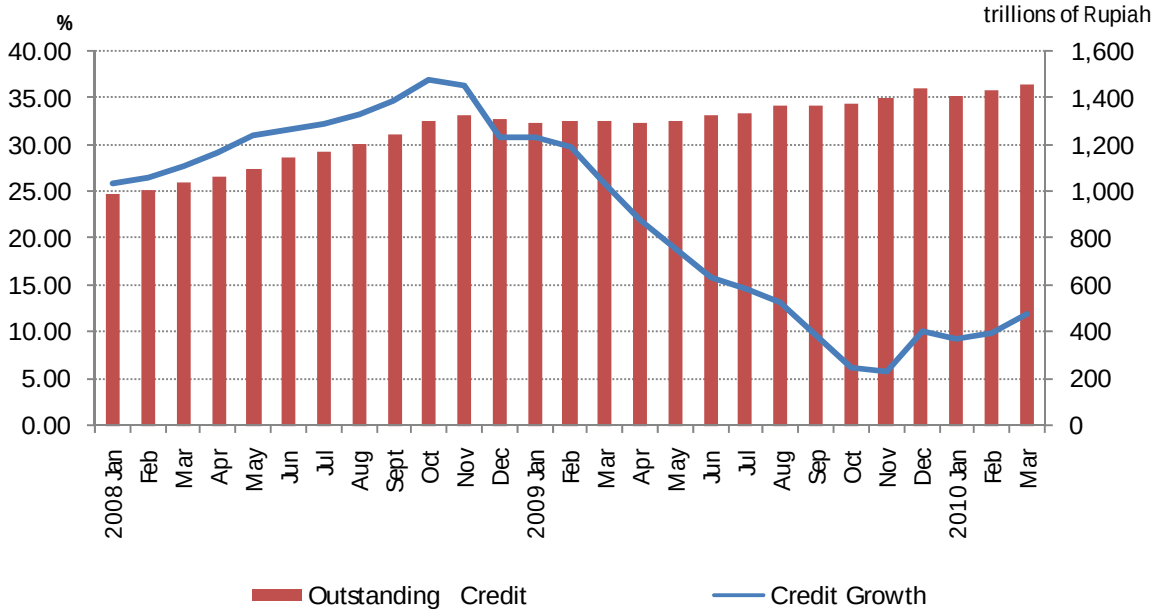
The Banking Survey conducted in the first quarter of 2009 also indicated that there are no signs that banks are starting to ease their credit conditions. The low capacity utilization, weak demand from both domestic and external markets that led to a delayed plan of business expansion and eventually to financial needs from banks which remain weak are among the reasons behind the deterioration of credit growth. On the other side, banks turned more cautious in their lending activities and even refrained from extending credit to particular sectors.

The deterioration of business conditions in 2009 was also denoted by the ad hoc survey in November 2008. Respondents were pessimistic about the prospects of the real economy and predicted that business conditions in 2009 would be getting worse. They predicted that business activities in 2009 would decline 7.51% compared to the previous year. In the second quarter of 2009 Banking Survey, the majority of the respondents in large bank groups expected that the recovery in both loan demand and credit supply would not happen in 2009.

Therefore, they predicted that credit growth in 2009 would be around 10% to 15%, which was lower than 2008.

Data from Banking Statistics confirmed those survey results. In 2008 banking credit grew reasonably high and by the end of 2008 credit growth was recorded at 31%. However, in 2009 credit growth was down significantly to 10%, which had been predicted in the second quarter of 2009 Banking Survey. The deceleration of credit growth was mainly because banks became more prudent in their lending. In addition, the subdued level of economic activity and trade, and the uncertainty surrounding the business outlook dampened firms' demand for financing. As a result, banks tended to place their funds in more secure and liquid instruments, mainly in the form of central bank certificates and government bonds.

Graph 1. Outstanding Commercial Bank Credit



Source: Bank Indonesia.

III.1.2 Non Performing Loans (NPL)

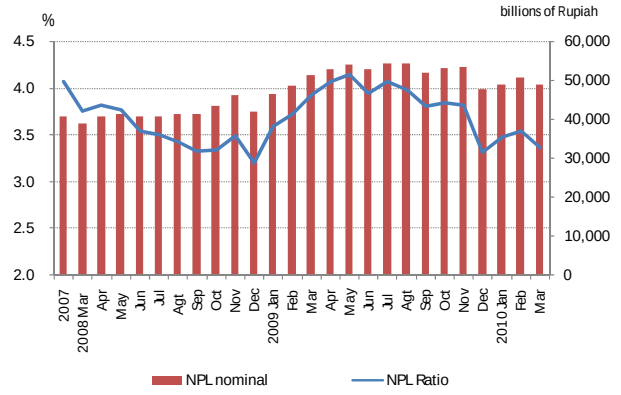
Pressure in the economic conditions has indirectly caused a broad unfavorable impact on the banking performance, through the downturn in the real sector performance, particularly in exports and imports activity. This condition undermined the ability of banks to provide credit to the business sector and eventually will increase their credit risk and Non Performing Loans (NPL)[1].

The increment in the NPL ratio was predicted by respondents when they were surveyed in the Banking Survey in the fourth quarter of 2008, the first quarter of 2009, and the second quarter of 2009. The majority of respondents predicted that the NPL ratio in 2009 would potentially increase, and would reach a high NPL ratio in the second quarter of 2009 and the third quarter of 2009. Respondents predicted that the NPL ratio in 2009 would be higher than that in 2008. Based on economic sectors, respondents claimed that the highest potential for NPL would occur in the manufacturing sector and trade sector.

[1] The NPL ratio is credits that are sub-standard, doubtful and loss divided by total credits.

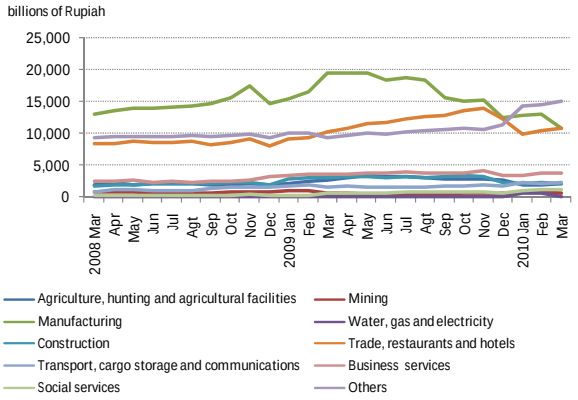
Data from Banking Statistics proved that since the fourth quarter of 2008, the NPL figure has increased monthly and hit the highest point in August 2009 with Rp54.3 trillion (Graph 2). The increasing of nominal NPL in the midst of sluggish credit growth exposed the economy to a rise in bank NPL in 2009. Following high nominal NPL, greater nominal credit risk by economic sector was focused on the trade, hotel and restaurant sector and the manufacturing sector, which contributed to 34% of NPL (Graph 3). The increasing of nominal NPL caused the ratio of NPL to tend to increase, starting at the end of 2008.

Graph 2. Non Performing Loans



Source: Bank Indonesia.

Graph 3. Non Performing Loans by Economic Sector



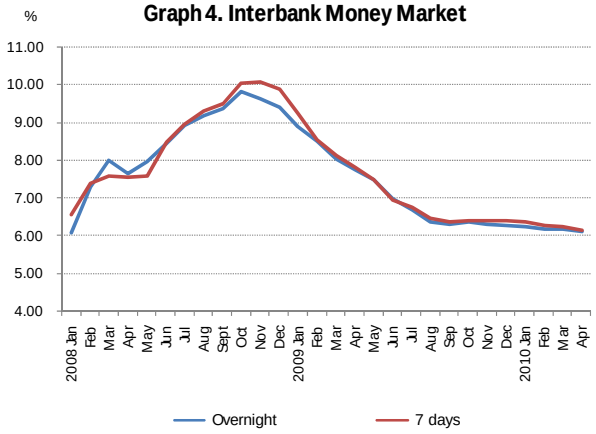
Source: Bank Indonesia.

III.1.3 Interest rates

Tight liquidity on the global financial market caused investors to adjust their investment portfolio in emerging countries, including Indonesia, which hastened a foreign capital flow reversal and intensified pressures on the domestic financial market. In the banking sector, tight liquidity was found in the interbank money market as a result of the banks' preference to keep the liquidity and limit interbank transactions. This condition was revealed in the Banking Survey in the fourth quarter of 2008. Most of the respondents (89.7%) argued that one of the impacts of the crisis on the banking sector was a high interest rate due to tightening liquidity. However, respondents to the Banking Survey in the first quarter of 2009 predicted that, for Quarter II-2009 and the whole year 2009, the interest rate would be lower than 2008.

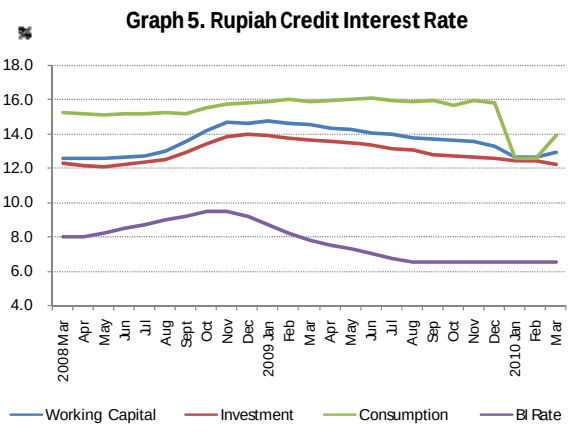
Banking Statistics data show that in 2008 the average rupiah credit interest rates start to mount especially in the second semester of 2008. However, entering the year of 2009, we found that pressures on liquidity due to the global crisis had eased slightly. This condition was parallel with the decline in the policy rate (BI rate).

Graph 4. Interbank Money Market



Source: Bank Indonesia.

Graph 5. Rupiah Credit Interest Rate



Source: Bank Indonesia.

III.2 The real sector

The impact of the global crisis in Indonesia was not only felt by the financial sector, but also spread to the real sector. The contraction of economic growth in several major countries caused a decline in world trade volume of –10.7% in 2009. This deterioration in the world economy led to sluggish business conditions in Indonesia, particularly in the export oriented businesses, and increased the risk of unemployment.

III.2.1 Performance of exports and imports

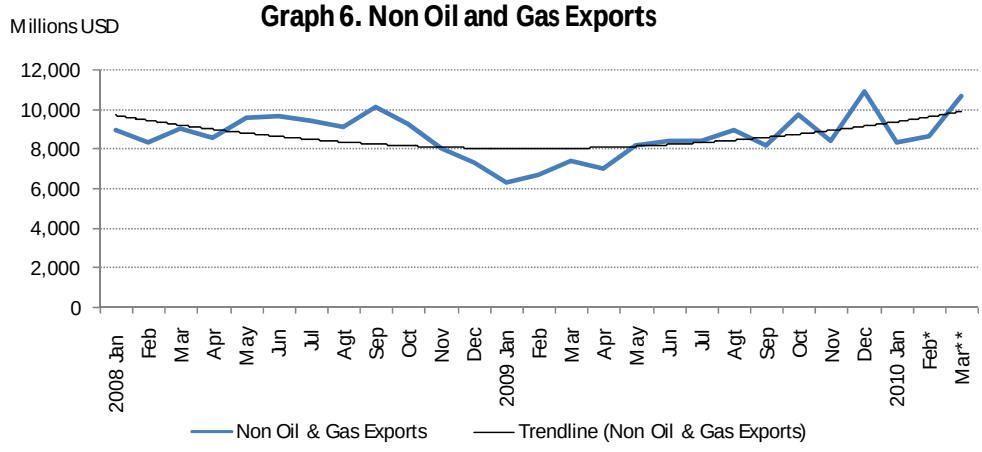
Export performance

Among the main primary external transactions, Indonesia's exports and imports have been affected by the global crisis. This was indicated by respondents when BI conducted its Exports and Imports of Non Oil and Gas Performance Survey in the first quarter of 2009.

The survey revealed that non oil and gas exports volume in the first quarter of 2009 was predicted to decline. On average, export volume was expected to decrease 18.0% compared to the same period in the previous year. Respondents believed that weak external demand and delayed export contracts were the main reasons behind such a depressing condition. The same conditions were also predicted for the whole year 2009, being projected to decrease 16.8%. To solve the problem of the weakness in export performance, respondents have some strategies such as cost efficiency, export destinations diversification, products diversification, product quality improvement, and the amount of labor reduction.

The weakening in export performance indicated by the survey was confirmed with export and import data. Contractions in economic growth in some of Indonesia's major trading partners such as the USA, Japan, and Singapore, in parallel with the decline of international commodity prices, triggered the weakening of export performance. Compared to the same quarter in the previous year, non oil and gas export growth in the first to third quarter 2009 experienced negative growth, thus export growth contracted to –8% during 2009.

Graph 6. Non Oil and Gas Exports



* preliminary figure
** very preliminary figure

Source: Bank Indonesia.

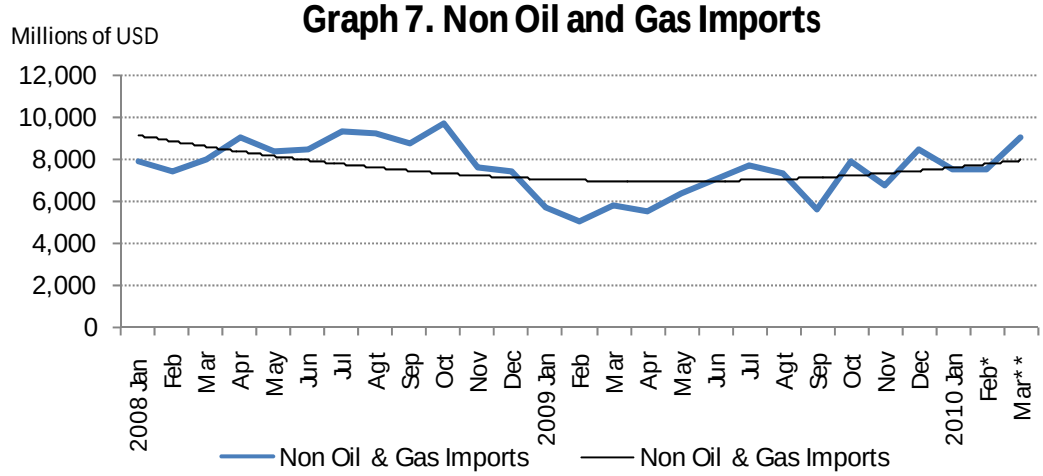
Import performance

Indonesia's imports have been dominated by non oil and gas commodities, which average over 70% of Indonesia's total imports. Although international turmoil affects the trade through exports, it may also affect trading activity. Moreover, a higher level of import substitution, especially for Indonesia's manufacturing products, may lead to import growth deceleration in line with export conditions. The contraction in non oil and gas imports has been indicated by

respondents in the Exports and Imports of Non Oil and Gas Performance Survey (first quarter of 2009). The survey revealed that non oil and gas imports were expected to decrease in the first quarter of 2009 at an average of –19.9%, in line with weak export performance. In 2009, respondents predicted that imports would decline by –15.7% on average.

Those predictions have been confirmed with import data. During 2009, imports of non oil and gas dropped in each quarter and touched –22% in 2009 compared to the previous year. The performance of imports can be seen in Graph 7.

Graph 7. Non Oil and Gas Imports



* preliminary figure
** very preliminary figure

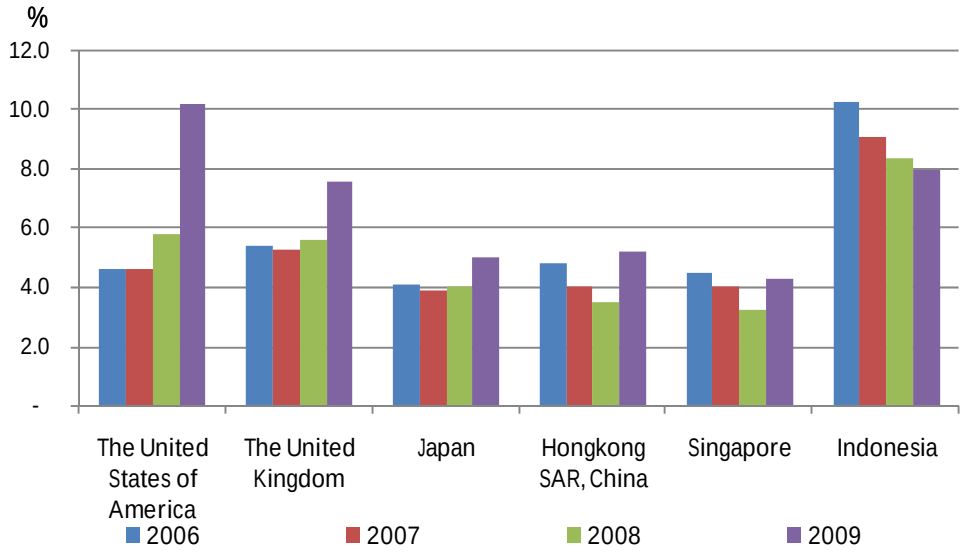
Source: Bank Indonesia.

III.2.2 Labor conditions

The pressure from the global crisis had a major effect on several companies to make changes to their operations and upgrade their business efficiency, with the result that some factories closed. These changes led to a rise in planned worker layoffs at some companies. The above condition was indicated in BI's ad hoc survey in May to June 2009 related to the impact of the crisis on companies' usage of labor. However, respondents predicted that the impact of the crisis on the decline in the use of labor would be insignificant. Respondents who reduced working hours or laid off their workers were relatively smaller compared to the total respondents. The survey conceded that the number of companies who reduced the working hours was only 10% in the fourth quarter of 2008 and 8% in the first quarter of 2009. The companies who laid off their workers, as much as 16% in Quarter IV-2008 and 21% in Quarter I-2009, were mostly from export oriented companies. The majority of layoffs were of non permanent workers. Generally, the reasons behind the layoffs were related to cost efficiency and weak demand both from abroad and from the domestic market. Furthermore, in 2009 only 11% of respondents believed that they had a plan to reduce labor. The rest of the respondents said that they would not reduce labor since their businesses went normally during the crisis.

The conditions of labor during the crisis can be seen from the unemployment rate. As shown in Graph 8, some countries experienced an increase in the unemployment rate. In the United States, when the crisis began, the unemployment rate in 2009 increased to 7.6% from 5.6% in 2008. However, the unemployment rate in Indonesia during the crisis tended to decline. It means that the global crisis had no such big impact on the Indonesian labor market as previously indicated in the survey.

Graph 8. Unemployment Rate



Source: Global Finance.

IV. Conclusion

Indonesia, as one of the countries that maintain an open economy, also suffered the adverse effect of the global crisis which was started in the United States in 2007. The crisis has been transmitted to fragility of world economic growth in 2008 and 2009. Indonesia itself also experienced a deceleration in economic growth, even though still charting positive growth. The impact of the crisis on the Indonesian economy was not only felt by the financial sector but also spread out to the real sector. This global recession presents a signal that there will be more challenges beyond the economic crisis itself.

As a central bank, Bank Indonesia (BI) presides over the global crisis and the impact on Indonesia's economy. To alleviate the impact of the crisis, BI carried out a series of monetary policies to reinforce earlier measurement. In order to formulate better monetary policies, BI requires data and information issued by official institutions. However, since the data are not available immediately to be used as supporting data, BI conducted some surveys on either a regular or ad hoc basis.

During the period of crisis (2008–2009), BI took a certain number of surveys to get early information from the banks and companies regarding the impact of the crisis on their businesses. The information was gathered from the Banking Survey and some ad hoc surveys. The surveys indicated that the financial sector and the real sector were affected by the crisis. Low credit growth and increasing Non Performing Loans (NPL) were several problems which arose in the financial sector although not yet indicated as a systemic banking crisis. In the real sector, exports and imports of non oil and gas dropped in 2009 and several companies cut their labor, particularly export oriented companies.

We found that indicators and information obtained from the surveys were essentially very important in giving early information concerning the impact of the global financial crisis on the domestic economy, and hence supported BI in taking prudent monetary policy measures to recover from the crisis.

References

1. Ad hoc survey: “The Impact of Global Economy Crisis to the Real Sectors”, Bank Indonesia, November 2008.
2. Ad hoc survey: “Exports and Imports of Non Oil and Gas Performance, Quarter I-2009 and 2009”, Bank Indonesia, March 2009.
3. Ad hoc survey: “Condition of Employment, Finance, and Corporate Financing”, Bank Indonesia, June 2009.
4. Banking Statistics, Bank Indonesia.
5. Banking Survey Report, Bank Indonesia, Quarter IV-2008.
6. Banking Survey Report, Bank Indonesia, Quarter I-2009.
7. Banking Survey Report, Bank Indonesia, Quarter II-2009.
8. Economic Report on Indonesia, Bank Indonesia, 2008.
9. Economic Report on Indonesia: Strengthening Resilience, Promoting the Momentum of Economic Recovery, Bank Indonesia, 2009.
10. Global Finance, http://www.gfmag.com
11. Indonesia Financial Statistics, Bank Indonesia.
12. World Economic Outlook, International Monetary Fund, April 2010.

The SNB survey on loan quality: a qualitative survey in a quantitative "suit"?

Hilmar Hoffmann

1. Introduction

This paper describes the innovative design of the Swiss National Bank (SNB) survey on loan quality, which is based on a non-harmonised data source. Implementing a statistical survey using a non-harmonised data source raises several problems, in particular with respect to data comparability. The paper describes in greater detail how the survey deals with these problems and places special emphasis on the modified calculation of quartiles, which is one of the key elements of the survey in its final form.

The paper is structured as follows: Section 2 discusses the need for an assessment of loan quality and gives a brief overview of some possible data sources for this assessment. Section 3 looks more closely at probability of default and the associated concept of expected loss, which are the core indicators of the SNB's survey on loan quality. Finally, placing emphasis on the description of the modified quartile calculation, the current survey design and possible data usage is explained. Section 4 concludes.

2. Loan quality, loan quantity and data needs

2.1 Overview

The core business of commercial banks is to transform deposits into loans. This activity exposes banks to liquidity risk, interest rate risk and credit risk. Credit risk depends on the quality of loans. If commercial banks lend imprudently, they finance unprofitable firms and projects. If these firms fail, this creates costs to the bank and to the firms' own creditors. In a fragile environment, such costs can lead to contagion, whereby the failure of some firms triggers the failure of other firms and/or banks. As a worst case, the impairment of a single bank threatens the banking sector as a whole. Hence, regulators and central banks should be concerned about banks' credit risk, i.e. the quality of their banks' loan portfolios.

2.2 The ideal survey and the real world

The quality of a loan depends on the quality of both the borrower and the collateral. Ideally, in addition to information on the quality of the collateral, all possible socioeconomic characteristics of individual borrowers would be collected on a continual basis, in order to obtain a broader understanding of interdependences with respect to the development of microeconomic and macroeconomic factors. However, for obvious reasons, this is not possible. In the case of Switzerland, it should furthermore be noted that, while the SNB is mandated to contribute to financial stability, it does not have the legislative authority to regulate[1] how banks should deal with credit risks. Therefore the SNB has to base its

[1] In Switzerland the state regulatory body is the Swiss Financial Market Supervisory Authority (FINMA). FINMA is endowed with supreme authority over banks, insurance companies, stock exchanges, securities dealers and collective investment schemes.

assessment of loan quality on existing data. In this regard, four different data sources can be considered:

- market data
- balance sheet data
- non-public data collected by the supervisory authority
- existing data from the banks' risk management systems.

Market data-based indicators, such as spreads on corporate bonds or prices for credit default swaps, have the advantage that they reflect all the information in the market and that they are readily available. Unfortunately, market indicators are not available for households or small and medium-sized companies – groups that make up the largest part of banks' loan portfolios in Switzerland. Furthermore, even if data were available for most of the relevant entities, information is still lacking on whether individual banks have exposures to these entities. Thus, market data is not well suited for the assessment of loan quality.

All kinds of borrower type are represented in banks' balance sheet data. Balance sheet-related items like write-downs or new loan loss provisions point to a materialisation of credit risk. Probably the most common indicator for describing loan portfolio quality is calculated as the ratio of non-performing loans to total lending volume. This indicator is a backward-looking indicator, i.e. it is an indicator that provides a description of the path of defaulted loans in the past, but offers limited forecasting possibilities. Furthermore, this indicator has the disadvantage that it does not provide any information on the coverage of non-performing loans (e.g. the existence of collateral).

Indicators that take into account the existence of collateral can be obtained from the data of supervisory authorities. Swiss legislation prescribes minimum capital requirements based on the Basel capital adequacy framework (Basel II) of the Basel Committee on Banking Supervision. An overall measure for credit risk is the capital required as backing for credit risk – a higher level of risk leads to an increase in required capital. However, it should be borne in mind that banks can choose between three different approaches[2] for determining their credit risk exposure for capital requirements. The most commonly used approaches classify the economic entities into relatively broad risk weight categories, so that they do not make differentiated distinctions with respect to credit risk distribution. Moreover, the risk weights are not regularly adapted, i.e. the defined risk weights are constant over a longer period. Finally, this data source does not provide a breakdown by industry, which is a key element in determining a risk profile.

To summarise: these data sources have specific advantages and disadvantages, although none of them are well suited to the requirements of the SNB. What all indicators have in common, though, is that they focus more or less on the probability of default. This is an indicator that attempts to measure the probability that a loan is becoming non-performing. It is often used in the banks' internal risk management systems. One main advantage is that it is, by definition, a "forward-looking" indicator, i.e. it estimates the probability that a borrower will default within a given period in the future. The possibility of using this indicator in a forward-looking manner explains the increasing interest[3] in using it for financial stability purposes. Since banks' internal risk assessment is based on this indicator, we assume that – in this context – this data source offers the best available data. Furthermore it is worth

[2] There are two standardised approaches and an internal ratings-based (IRB) approach. The two standardised approaches work with predetermined risk weights for counterparties, whereas only the IRB approach allows an individual assessment of the particular risk weights.

[3] For instance, probability of default is the core of the IRB approach that was introduced as part of Basel II.

mentioning that by collecting information on both the probability of default and the related expected loss indicator, it is possible to derive information on the coverage of loans (e.g. existence of collateral). This is especially important with respect to household loans, which are often mortgages.

The SNB's approach is therefore to collect data from the banks' internal risk management systems. Consequently, the probability of default and the expected loss are the core indicators of the SNB survey on loan quality. We will look more closely at the underlying concepts in the following section.

3. The SNB survey on loan quality

3.1 The core of the survey: probability of default and expected loss

The core indicators used in banks' internal risk management systems are the probability of default (PD) and the expected loss (EL). The PD is the probability that a particular counterparty will default on its obligation within a certain time period (see, for instance, Boemle et al., 2002). Usually the time horizon to which the PD refers is one year. The PD is typically, but not mandatorily, estimated through the use of models which draw on macroeconomic and socioeconomic variables. Generally two different approaches are applied in the models: "point in time" and "through-the-cycle" (Balás, 2009). The former estimates the PD on the basis of the current economic situation, whereas the latter takes into account the long-term trend, i.e. it provides an average value over the economic cycle.

The concept of the PD has gained in importance as a result of the increasing popularity of risk-adjusted pricing (RAP), which is considered best practice in lending (Spreeman and Gantenbein, 2007). RAP means that the price of a credit contains a "premium", or to be more precise, an additional charge, which should correspond with – and therefore pay off – an expected loss ("standard risk cost"). Therefore the result of RAP is that banks can grant loans with an individual risk premium for every single client, instead of pricing loans via a standard price, including an interest margin. The key variable in the RAP approach is the expected value of the loss for the bank, generally referred to as expected loss. The expected loss can be expressed as a ratio (EL_R) or a monetary amount (EL_M). When estimating the EL_R, the first element that needs to be known is the likelihood that a borrower will default within a given time horizon, i.e. the PD. Second, the EL_R depends on the fraction of the credit exposure that is lost if the borrower defaults (typically expressed as a proportion of nominal). This ratio, usually referred to as loss given default (LGD), is equal to one minus recovery rate (RR). The RR is an estimation of the collectability of the loan and indicates that in a given default only a part of the exposure is lost. Finally the EL_M is calculated by multiplying the EL_R by the exposure at default (EAD), which describes the amount of the exposure at the moment of default. The above-mentioned relations can be expressed in terms of the following equations:

(1) $EL_R = PD * LGD$

(2) $LGD = 1 – RR$

(3) $EL_M = EL_R * EAD$

The variable EL_M reflects the figure which must be compensated by means of a risk premium that has been calculated actuarially. The definition of a default – crucial when calculating EL –

is provided by Basel II.[4] Basel II also introduces an internal ratings-based (IRB) approach, whose core is the estimation of the PD.[5] Opting for this approach requires the application of sophisticated rating models by the banks. Taking the longer-term view, RAP and capital adequacy regulations create in turn a kind of "lemons problem" because banks with more primitive rating approaches fear that poor quality borrowers rejected by banks with sophisticated risk management systems will end up with them. Thus, this development creates market pressure for banks to develop and use sophisticated internal rating systems.

In combination, these two factors – RAP and capital adequacy regulations – will contribute to a continued increase in the use of PD estimates in bank risk controlling systems, and this should, ultimately, result in a steadily improving data base.

At this point it might be worth mentioning that even though RAP and the IRB approach are based on the estimation of the PD, the two concepts target different areas of loss distribution. The aim of RAP is to give a best possible estimation for the provision designed to cover the expected loss, while the intention of the capital adequacy regulation is to estimate the unexpected loss (UL). The reason for this is based on the logic that the expected loss should be covered by the loan loss provisions. Thus, the supervisory capital requirements for credit risk should cover unexpected losses. The difference between expected and unexpected loss is illustrated in Figure 1, which shows a credit loss distribution. The losses that will not be exceeded, with a probability of 99.9%,[6] are called the value at risk. The difference between the value at risk and the expected loss is the unexpected loss.

Figure 1 – Probability Distribution of Potential Losses

Source: Federal Reserve Board (2006)

[4] A default is considered to have occurred with regard to a particular obligor when either or both of the two following events have taken place. 1) The bank considers that the obligor is unlikely to pay its credit obligations to the banking group in full, without recourse by the bank to actions such as realising security (if held). 2) The obligor is past due more than 90 days on any material credit obligation to the banking group. Overdrafts will be considered as being past due once the customer has breached an advised limit or been advised of a limit smaller than current outstandings (cf. Basel Committee on Banking Supervision, 2006).

[5] More precisely: The framework distinguishes two alternatives of the IRB approaches: Foundation IRB (F IRB) and Advanced IRB (A IRB). In the former, the banks only estimate the PD; in the latter, banks are allowed to estimate more risk parameters in addition to the PD, namely LGD and EAD. However, both alternatives are usually only referred to as IRB approach.

[6] Parameters other than 99.9% can be chosen for the estimation of the value at risk.

3.2 Implementation: practical and technical obstacles

The SNB started work on a loan quality survey in 2002. Yet banks will not begin to report data until the third quarter of 2010. It therefore took nearly eight years to implement this survey. Why did implementation take so long? The answer can be split into two parts – a more or less political (or cost-related) reason and a technical (or statistical) reason. At the beginning of the discussions, banks feared that the intention of this survey was to implement an IRB approach for all banks through the back door. This fear was alleviated by clearly stating that the SNB would use the existing data and would not make any prescriptions.[7] The lack of any binding principles with regard to the design of banks' internal risk management systems has led to a non-harmonised data source. The heterogeneity of the different risk management systems, in turn, creates problems of data comparability. These problems, together with technical issues, turned implementation of the survey into a challenge.

In order to obtain a solution to the technical (statistical) hurdles, three main building blocks were necessary:

1) Collection of the location parameters of the PD distribution.

2) Collection of the average values for the PD and EL for every single PD quartile and for the whole population.

3) Modification to the quartile calculation.

Adequate results have mainly been achieved through the third building block, i.e. by modifying the quartile calculation. Collecting location parameters and their related means has provided comprehensive information on PD distribution and loan coverage, and made it possible to handle the heterogeneous data without harmonising it.

The next section will present the survey, placing the emphasis on the modified quartile calculation.

3.3 The final form of the survey

Since separate reporting of data on every single loan is not feasible, aggregated data is reported in the survey. Loan quality is, as mentioned above, gauged by the PD and the EL.[8] By collecting the means of both the PD and the EL,[9] we can accordingly derive average LGD and average RR by applying equations (1) and (2). At this point the question might be raised as to why information on the LGD is estimated and not collected by the SNB. The answer is that many banks do not keep this information in their systems, because the LGD is often only an intermediate result in assessing the EL.

Due to the fact that a statistical average can be biased by extreme values the survey collects the PD quartiles and the maximum PD. This facilitates the handling of heterogeneous data.

---

7 These would otherwise have generated considerable costs for the reporting agents.

8 Banks report the one-year PD and the one-year EL.

9 In practice, not all loans are rated by the banks. Some banks estimate only the PD or the EL for some loans. Thus, if we were to mix information for the different loan types in one reporting form (loans with PD and EL together with loans featuring only one of these two parameters), the PD and EL could no longer be mutually allocated (i.e. we would not know if PD and EL are based on an identical population). The estimation of an LGD on the basis of two different independent loans should be classified as a misleading result. To obtain a picture for all loans, and not just for those loans for which we have PD and EL data, information is collected on all loan types separately (loans with PD and EL, loans with only one of either PD or EL and non-rated loans). In the event that only PD or EL is available, banks provide the mean, the quartiles and the mean of the quartiles in each case for the parameter in question.

To ensure that the LGD can be calculated PD quartile by PD quartile the average values of the PD and the EL are also collected for every single PD quartile.

When developing the survey, the question arose as to how the quartiles need to be calculated if we are to obtain useful additional information. Quartiles are usually calculated one-dimensionally. What this means is that the population is sorted by one variable and the resulting output is a value that depends on the number of units of the population. For financial stability purposes, however, the number of loans is much less important than the volume of loans. Thus quartiles based on the number of loans do not provide an adequate result. To illustrate this point, let us take the simplified example of a portfolio of four loans A, B, C, D (see Table 1). In this example we assume a constant LGD of 50%. We also assume that the loan volume is equivalent to the exposure at default.

Table 1

Simplified example

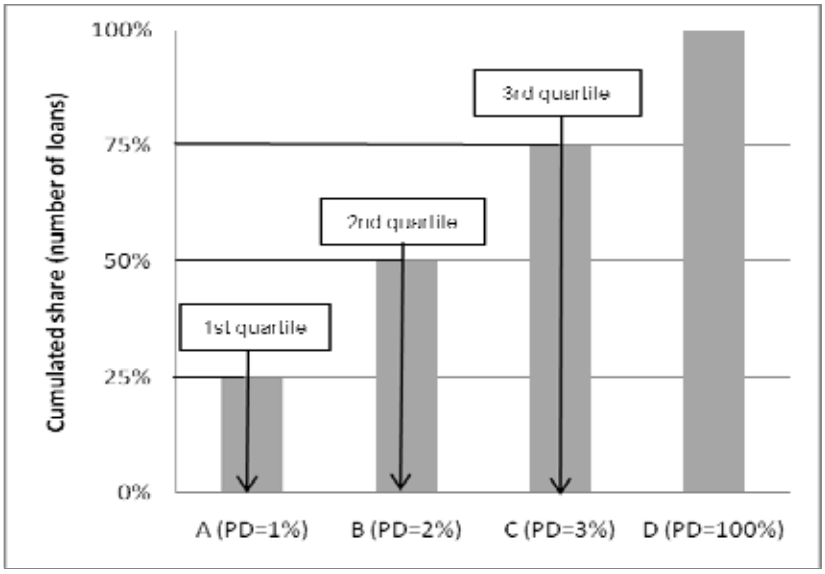
	Loan A	Loan B	Loan C	Loan D
PD	1%	2%	3%	100%
EL	0.5%	1%	1.5%	50%
Loan volume	$2	$3	$20	$75

It is evident that loan D, which has a PD of 100% and a loan volume accounting for 75% of the total loan volume of the given portfolio, is the most important with regard to financial stability.

However, an “ordinary” quartile calculation would undervalue the risk. In our example, with a portfolio of four loans, one loan corresponds to 25% of the population. Thus the result of an “ordinary” quartile calculation would be that the first quartile consists of loan A, the second quartile of loan A and B and so on. Our interpretation would be that 25% of the loans have a PD not exceeding 1%, 50% of the loans a PD not exceeding 2% and 75% of the loans a PD not exceeding 3%. At this point it should be borne in mind that these 75% of the loans only account for a 25% share of total loan volume. The result of an “ordinary” quartile calculation is shown in Figure 2.

Figure 2

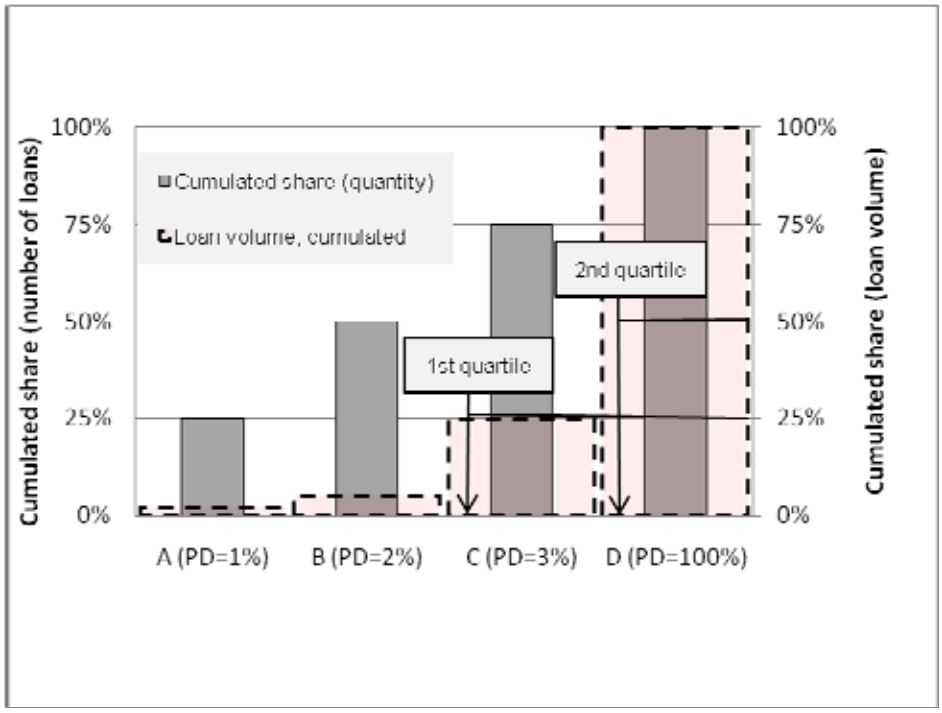
“Ordinary” quartile calculation



As mentioned above, for financial stability purposes the loan volume is the relevant criterion. By adding the relevant loan volume, we obtain the following result: 25% of loan volume has a PD not exceeding 3%.

Figure 3

Modified quartile calculation



The approach adopted for the SNB survey on loan quality is as follows. The information it collects for each individual quartile depends on the quantity of individual loans and has a PD value as its outcome. To obtain this result, the loans are sorted in ascending order according to their PD values, as is done in the "ordinary" quartile calculation. But the criterion whereby the population is divided into four subsets is the loan volume, or more precisely, the cumulated shares of the loan volume. The resulting quartiles are the PD values that divide the volume of the loans into four equal subsets.[10]

Taking up the above-mentioned example, banks would report for the first quartile for which:

- 25% of the loan volume with the lowest PDs has a PD not exceeding 3%
- 25% of the loan volume with the lowest PDs has an average PD of 2.72%
- 25% of the loan volume with the lowest PDs has an average EL of 1.36%
- 25% of the loan volume with the lowest PDs is composed of three loans

We can then estimate that the average LGD of these 25% of the loan volume with the lowest PDs amounts to 50%. For the second quartile they would report the quartile value of 100% and an average PD of 75.6%, and so on. The values of the third quartile would then be equal to those of the second quartile. This result better reflects the risk in the given loan portfolio.

[10] It lies in the nature of this calculation that a single loan will not always exactly match the quartile limits (25%, 50%, 75%). Therefore the quartile PD value is defined as the PD of the loan which lies at least partly below the limit in question.

To assess both the distribution within a quartile and the significance of quartile values, the number of loans is collected. As regards lending volume, the survey is based on the EAD.[11] If the EAD is not available, the amount is approximated by the higher of either the value of any facilities approved by the relevant authority without further credit decision (credit lines), or any facilities actually drawn down.[12] Data on loans collected in this survey are broken down by industry, whereas households figure as a separate category in this breakdown.[13]

To complete the description of the survey, the basic framework is defined as follows: the questionnaire asks for all loans recorded in the balance sheet to be listed under "mortgage claims" and "claims against customers". This ensures that the data can subsequently be compared with other SNB statistics. Data is reported on a quarterly basis at consolidated level, i.e. the reporting entity is the corporate group. Data collection will start as of the third quarter of 2010. 12 banks with a share of more than 85% of domestic lending volume will participate in the survey.

The next section describes how the data can be used for financial stability analyses.

3.4 Use of the data

Usually, financial vulnerabilities are not built up in a single period. Thus time series analysis is crucial for monitoring loan quality. The survey on loan quality provides data that are well suited for this purpose and allow the SNB to keep track of movements in the portfolios of individual banks. In addition to the intra-bank view, an inter-bank view can be obtained by monitoring changes in "spreads" between the different types of means[14] of different banks. This involves comparing movements in the differences in bank means.

One of the main merits of rating systems is in estimating the capital level, be it regulatory capital or economic capital (in terms of the loss provision), that banks have to maintain over the given risk horizon. By, for example, using the UL function defined in the Basel Capital Accord, it becomes possible to establish a certain connection to capital requirements. For instance, it is possible to determine a certain capital level by using the UL formula of the F IRB[15] approach, which defines the required regulatory capital on the basis of the PD estimation of a given bank. This relationship can then be used for macro-stress testing by comparing the capital levels for the bank's estimate of PD X_i and the capital level for a "stressed" PD ($Xi_{\square} + \Delta X_{st}$). A result of such an exercise would, for instance, be that a 10% deterioration in the PD would result in a 12% increase in required capital. This could then be related to the bank's eligible capital. However, due to the heterogeneity of the data, the results should be interpreted qualitatively rather than quantitatively. In other words, the above-mentioned 12% should not be interpreted literally as 12%, but rather as a risk indicator which should not exceed a certain threshold.

Once the first data are reported, further options are tested.

---

[11] Banks are asked to report the EAD without consideration of any collateral, specific provisions or partial write-offs (i.e. gross EAD).

[12] We assume that a borrower will exhaust his credit line on the eve of a default.

[13] Banks with a substantial volume of loans abroad also provide this breakdown for foreign loans. All other banks report only the total amount of foreign lending.

[14] Four types of means are provided in this survey – the mean for the population and those for three quartiles.

[15] See footnote 5.

4. Conclusion

Due to both the heterogeneity of the banks' internal risk systems and the heterogeneity of the models upon which the latter are based, the comparability of the data is restricted to a certain extent. With the way the survey is set up, however, we are convinced that it is well suited for monitoring changes in portfolio quality and for forming a reliable data basis for macro-stress testing.

The innovative design of the survey and especially the modified quartile calculation makes it possible to use an existing data source. Given the fact that, usually, financial vulnerabilities and financial imbalances are not built up in a single period the data basis is sufficient to monitor trends in banks' loan portfolios. Furthermore, we should bear in mind the fact that using an existing data source minimises the reporting burden.

As regards future prospects, this positive assessment is supported by the fact that many banks are currently in the process of improving and enhancing their internal rating systems. Furthermore, some banks emphasised that they do not have adequate PD and EL numbers due to a lack of defaults and the fact that their time series do not consist of a whole business cycle and are therefore too short. For this reason, some banks are currently developing data pooling models.[16] This will further improve the quality of the data.

Despite this positive assessment, the fact remains that the data base is not harmonised. Thus, individual figures reported by one bank cannot be directly compared to those reported by another. To return to the initial question, we might therefore describe this survey – based on quantitative values – as a qualitative survey in a quantitative "suit".

References

Balás, T. (2009): "Comparison of the indicators describing the loan portfolio quality of the banking sector", *Report on financial stability 2009, Background study III.*

Basel Committee on Banking Supervision (2003): "Overview of the New Basel Capital Accord", *Consultative Document, BIS.*

Basel Committee on Banking Supervision (2006): "International Convergence of Capital Measurement and Capital Standards", *Revised Framework, BIS.*

Boemle, M. et al. (2002): "Geld-, Bank- u, Finanzmarkt-Lexikon der Schweiz", Zürich.

Federal Reserve Board (2006): "Basel II Capital Accord; Notice of Proposed Rulemaking (NPR)"; http://www.federalreserve.gov/generalinfo/Basel2/NPR_20060905/NPR/section_1.htm; accessed on 10 June 2010.

Spreemann, K. and Gantenbein, P. (2007): "Zinsen Anleihen und Kredite", *Oldenburg Wissenschaftsverlag, München.*

[16] The resulting concession is that the SNB is granting banks a transition period until 2015 to report the data. All banks have to report the volume and the number of loans from the inauguration of the survey. But data on PD and EL is not to be reported until data are available in the reporting systems.

Session 5 B

Marrying analytical methods and frameworks with data sources

Chair: Charles Thomas, Board of Governors of the Federal Reserve System

Papers:

CDS and government bond spreads – how informative are they for financial stability analysis?
Irina Mihai and Florian Neagu, National Bank of Romania

Market uncertainty and market instability
Patrick Slovik, Organisation for Economic Co-operation and Development

Measuring carry trade activity
Stephanie Curcuru, Clara Vega and Jasper Hoek, Board of Governors of the Federal Reserve System

The current crisis and macroeconomic statistics: statistical initiatives and challenges at the Central Bank of Nigeria
Muhammad A Bamanga, Central Bank of Nigeria

CDS and government bond spreads – how informative are they for financial stability analysis?

Irina Mihai[1] and Florian Neagu[2]

1. Introduction

Changes in CDS spreads[3] are shaping to an increasing extent markets' risk perceptions, although there is no consensus about the adequacy of the informational content provided by such instruments. Some voices (e.g. Altman, 2010; Hart and Zingales, 2009) consider CDS to be one of the most important indicators of credit quality. Other opinions highlight that the CDS market structure and pricing might endogenously bear some drawbacks, and the signals delivered by CDS should be cautiously valued (e.g. Anderson, 2010; Longstaff et al., 2007). The CDS instruments for emerging markets hold even more adverse characteristics (in terms of liquidity, concentration, deepness etc.), calling for additional caution in reading CDS spread developments.

The wider use of CDS information is taking place jointly with a fading-away of the role of government bond spreads. Alexopoulou et al. (2009) argue the bias towards CDS spreads is normal: (i) bond yields are subject to some characteristics affecting the price; (ii) the credit spread is more easily inferred from CDS contracts being directly priced, while bond spreads deliver differences based on the benchmark assumption; and (iii) the bond market is more prone to low liquidity than the CDS market (although the CDS market is more concentrated and the price displays a higher correlation with peer countries during turbulent times). Soros (2009) argues that it is easier to take a short position on an entity using a CDS contract instead of shorting a bond, as a CDS investor is not exposed to a similar loss asymmetry.

In this paper we question how germane for the macroprudential analysis is the informational content delivered by CDS and government bond spreads. We focus on the Romanian case, targeting three issues: (i) the degree to which the movements in CDS or bond spreads are linked with Romanian fundamentals and their specific risk; (ii) which instrument leads in the price discovery process; and (iii) the impact of CDS and bond spreads' dynamics on the interest rates charged by banks to their customers.

---

[1] National Bank of Romania, Financial Stability Department, email: Irina.Racaru@bnro.ro

[2] National Bank of Romania, Financial Stability Department, email: Florian.Neagu@bnro.ro

The opinions expressed in this paper are those of the authors and do not necessarily represent the views of the National Bank of Romania, nor do they engage it in any way. We convey special thanks to Ion Drăgulin, Adrian Costeiu, Jochen Andritzky, Mihai Copaciu, and Nicolae Chideşciuc for their contributions in drafting this paper.

[3] CDS are instruments for which the buyer pays a regular fee (e.g. on a quarterly basis for the Romanian sovereign CDS case), and receives the full amount of the reference instruments (if physical settlement) or net of the recovered amount (if cash settlement) when a specified credit event occurs. The CDS spread represents the annualized fee that the buyer pays during the life time of the contract or until the event occurs. In the case of sovereign CDS contracts for the Eastern European countries, the credit events considered are: failure to pay, obligation acceleration, repudiation/moratorium, restructuring. The form of debt covered by CDS contracts in this case is only foreign currency internationally issued bonds (ISDA, 2010a).

In searching for answers, we combine three types of databases:

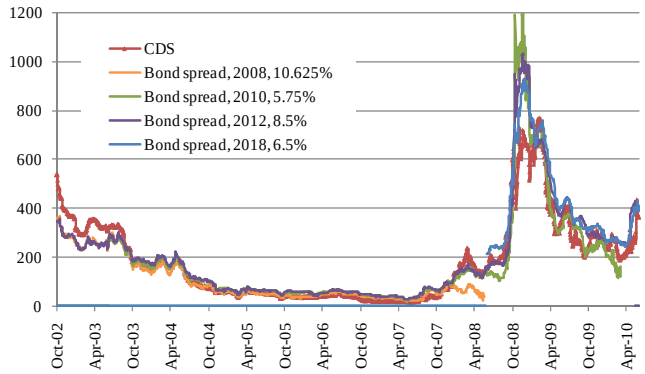
(i) Public information data, provided especially by DTCC, Bloomberg, and CMA. We present in Annexes 2 and 3 a summary of these data. We use CDS spreads for both euro and US dollar denominated contracts. We observe no significant differences between the two prices. US dollar contracts bear the advantage of longer tenure series (since October 2002, while the euro contracts last from January 2004). The 5-year CDS is the most liquid instrument for Romanian sovereign debt (similar to other Central and Eastern European countries). We use Bloomberg data to collect Romanian international bond prices, and compute the spreads against similar German bonds. We use only the 2008, 2010, and 2012 maturity issuances, because no CDS spread quotations are available before October 2002. We compute monthly data as average daily values.

(ii) An ad-hoc survey sent to all Romanian banks to get inputs from their side about the role of CDS and bond spreads in assessing risks and in impinging on their financing costs. Banks that answered the questions count for more than a 90% market share of banking sector assets. The survey included two similar subsections: one on CDS spreads and another on international bond spreads. The questions were: (i) if banks monitor the evolution of these spreads, eg they include them in their internal reports for the banks' management; (ii) if and to what extent are these spreads affecting their funding costs; and (iii) if and to what amount they pass these costs to the real sector.

(iii) Individual information about the interest rates charged by each Romanian bank to its clients (distinct for companies and households) for the new loans denominated in euros during January 2007–May 2010. Euro denominated loans account for approximately a 50% share in total household and company loans.

The Romanian sovereign CDS market is relatively small compared to other countries from the region (similar to Bulgaria). The net notional value stands at about USD 1.2 bln (June 2010). The number of contracts and the average contract value augmented after the end of October 2008, but at the cost of market concentration: net notional value has embarked on a downward trend in the last two years (decreased by 40%, October 2008–June 2010). The process is in tune with the region (Annex 1).

Chart 1:
Basis risk[4] for Romanian CDS 5-year contracts
(basis points)



Source: Bloomberg, own calculations.

[4] See Andritzky and Singh (2006) for a detailed insight into basis effects.

The outstanding amount of Romanian international bonds[5] is very thin (Annex 1), but the number of players quoting such instruments is larger than in the CDS instruments case[6].

Despite these market characteristics, the importance of CDS spreads in building up risk perception about Romania seems to be on an upward trend. Starting from 2008, there is a growing number of literature and media positions assessing Romanian risk through the CDS lens. Many domestic banks screen CDS developments to get a better flavor about the trend of perils. According to the ad-hoc survey we have conducted on Romanian banks, especially medium and large banks monitor and include information about CDS spread developments in their internal reports to the management. No Romanian bank is involved in trading CDS instruments (August 2009), whatever the purpose (hedging or speculation). Almost 75% of the Romanian banks do not pay attention in their internal reports to government bond dynamics. There are a few banks trading such bonds, both for hedging and speculative purposes, but the amount is modest (about EUR 20 mln, August 2009). The annual reports on Romania drafted by major financial institutions or rating agencies exhibit a mixed picture about the importance assigned to the information delivered by CDS or bond spreads (Table 1). There are entities putting no emphasis on such information in assessing the country risk. On the other hand, some institutions consider CDS to provide useful inputs about risk developments.

Table 1

Number of references about CDS/bond spreads in annual reports on Romania

Institution	2005	2006	2007	2008	2009	2010
Raiffeisen Romania	0/0	0/0	0/8	3/9	10/1	4/0
Unicredit Romania	n.a.	n.a.	0	7/0	1/0	5/0
ING Romania	0/0	0/0	0/0	0/0	0/0	0/0
BCR	n.a.	n.a.	0	n.a.	3/0	n.a.
BRD	n.a.	n.a.	0	0	1/0	0
Fitch	0	0	0	0	0	n.a.
Moody's	0	0	0	0	0	0
JCR	0	0	0	0	0	n.a.
IMF	n.a.	0/1	0/2	3/2	2/1	2/0
IIF	0	0	0	0	0	0

Source: Annual reports issued by the above-mentioned institutions.

[5] The analysis is focused only on international bonds as an alternative to CDS contracts in quantifying market perception on country risk. The reason stands in the fact that CDS contracts use as reference only foreign currency denominated bonds (ISDA, 2010a).

[6] According to the survey conducted on the Romanian banks, most of the data sources used by banks for CDS contracts are provided by Bloomberg and Reuters terminals. On Bloomberg, there are only two low level access data providers for Romanian sovereign CDS (as opposed to at least 20 for Romanian international bonds maturing in 2012): Raiffeisen Austria and CMA Datavision (see Annex 2). The latter is an electronic platform which collects data from other financial institutions and, if there are not enough data contributors, provides additional values on a peer group or a model based approach.

The remainder of this paper is organized as follows: Section 2 identifies the factors underlying spread movements, breaking down the determinants into regional, liquidity and specific risk components. Section 3 highlights the level of pass-through from the spread developments to the interest rates charged by banks to firms and households, while the last section concludes the main messages of the paper.

2. What do the changes in CDS and bond spreads depict?

We embark on a macroprudential approach to assess (i) the degree to which CDS and bond spreads explain and mirror sovereign specific risk; and (ii) the link between CDS and bond spreads.

We decompose the CDS spread dynamics into three factors: (i) global and regional systemic risk; (ii) liquidity risk; and (iii) country specific risk. We reach the conclusion that the first two factors count the most in explaining the spreads' movements. This outcome is in line with Longstaff et al. (2007). We replicate the analysis for Romanian international bond spreads and we reach the same conclusion. Similar evidence was found in Amato and Remolona (2003) and Schuknecht et al. (2009).

The methodology behind the analysis is based on a reduced form model:

$S = (1 - RR)PD + RP + Lq$,

where RR = recovery rate, PD = probability of default, RP = risk premium, and Lq = liquidity premium.

We approximate the (1 – RR)PD using public debt to GDP, budget deficit to GDP, GDP growth, and industrial production. For RP we use implied volatility for S&P 500 and for Euro Stoxx 50 indexes (similar to Longstaff et al., 2007). We also include a regional marker like MSCI index prices for Eastern European countries, its volume and its volatility. For the interest free rate we use repo, three month Libor/Euribor, and yield curve indicators – the differences between 2-year and 10-year yields on US and German government bonds. The choice of risk free interest rate is not clear in the literature. Hull et al. (2004) find evidence for the interest swap rate and repo rate. The authors argue that most CDS models use the Treasury rate as the risk free rate, while the market practice seems to prefer the interest swap rate.

For Lq we use the bid-ask spread. As an alternative indicator we use the number of quotations per month, but it was not found significant. The liquidity component[7] for CDS spreads is highly conditioned on the global risk aversion sentiment and, to a lesser extent, on regional mood. These two factors explain over 50% of bid-ask spread variance. In the bond case, the link with risk aversion is much less important. The results are presented in Annex 4. Spreads' sensitivity to factors tested changed after November 2004 (Fitch granted Romania the investment grade), and October 2008 (Lehman Brothers went bankrupt, S&P downgraded Romania to below investment grade, and the domestic currency suffered a speculative attack).

The shifts in coefficients were detected using recursive coefficient estimations (for individual coefficients) and Chow break tests (for all coefficients). The individual tests show mild changes in the first breakpoint (November 2004), and important shifts in the second one (October 2008). The results of the aggregate tests are presented in Annex 4. The second aim of the analysis is to gain an insight into the link between the bond and CDS spreads.

[7] Brigo et al. (2010) provide an extensive overview of the estimation for the CDS liquidity premia.

Price discovery[8] is considered one of the most important CDS benefits. The method applied is similar to Dötz (2007).

We find for the Romanian case that both CDS and bond spreads count for the price discovery process, but CDS seems to matter more (Annex 5). We conduct our tests using various bond spread series: a synthetic 5-year bond spread index and singular bond spread. We re-run the tests on a monthly basis (using average monthly prices) to check the validity of the results (without heteroskedastic autoregressive profile). The outcome is alike.

Our results are similar to other studies on sovereign CDS (e.g. Ammer and Cai, 2007; Coudert and Gex, 2010). However, the evidence in literature is mixed. Ashcraft and Santos (2007), and Blanco et al. (2004) find that CDS spreads lead bond spreads, while Dötz (2007) shows vice-versa. Chan-Lau and Kim (2004), and Ammer and Cai (2007) indicate that alternations in price discovery role for CDS and bonds is due to shifts in liquidity toward CDS markets in turmoil periods. Varga (2009) investigates this relation for some Eastern European countries and finds that, for Romania, the bond market led the CDS market during 2005–2008, while an inverted relation is reached when considering the year 2008 alone.

3. Do banks pass through the changes in CDS spreads to their clients?

Changes in CDS or bond spreads might impair financial stability indirectly (altering risk perception), and directly (through the cost channel). In this second channel, banks that finance from abroad might face an additional charge. If such costs are passed on to the clients, an increasing debt service burden will put pressure on the default rate.

We ask two questions: (i) how much an adjustment in spreads affects the costs of the Romanian banks that finance from abroad; and (ii) what is the level of pass-through of such changes in the CDS spreads to the interest rates charged for the banks' clients.

From the ad-hoc survey, we discover a rather poor relation between, on the one hand, CDS and bond spread dynamics, and, on the other, the cost of financing from abroad for Romanian banks. The majority of banks declare no relation between spreads and their funding cost (from the parent bank or from other foreign lenders). However, there are some banks (especially the larger ones) indicating a strong direct link between the spreads and their cost of external financing. The CDS price matters on a larger scale than the bond spread.

We investigate if domestic banks transfer the CDS spread costs to the real economy and households. Only few banks reported in the ad-hoc survey that they use CDS spreads in computing credit margins for households. The amount at stake is very small: 0.2% of total loans granted to households (August 2009). Banks' motivation was mostly determined by requirements to increase transparency on interest rates and margins on retail contracts.

We test the link between the interest rate on new loans in euros for households and for companies and CDS spreads and CDS dynamics, to check for indirect effects. We use the

[8] The price discovery process is discussed in detail in Garbade and Silber (1983) and Hasbrouck (1995). For the purpose of this paper, the understanding of this process relies on that provided by Hasbrouck (1995). He notes that "it is generally acknowledged that it is relatively expensive for a market to provide a price discovery mechanism: balancing supply and demand in an orderly fashion requires procedural safeguards that are costly to provide. In contrast, once a price has been determined and publicized, it is relatively cheap to provide order matching or crossing functions that simply pair off buyers and sellers at that price."

monthly average figures reported by each Romanian bank during January 2007–May 2010, and run a Granger causality test[9].

We find no direct link between CDS spreads and CDS dynamics, on the one hand, and the new interest rate charged to companies, on the other hand. Both econometric results (Granger causality test at the individual and aggregate level), and the ad-hoc survey support this conclusion. In the case of households, the results are mixed. We cannot rule out such a link at the average banking sector level. We run a dynamic panel using the GMM technique on the first 20 banks (based on their assets and household and corporate portfolio). The outcome is similar. The CDS spread dynamics are not found important in the corporate case, but are significant for households. Results are displayed in Annex 6.

4. Conclusions

Anecdotic evidence exhibits a mounting role for CDS spreads in building up risk perceptions about Romania, while the similar task for sovereign bonds seems to be fading away. We adopt a macroprudential perspective to assess (i) to what extent a movement in spreads is able to signal, in a forward looking approach, an adjustment to the Romanian specific risk; and (ii) the impact on the interest rates charged by the Romanian banks to their clients due to changes in CDS spreads.

We find that markets for Romanian CDS and bond spreads display some features that would call for caution when judging their information content. The CDS market is very small, on an upward trend in terms of concentration, and with a low number of transactions. The outstanding amount of Romanian international bonds is very thin, but the number of players quoting such instruments appears to be larger as in the CDS case. Domestic banks are not involved in trading the Romanian CDS. To trade bonds issued internationally is not a widespread activity within the Romanian banking sector, being concentrated to a few banks and counting to small amounts.

The most important factors explaining Romanian spread movements are liquidity risk and regional mood. The specific factor, i.e. the Romanian stance of risk, modestly counts in spread dynamics. The link between changes in fundamentals and spreads is humble.

Both CDS and bond spreads are important for the price discovery process. Bonds are the followers during the analyzed tenure (October 2002–June 2010).

There is no direct link between CDS spreads and the new interest rate charged by banks to companies. Both econometric results and the ad-hoc survey support this conclusion. For household financing, the output is mixed. We cannot rule out such a link at the average banking sector level. However, the amount of household loans linked to CDS spreads is very small: 0.2% of the total credits granted to households (August 2009).

[9] The Granger causality test has to be read with caution. First, the test should not be interpreted as causality of CDS spreads to interest rates, but rather as the forecast capacity of CDS spreads for interest rates. Second, the results generated by Granger causality might be invalidated because: (i) during the crisis the financial variables are highly heteroskedastic (affecting the output of the test; Davidson and MacKinnon, 2003); and (ii) the test is very sensitive to number of lags and how the variables are transformed into stationary variables (Hamilton, 1994).

Annex 1:
CDS and government bond market characteristics

	CDS								International bonds and notes – amounts outstanding (bln USD)	
	Net notional value (bln USD)		Gross notional value (bln USD)		Number of contracts		Average contract value (mln USD)			
	10/31/2008	6/25/2010	10/31/2008	6/25/2010	10/31/2008	6/25/2010	10/31/2008	6/25/2010	9/2008	3/2010
BG	1.82	1.05	15.76	17.63	1,514	1,729	10.41	10.20	2.4	2.2
CZ	1.17	0.92	4.67	9.82	382	786	12.22	12.49	12.7	17.3
EE	0.65	0.42	2.18	3.23	287	393	7.59	8.23	1.6	0.4
HR	0.79	0.66	4.12	6.62	557	892	7.40	7.42	6.2	6.4
HU	4.38	3.33	32.76	57.34	3,014	4,421	10.87	12.97	38.3	37.3
LT	0.72	0.67	3.22	5.17	411	563	7.82	9.18	5.4	9.6
LV	1.13	0.71	6.28	8.39	822	956	7.64	8.78	1.7	1.3
PL	2.43	2.04	16.45	27.60	1,516	2,396	10.85	11.52	42.6	55.3
RO	1.93	1.19	11.94	16.04	1,283	1,610	9.31	9.97	4.7	5.4
RU	8.47	3.87	110.07	98.09	7,651	6,736	14.39	14.56	63.8	56.8
TR	6.98	5.81	188.63	138.35	14,093	8,027	13.38	17.24	41.6	43.7
UA	3.15	1.49	65.54	44.67	6,023	3,180	10.88	14.05	11.8	10.9
Median	1.88	1.12	13.85	16.84	1,398	1,669	10.63	10.86	9.00	10.25
Total	33.62	22.17	461.60	432.96	37,553	31,689	12.29	13.66	233.3	247.0

Source: DTCC, BIS, own calculations

Annex 2:
CDS[10] and bond spread statistics

Statistics for Romania CDS EUR and bid-ask spread

	Bloomberg		CMA (London)		CMA (New York)		Raiffeisen Austria	
	Mid price	Bid/ask	Mid price	Bid/ask	Mid price	Bid/ask	Mid price	Bid/ask
Mean	291	17	162	13	160	13	250	19
Median	272	10	62	8	82	9	197	10
Min	113	1	17	1	17	1	34	-30
Max	706	60	786	100	781	100	788	240
Std	115	16	177	15	167	14	206	21
Skewness	1.4	1.5	1.6	3.0	1.7	2.8	1.1	4.1
Kurtosis	5.2	4.5	5.0	12.4	5.6	11.4	3.2	36.3
No. obs.	634		1,475		1,687		710	
No. months*	18		69		78		38	
Period	10/2/2004–6/21/2010		10/1/2004–6/21/2010		1/1/2004–6/21/2010		2/10/2004–6/21/2010	

* number of months with more than 10 daily quotations (from a maximum of 78)

Source: Bloomberg, own calculations

[10] For extended references on various databases on CDS spreads see ISDA (2010b), Mayordomo et al. (2009)

Statistics for Romania CDS USD and bid-ask spread (cont)

	Bloomberg		CMA (London)		CMA (New York)		Raiffeisen Austria	
	Mid price	Bid/ask	Mid price	Bid/ask	Mid price	Bid/ask	Mid price	Bid/ask
Mean	181	13	160	12	158	13	211	15
Median	153	9	61	8	78	9	169	8
Min	17	1	17	1	17	1	18	-37
Max	769	100	786	100	781	100	785	240
Std	165	14	175	15	165	14	204	22
Skewness	1.3	2.8	1.6	3.1	1.7	2.8	1.1	3.9
Kurtosis	4.5	11.9	5.1	13.2	5.8	11.9	3.2	30.0
No. obs.	1,956		1,462		1,666		858	
No. months*	93		69		78		43	
Period	10/16/2002–6/21/2010		10/1/2004–6/21/2010		1/2/2004–6/21/2010		1/25/2006–6/21/2010	

* number of months with more than 10 quotations (from a maximum of 93)
Source: Bloomberg, own calculations

Statistics for Romanian bond spreads and bid-ask spreads

	Bond1 (2008)		Bond2 (2010)		Bond3 (2012)		Bond4 (2015)		Bond5 (2018)	
	Average spread	Bid/ask	Average spread	Bid/ask	Average spread	Bid/ask	Average spread	Bid/ask	Average spread	Bid/ask
Mean	104.1	4.4	164.6	4.6	193.8	5.2	359.9	5.4	422.8	7.5
Median	58.5	4.4	105.4	4.4	146.1	4.9	355.0	5.3	346.6	6.8
Min	19.3	2.7	19.3	1.3	25.3	3.2	258.2	4.8	211.8	5.4
Max	437.1	8.2	1,204.8	14.2	1,026.6	12.6	512.4	6.5	931.1	12.5
Std	88.9	1.1	187.6	1.7	182.9	1.6	88.1	0.6	190.5	1.9
Skewness	1.29	0.69	2.94	2.29	2.03	1.84	0.23	0.37	1.10	1.06
Kurtosis	0.53	0.53	9.83	8.89	4.92	4.90	8.23	8.23	2.14	2.14
No.obs.	1,473		1,798		2,007		80		525	
Period	10/1/2002–5/30/2008		6/24/2003–5/31/2010		10/1/2002–6/30/2010		2/11/2010–6/30/2010		6/12/2008–6/21/2010	

Source: Bloomberg, own calculations

Annex 3:
Data sources

Indicators	Observations	Source
Romanian CDS		
CDS USD	5Y series, monthly average	Bloomberg
CDS EUR	5Y series, monthly average	Bloomberg
Romanian bond		
BOND1 (ISIN: XS0131554700)	monthly average	Bloomberg
BOND2 (ISIN: XS0171638330)	monthly average	Bloomberg
BOND3 (ISIN: XS0147466501)	monthly average	Bloomberg
BOND4 (ISIN: XS0495980095)	monthly average	Bloomberg
BOND5 (ISIN: XS0371163600)	monthly average	Bloomberg
Risk free rate		
Euribor 3M	monthly average	Bloomberg
USD and EUR Libor 3M	monthly average	Bloomberg
USD and EUR repo rate	monthly average	Bloomberg
USD and EUR swap rate	monthly average	Bloomberg
Slope		
Government 2Y	monthly average	Bloomberg
Government 10Y	monthly average	Bloomberg
Yield slope	difference between government 10Y and government 2Y yields, monthly average	Bloomberg
Volatility		
VIX and VSTOXX	monthly average	Bloomberg
Regional factors		
MSCI Eastern European Index (MSCI EE)	monthly average	Bloomberg
MSCI Eastern European Volatility 100 days	monthly average	Bloomberg
MSCI Eastern European Volume	monthly average	Bloomberg
Macro economic factors		
Public expenses (% of public revenue)	monthly data	MFP
Budget deficit (% of GDP)	monthly data	MFP
Public debt (% of GDP)	monthly data	MFP
GDP growth rate	quarterly data, interpolated	NIS
Industrial production (2005 = 100%)	monthly data	NIS
Confidence indicator	monthly data	EC

Note: MFP stands for Minister of Public Finance, NIS for National Institute for Statistics and EC for European Commission

Annex 4:
Regression analysis for CDS spreads

All the variables (CDS and bond spreads, bid-ask spreads etc.) are in percentage points. The table displays regression coefficients and Newey-West adjusted standard errors. CDS and bond liquidity premia are calculated as residuals (see the third table below). The series were tested for unit root using Augmented Dickey-Fuller and Phillips-Perron, but the results are not included in this paper. In bold are tests significant at 5% and in italic those that are significant at 10%.

	ΔCDS		ΔCS	
	(1)		(2)	
CDS/CS Liquidity Premia	**3.5**	0.92	**19.4**	6.7
ΔPublic Deficit/GDP	0.1	0.08	-0.1	0.1
ΔPublic Debt*/GDP	**0.2**	0.06	0.1	0.1
ΔIndustrial Production	0.0	0.02	*-0.1*	0.0
ΔCurrent Account/GDP	0.0	0.06	0.0	0.1
ΔRisk Free Rate	-0.3	0.25	-0.3	0.3
ΔVIX Index	**0.04**	0.01	**0.04**	0.02
ΔMSCI EE	*-0.004*	0.00	0.0	0.0
ΔMSCI EE Volatility	*0.02*	0.01	**0.1**	0.02
constant	-0.03	0.03	0.0	0.0
Adj. R2	0.57		0.67	
Durbin-Watson statistic	1.87		2.03	
Breusch-Godfrey serial correlation LM test	F-stat: 0.22 Prob F(1,76): 0.64		F-stat: 0.02 Prob F(1,77): 0.89	
Breusch-Pagan-Godfrey heteroskedasticity test	F-stat: 2.98 Prob F(9,77): 0.00		F-stat: 4.38 Prob F(9,77): 0.00	

* domestic debt only
CS = bond spread. We conduct tests on both synthetic 5Y-spread and individual bond spread. The results are similar.
B/A = bid-ask spread (difference between ask and bid quotations)

Chow breakpoint test

		F-statistic	Probability	Log likelihood ratio	Probability
Equation on column (1) previous table	11/2004	0.9	0.51	4.7	0.45
	10/2008	**3.2**	0.01	**16.2**	0.01
Equation on column (3) previous table	11/2004	1.1	0.36	4.7	0.32
	10/2008	**10.9**	0.00	**38.5**	0.00

CDS and bond liquidity premia regression results

	ΔCDS B/A		ΔCS B/A	
	(1)		(2)	
ΔVIX	**0.006**	0.00	**0.001**	0.00
ΔMSCI EE	**-0.0006**	0.06		
Adj. R2	0.51		0.05	
Durbin-Watson statistic	1.94		1.92	
Breusch-Godfrey serial correlation LM test	F-stat: 1.47 Prob F(2,86): 0.23		F-stat: 0.66 Prob F(2,87): 0.51	
Breusch-Pagan-Godfrey heteroskedasticity test	F-stat: 15.17 Prob F(2,87): 0.00		F-stat: 0.05 Prob F(1,88): 0.83	

Annex 5:
Contributions to price discovery

We follow the procedure applied by Dötz (2007) to test the contribution of CDS and bond spreads to price discovery. We estimate the Error Correction Model:

$$EC_t = CDS_t - \upsilon - \gamma CS_t$$

$$\Delta CDS_t = \lambda_1 EC_{t-1} + \alpha_1 + \sum_{k=1}^{l} \beta_{1,k} \Delta CDS_{t-k} + \sum_{k=1}^{l} \beta_{2,k} \Delta CS_{t-k} + \varepsilon_{1,t}$$

$$\Delta CS_t = \lambda_2 EC_{t-1} + \alpha_2 + \sum_{k=1}^{l} \beta_{3,k} \Delta CDS_{t-k} + \sum_{k=1}^{l} \beta_{4,k} \Delta CS_{t-k} + \varepsilon_{2,t}$$

We compute price discovery intensity using two measures: Gonzalo Granger (GG) and Hasbrouck (HAS)[11]. A value higher than 0.5 (for GG and MID) signifies that CDS spreads lead the price discovery process.

Cointegration tests*,**

	CDS USD	CDS USD	CDS USD	CDS EUR	CDS EUR	CDS EUR
	ALL	1/3/04 – 7/31/07	8/1/07 – 6/21/10	ALL	1/3/04 – 7/31/07	8/1/07 – 6/21/10
Trace test	**37.8**	**27.5**	**18.8**	**35.5**	**31.7**	**18.8**
probability value	0.00	0.03	0.02	0.00	0.01	0.02
Maximum eigenvalue	**36.2**	**22.3**	**16.8**	**34.4**	**24.8**	**16.8**
probability value	0.00	0.02	0.02	0.00	0.01	0.02

* both test values are for H0: No cointegration relation exists

** the number of lags was determined based on Schwartz Information Criteria

Error Correction Model results

	CDS USD	CDS USD	CDS USD	CDS EUR	CDS EUR	CDS EUR
	ALL	1/3/04 – 7/31/07	8/1/07 – 6/21/10	ALL	1/3/04 – 7/31/07	8/1/07 – 6/21/10
γ	-0.83	-0.98	-0.84	-0.83	-0.97	-0.85
λ_1	**-0.016**	**-0.027**	*-0.013*	**-0.020**	*-0.022*	**-0.019**
H0 λ_1=0 t statistic	-2.9	-2.2	-1.7	-3.3	-1.7	-2.1
λ_2	**0.024**	**0.033**	**0.024**	**0.021**	**0.037**	**0.022**
H0 λ_2=0 t statistic	4.3	3.1	2.9	3.9	3.8	2.7
GG	0.6	0.5	0.6	0.5	0.6	0.5
HAS1	0.5	0.4	0.6	0.4	0.6	0.5
HAS2	0.8	0.8	0.8	0.7	0.9	0.7
MID	0.6	0.6	0.7	0.6	0.7	0.6

[11] For more details on these measures see Dötz (2007).

Annex 6:
Testing the link between CDS spreads and interest rates for new loans

Granger causality test for average new interest rates on new credit in euros

Null hypothesis (test using two lags)*:	F-test	Prob.	F-test	Prob.	F-test	Prob.
	all		period 1**		period 2***	
ΔCDS USD does not Granger Cause ΔIR CNF	2.28	0.11	0.91	0.41	1.80	0.18
ΔIR CNF does not Granger Cause ΔCDS USD	0.02	0.98	2.22	0.12	0.21	0.82
ΔCDS EUR does not Granger Cause ΔIR CNF	2.27	0.11	1.78	0.18	1.65	0.21
ΔIR CNF does not Granger Cause ΔCDS EUR	0.04	0.96	0.48	0.62	0.09	0.91
ΔCDS USD does not Granger Cause ΔIR HH	**5.03**	**0.01**	1.00	0.37	**3.65**	**0.04**
ΔIR HH does not Granger Cause ΔCDS USD	1.60	0.21	0.53	0.59	0.81	0.46
ΔCDS EUR does not Granger Cause ΔIR HH	**5.66**	**0.01**	0.37	0.69	**3.70**	**0.04**
ΔIR HH does not Granger Cause ΔCDS EUR	1.41	0.25	0.67	0.52	0.74	0.48

* IR CNF (HH) represents interest on new credit in euros granted to corporate (household) sector

**period 1: 05/2003–07/2007 (51 observations)
***period 2: 08/2007–05/2010 (34 observations)
HH = households, CNF = non-financial companies

Dynamic panel (GMM)

	01/2007 – 05/2010			
	IR CNF		IR HH	
	(1)		(2)	
ΔCDS spread	-0.40	0.56	**0.19**	0.01
Market position	**-0.04**	0.00	**-0.02**	0.02
IR (t-1)*	**0.66**	0.00	**0.84**	0.00
No of obs.	858		760	
No. of banks	20		20	
Wooldridge test for serial correlation	F-stat: 5.52 Prob F(1,19): 0.03		F-stat: 0.16 Prob F(1,19): 0.69	

*IR (t-1) represents the interest rate on new credit for companies (column 1) and households (column 3).

References

Alexopoulou I, Magnus A, Georgescu O	2009	An Empirical Study on Decoupling Movements between Corporate Bond and CDS Spreads, *Working Paper Series No. 1085*, European Central Bank
Altman E	2010	Sovereign Default Risk Assessment from the Bottom-Up, *NYU Stern School of Business*, http://pages.stern.nyu.edu/~ealtman
Amato J, Remolona E	2003	The Credit Spread Puzzle, *BIS Quarterly Review*, Bank for International Settlements
Ammer J, Cai F	2007	Sovereign CDS and Bond Pricing Dynamics in Emerging Markets: Does Cheapest-To-Deliver Option Matter?, *International Finance Discussion Papers 912*, Board of Governors of the Federal Reserve System
Anderson R	2010	Credit Default Swaps: What are the Social Benefits and Costs?, *Financial Stability Review*, No. 14, Banque de France
Andritzky J, Singh M	2006	The Pricing of Credit Default Swaps During Distress, *IMF Working Paper 254*
Ashcraft A, Santos J	2007	Has the CDS Market Lowered the Cost of Corporate Debt?, *Staff Reports 290,* Federal Reserve Bank of New York
Blanco R, Brennan S, Marsh I	2004	An Empirical Analysis of the Dynamic Relationship between Investment Grade Bonds and Credit Default Swaps, *Working Paper No. 211*, Bank of England
Brigo D, Predescu M, Capponi A	2010	Credit Default Swaps Liquidity Modeling: A Survey, *Quantitative Finance Papers*
Chan-Lau J, Kim Y	2004	Equity Prices, Credit Default Swaps, and Bond Spreads in Emerging Markets, *IMF Working Paper 27*
Coudert V, Gex M	2010	Credit Default Swap and Bond Markets: Which Leads the Other?, *Financial Stability Review*, No. 14, Banque de France
Davidson R, MacKinnon J	2003	Econometric Theory and Methods, Oxford University Press
Dötz N	2007	Time-Varying Contributions by Corporate Bond and CDS Markets to Credit Risk Price Discovery, *Discussion Paper Series: 2 Banking and Financial Studies*, No. 08, Deutsche Bundesbank
Garbade KD, Silber W	1983	Price Movements and Price Discovery in Futures and Cash Markets, *The Review of Economics and Statistics*, Vol. 65, No. 2
Hamilton J	1994	Time Series Analysis*,* Princeton Univ. Press
Hart O, Zingales L	2009	A New Capital Regulation For Large Financial Institutions, *CEPR Discussion Papers 7298*

Hasbrouck J	1995	One Security, Many Markets: Determining the Contributions to Price Discovery, *Journal of Finance*, Vol. 30, Issue 4
Hull J, Predescu M, White A	2004	The Relationship Between Credit Default Swap Spreads, Bond Yields, and Credit Rating Announcements, *Journal of Banking & Finance*, Elsevier, Vol. 28(11)
ISDA	2010a	Credit Derivatives Physical Settlement Matrix, ISDA
ISDA	2010b	Joint Response to Committee of European Securities Regulators (CESR) Technical Advice to the European Commission in the Context of the MiFID Review: Non-Equity Markets Transparency, AFME, BBA and ISDA
Longstaff F, Pan J, Pedersen L, Singleton K	2007	How Sovereign is Sovereign Credit Risk? *NBER Working Paper 13658*
Mayordomo S, Peña JI, Romo J	2009	Are there Arbitrage Opportunities in Credit Derivatives Markets? A New Test and an Application to the Case of CDS and ASPs, *Business Economics Working Papers wb096303,* Universidad Carlos III, Departamento de Economía de la Empresa, September
Schuknecht L, Hagen J, Wolswijk G	2009	Government Bond Risk Premiums in the EU Revisited: the Impact of the Financial Crisis, *ECB Working Paper No. 1152*
Soros G	2009	The Crash of 2008 and What it Means, Chapter 9: The Crash of 2008, *Public Affairs*, revised edition
Varga L	2009	The Information Content of Hungarian Sovereign CDS Spreads, *Occasional Paper No. 78*, Central Bank of Hungary

Market uncertainty and market instability

Patrick Slovik[1]

1. Introduction

While known factors are already reflected in efficient market prices, the main sources of market instability are unknown factors. These unknown factors shall not be referred to as market risk, but as market uncertainty. Efficient market prices can be considered as correct only in reference to a set of known factors. Therefore, from the perspective of market stability, the most important aspect is not market risk, but the degree of market uncertainty embedded in different assets or business models. The market uncertainty theory presented in this paper interprets market behaviour and market instability in a framework that takes into account both market risks and market uncertainty. The first half of the paper describes the market uncertainty theory comprising the market uncertainty theorem and the notion of heterogeneity of market uncertainty. The second half of the paper focuses on policy recommendations relevant for rating agencies, financial institutions, and public authorities.

2. Market uncertainty theorem

The assertion made by the efficient market hypothesis is that markets incorporate all known information and instantly change to reflect new information. The hypothesis has been challenged in the fallout from nearly all of the recent episodes of financial crisis. Before turning to the alternative, it is important to describe the terminology and the setting used in this paper. Market prices reflect the “known information set”, which comprises all information, all knowledge, and all experience available at the time. In addition to the “known information set”, there is also information, knowledge, and experience that is unavailable at the time and will be further referred to as the “unknown information set”. The core point is that in an efficient market the “unknown information set” is not and cannot be reflected in market prices. The notion that markets are always right in their present discounting of the future state of affairs is only correct with reference to the “known information set”. The use of the term “right” is, thus, different to its usage in common discourse. The rightness or correctness of markets is restricted exclusively to available information, available knowledge, and available experience at the time. Although market prices are based on the “known information set”, both information sets, also the “unknown information set”, are relevant for understanding the sources of market instability.

The two information sets are affected by two antagonistic processes. First, over time new information and new knowledge become available, so the “known information set” expands and the “unknown information set” contracts. Second, as the socio-economic system constantly changes, available information and knowledge become outdated, and thus the “known information set” shrinks and the “unknown information set” expands. Whenever new information becomes available, efficient market prices adjust to it. This process usually occurs in slow adjustments as bits and pieces of new information, knowledge, and experience enter the “known information set”. However, it cannot be excluded that some new

[1] Patrick Slovik is an economist at the OECD. The views expressed in this paper are those of the author and should not be attributed to the OECD or its member countries. E-mail: patrick.slovik@oecd.org.

information, new knowledge, or new experience will be of such significance that it will substantially alter previous beliefs about the socio-economic state of affairs. Thus, whenever the "known information set" is undergoing a substantial change, it is natural to expect substantial revaluations of efficient market prices. Substantial changes in information and knowledge can occur gradually over time, but they can also occur suddenly. When this happens, it is natural to expect market prices to change substantially in line with the changes in the "known information set". As a rule of thumb, the bigger is the "public awe" related to new information, new knowledge, or new experience the more impactful is the rebalancing of the "known information set" and market prices.

In a market economy there is always an element of uncertainty that the "known information set" could change substantially, or to put it differently, that the "unknown information set" may contain some substantial information, knowledge, or experience that could in the future significantly alter the "known information set". Thus, the "unknown information set" conceptually represents the uncertainty of the correctness of efficient market prices. Since there is no ultimate knowledge, prices in efficient markets can never be completely correct or right. The validity of efficient market prices should always be understood as implicitly uncertain. The concept of market uncertainty is deducible from the basic postulates of the prevailing paradigm, but interpreted in this way it allows us to view the markets from a different dimension that is necessary to interpret market behaviour and market instability. It is important to stress that market uncertainty is not related to market risks, since the measured market risks are part of the "known information set". Market risks do not challenge the validity of efficient market pricing, because as part of the existing knowledge set they are incorporated in market prices. The validity of efficient market prices is challenged by the lack of information, the lack of knowledge, and the lack of experience. Under the market uncertainty theorem, market behaviour is interpreted with reference to market prices and market uncertainty. Market price is based on available knowledge and market uncertainty conceptually represents the uncertainty of the validity of that knowledge.

3. Heterogeneity of market uncertainty

It is worth emphasising that market uncertainty embedded in efficient market prices is not (and cannot be) part of known market risks, because managed and regulated risks are part of the "known information set". The main problem with the prevailing economic paradigm is that there is no well-developed process, in either the corporate or the public sector, that recognizes and deals with market uncertainty. An investment strategy based on maximizing profit with respect to market risks naturally omits market uncertainty. So do public authorities that regulate and supervise the markets on the basis of risks. As a consequence, the financial system is liable to the build-up of unrecognized and unmanaged market uncertainty in good times and can suddenly fall apart leaving the stakeholders of the socio-economic system guessing "what went wrong?". The problem of market instability is that market participants and market regulators are following an incomplete economic paradigm. The prevailing paradigm treats uncertainty as a homogeneous mass that spans equally across all assets, companies, sectors, or markets; a mass that is not identifiable and least of all analyzable. The prevailing paradigm's view is that because the "unknown information set" is not identifiable, market uncertainty does not matter, and even if it does matter nothing can be done about it. For these reasons, the focus of the prevailing economic paradigm has been almost exclusively on the spectrum of known theories, known risk, and other known factors.

The market uncertainty theory presents a different perspective. It argues that efficient market prices are not created equal. The uncertainty of the validity of the efficient market prices is heterogeneous and particularly high if available information, available knowledge, and available experience are limited. While the markets attempt to provide the best possible present value of the future state of affairs, the validity of that value differs across different

assets. Therefore, from the perspective of market instability, the most important factor is the degree of market uncertainty. The dot.com boom as well as the recent financial crisis serve as good examples of market mispricing due to limited or diminishing knowledge. During the dot.com boom the knowledge about the potential impact of the internet on society was limited. Although efficient markets aim to utilize all available information to produce the best possible asset pricing, whenever what is known is relatively limited, the uncertainty of the validity of the market prices will be on the high side. In the run-up to the dot.com crisis the market uncertainty of market prices was high, which was subsequently made apparent in the fact that most of the dot.com boom prices totally missed the target. In the run-up to the recent financial crisis the financial system changed due to rapid proliferation of financial innovations to such an extent that the applicability of the available information, knowledge, and experience had significantly diminished. Although the diffusion of the innovation was more complex than in the dot.com crisis, the effects were similar. The markets attempted to provide the best estimate of the various market prices, but the validity of these prices had to be understood as largely uncertain.

What are the options for market participants and market regulators when facing market uncertainty? The options are plentiful and some of them will be outlined in the next sections, which focus on policy recommendations. However, suffice it to say at this point that assets with a higher degree of market uncertainty are more liable to sudden and unexpected shocks. Investors and regulators have to treat exposures to these assets with a higher degree of caution and request adequate uncertainty premiums on top of risk premiums. Higher uncertainty premiums will limit the growth of these assets as compared with the practice to date. Financial institutions with higher exposures to market uncertainty should face higher costs of credit to limit their ability to become overexposed to these assets. There tends to be a tremendous bias in both the corporate and public sectors to communicate and promote knowledge and to conceal lack of knowledge. The prevailing economic paradigm thus has the effect of focusing societies' efforts on the "known information set". However, from the perspective of systemic stability, understanding and promoting "what is not known" is at least as important as analyzing and promoting "what is known". An analysis of the lack of relevant information, knowledge, and experience (related to assets, business practices, and the socio-economic environment) should become an integral part of any investment strategy or financial stability review. With many resources allocated to risk management and economic science, their marginal value added is likely to be low. By reallocating at least part of these resources to market uncertainty analysis, the marginal value added to the preservation of systemic stability would be substantial.

4. Risk, uncertainty, and rating agencies

Prior to the financial crisis, rating agencies had embarked on a great success story on the global stage. The consensus view had been that independent third-party ratings provided the best available method to assess the riskiness of banks' assets for commercial as well as regulatory purposes. The rating agencies provided their ratings based on their analyses of past market knowledge and past risk management experiences. The financial industry and the industry's supervisors became increasingly reliant on knowledge communicated by the rating agencies. However, ratings of illiquid, unconventional, and relatively new financial assets were based on far less knowledge than ratings of traditional assets such as government bonds. The more limited knowledge base was known to the rating agencies at least on a qualitative level but not communicated to the industry. The level of qualitative lack of knowledge embedded in ratings needs to be efficiently communicated to the markets at least in a form of written disclosures. The distinction between risk and uncertainty is necessary to allow markets to allocate capital optimally.

In the ideal case, the lack of knowledge embedded in certain ratings should be openly communicated by rating agencies in the form of a qualitative level of uncertainty, unknown factors, or unconventionality of the rated financial assets, for instance, on a scale from U1 to U5. The risk-uncertainty rating system would thus consist of a rating of measured risk and a rating of market uncertainty embedded in that measure. For example, a traditional financial asset would be rated for instance AAA/U1, BBB/U1 or CCC/U1, while a very unconventional, difficult-to-rate asset with the same known risks would be rated AAA/U5, BBB/U5, CCC/U5. The risk rating is based on all information that rating agencies currently know, while the uncertainty rating is based upon openly communicating lack of relevant information, knowledge, and experience relative to more traditional financial assets.

To streamline the implementation, if the rating agency is unable or unwilling to provide the "lack of knowledge" rating, it could be allowed to mark it as "not available" (e.g. AAA/na). Competitive market forces would certainly reward the more open, more willing, and more flexible rating agencies. The uncertainty ratings would not only provide a warning signal to more conservative investors (such as pension funds), to wary investors such as creditors and shareholders of banks, and to financial system regulators, but would also offer a certain face-saving premium for the rating agencies that are pushed by market competition to rate difficult-to-rate assets. Under the risk-uncertainty rating method, as is currently the case, difficult-to-rate assets with minimum available information would still receive a rating, but in contrast to practices to date, the difficulty and short-cuts made in the calculation of such risk ratings would be openly communicated by adding the qualified uncertainty rating.

5. Risk, uncertainty, and financial institutions

The success of financial innovation and unconventional business practices is dependent upon its contribution to the profitability of financial institutions. The prevailing economic paradigm commonly accepts that profits should be maximized with respect to risks. The riskiness of operations of financial institutions is further supervised and regulated by public authorities to make sure that depositors' funds as well as systemic stability are not endangered. Hence, a financial corporation will expand its exposures to innovative assets or unconventional practices as long as it contributes to the risk-weighted profits. Both measured risks and realized or expected profits are part of market knowledge. However, the specific particularity of innovative assets and unconventional practices is that in most of the cases "what we know" is limited, and "what we don't know" could be a lot. Thus, the rise in exposures of financial institutions to financial innovation based on maximizing risk-weighted profits is accompanied by accumulation of exposures to market uncertainty.

When the rise in exposures to a financial innovation or unconventional business practice becomes widespread across many financial institutions, the financial system as a whole could be accumulating market uncertainty to levels that endanger systemic stability. In cases in which it becomes apparent that "what we did not know" has had a substantial relevance, the accumulated market uncertainty could be transformed into a market meltdown or a systemic meltdown. A higher degree of market uncertainty does not necessarily imply that our lack of knowledge will in all cases have a substantial impact, but the probability that it could have a substantial impact is higher. Ex-post, after the meltdown, it will naturally become apparent that our knowledge has not been sufficient and needs to be substantially revised. However, since knowledge can never be ultimate, in a constantly changing and evolving socio-economic system, the omnipresent lack of knowledge could lead to another proliferation of market uncertainty hiding under the shadow of good times. Therefore, knowledge alone does not guarantee systemic stability and needs to be accompanied by an allocation of efforts into the analysis of market uncertainty.

Investors and regulators did not resolutely demand this information to be analytically separated, because under the prevailing paradigm there was no process or real reason to assign costs to banks' exposures to market uncertainty. Once a bank made higher risk-weighted profits, it is not unlikely that creditors and investors rewarded it via a lower cost of credit and capital. On the contrary, traditional banks that were not able to achieve similar profitability for the same levels of risks have often come under pressure from unhappy shareholders, takeover attempts, and worrying creditors demanding higher returns to continue financing the banks' operations. It is not difficult to imagine that some of the more traditional or cautious banks were left with little choice but to join the innovative or unconventional methods to increase their risk-weighted returns. For these reasons, it is necessary that exposures to innovative assets and unconventional business practices become an integral, compulsory, and analytically separate part of financial statements. It is not sufficient if this information is partially released to regulators. What is most important is that the information is shared with investors, creditors, and other stakeholders (e.g. media, academics, analysts) that assign costs to the banks' credit, capital, and publicly traded stocks and channel the information to the general public.

6. Risk, uncertainty, and public authorities

Signalling to markets not only what is understood but also what is not understood is necessary for markets to produce an optimal outcome. Bias towards promoting knowledge and not communicating lack of knowledge fools markets and leads to market excesses, in particular in the least understood markets, which are eventually prone to a sudden break-up. Advances in economic theory, mathematical modelling, and the increase in social resources in economics and the financial sector have led to an increased sense of confidence in the field's ability to conquer the uncertainty of the future and, paradoxically, to the accumulation of market uncertainty at systemically dangerous levels. Whenever an innovative asset class, unconventional market practice, or other systemic change develops in the financial markets, market supervisors and regulators often react promptly and correctly in terms of management of knowledge. Relevant discussions are initiated at internal meetings and external committees, resources are allocated to research, decisions are taken to collect new statistical data, new regulatory rules are drafted and implemented, new standards for supervisory conduct are initiated, and in some cases laws are drafted or amended via the legislative process.

Although this reaction is certainly correct and necessary, on the down-side, it will objectively take prudential supervisors or market regulators several years to establish and implement an optimal analytical, supervisory, and regulatory grip on the market. In the meantime, market participants and individual investors must under no circumstances be allowed to believe that asset classes or business models that are not well understood bear similar or the same uncertainty as the more traditional ones. As this study argues, market uncertainty is heterogeneous and efforts should be made towards its proper understanding and classification. For this reason, if the "lack of knowledge" is an objective reality its immediate and effective communication to investors is the only viable tool to give markets the sense of balance necessary for assigning costs to both market risk and market uncertainty.

One possible argument against communicating the "lack of knowledge" by rating agencies, banks and public authorities to markets is that it will limit the extent and pace of financial innovation and increase the cost of capital required by investors. This is an unfounded fear, because investors with a sufficient and balanced understanding of "what is known" and "what is not known" will be able to allocate resources in a more optimal way, which should result in a higher quality of financial innovation, long-term systemic stability, and more sustainable economic growth. Public institutions should take the effort of identifying, understanding, and communicating market uncertainty as seriously as they do for market risks due to the

importance of both for long-term systemic stability. While in recent decades the analysis, management, and communication of market risks has developed remarkably, going forward it needs to be complemented by identification, management, and communication of market uncertainty at all levels of the financial industry and economic policy making.

Measuring carry trade activity

Stephanie Curcuru, Clara Vega and Jasper Hoek[1]

I. Introduction

Many commentators attribute recent episodes of rapid changes in asset prices to widespread investment in carry trades fueled by low interest rates. While carry trade strategies did not contribute to the recent financial crisis, the disparate monetary policies in place after the height of the crisis – with some central banks pursuing very accommodative policies with low interest rates and others returning to higher rates – may have created an environment where carry trades were attractive.

In this paper we describe common carry-trade strategies and the associated risks that are of concern to financial regulators and policymakers. These risks include excessive exchange-rate and asset price volatility, and increased stress on the banking system arising from loan defaults. We then review the available evidence as to whether carry trades were actually being undertaken during two recent periods when carry trade activity was reported to be widespread – during 2006–2007, funded by yen-denominated borrowing, and during 2008–2009, funded by U.S. dollar-denominated borrowing. Because detailed data on individual investor positions that would provide direct evidence on the carry trade are not available, we use several proxies for carry trade activity.

We do not find convincing evidence that carry trade strategies were adopted on a widespread and substantial basis during these periods. This conclusion must be only tentative, however, because the data needed to definitively assess how widely carry trade strategies were used are not available. For example, most measures do not allow the segregation of transactions associated with carry trades from other types of investment activities. Further, none of the available measures identify the amount of leverage associated with carry trades. We conclude with a discussion of recent data initiatives, such as the creation of trade repositories, and suggest improvements to existing data sources which would improve our ability to measure carry trade activity.

II. The Carry Trade and Its Risks

The most basic carry-trade strategy pairs borrowing in a low-interest rate funding currency with a deposit in a higher-yielding target currency.[2] At initiation, the borrowed funds are exchanged for the target currency in the spot FX market and deposited in a higher-yielding account, and at termination the deposited funds are withdrawn and exchanged back to the funding currency in the spot market. The investment return depends on both exchange rate movements and the difference between the borrowing and deposit rates. Another form of carry trade with a very similar investment return involves purchasing an exchange-rate future

---

[1] Board of Governors of the Federal Reserve System.

[2] The carry trade label has also been used more broadly to refer to investment strategies designed to profit from almost any type of expected return differential, such as borrowing and investing in risky assets of the same currency, or simply investing in rapidly appreciating commodities such as gold. However, in this note we use the term to refer to a strategy of taking a short position in a low-interest rate currency and investing the proceeds in a higher-interest rate currency.

or forward contract to buy the target currency and sell the funding currency. For retail investors, there are also exchange-traded funds (ETFs) and exchange-traded notes (ETNs) that are designed to borrow in low-interest rate currencies and invest in higher-yielding currencies.

A carry trade will be profitable as long as the exchange rate of the currency in which the funds are deposited does not depreciate by too much against the funding currency.[3] Even a small depreciation of the target currency can erase the gains from the higher rate of interest. Thus, exchange rate volatility is the main risk for a carry trade investor, and carry trades tend to take place in periods when exchange rate volatility has been low.[4]

The carry trade may often serve a useful economic purpose in helping equilibrate rates of return across markets. To the extent that the carry trade represents the kind of risky arbitrage between markets that is necessary for market functioning, it may be of little concern to policy makers. However, there are also valid reasons for policy makers to monitor this activity. Because carry trades tend to take place when exchange rate volatility is low, there is a concern that some investors fail to understand that volatility can rise, and hence are not taking the full risk of these trades into account. If this is the case, then as investment in a carry trade builds, there may be depreciation of the funding currency in excess of that implied by fundamentals, and also excessive appreciation of assets in the target currency. Further, carry trade positions are quite fragile because they are typically highly leveraged. Because the profitability of these trades can be quickly erased if the exchange rate moves against them, even minor depreciation of the target currency may induce a large-scale unwinding of carry trade positions. This could induce a further, and perhaps considerably sharper, depreciation of the target currency and a rapid fall of asset prices in the target country.[5] The resulting losses may be large enough to lead to widespread loan defaults and serious consequences for the banking systems in both funding and target countries.

III. Evidence of Carry Trades

Direct evidence on the carry trade requires detailed data on individual investor positions, something that is rarely available. Purchases of assets in high-yielding currencies, for example, do not by themselves represent conclusive evidence of the basic carry-trade strategy. To identify a carry trade, we would also need data indicating that investors were borrowing to make these purchases. Below we discuss common measures of carry trade activity and discuss their weaknesses.

---

[3] Uncovered interest rate parity, a central tenet of many theories of international finance, predicts that investors should expect exchange rates to move in a way that equalizes the rates of return on equally risky assets denominated in different currencies. If this theory held true, then carry trades would yield no excess profits. However, historical evidence suggests that exchange rates frequently fail to follow the path implied by uncovered interest rate parity for extended periods of time, and instead follow something closer to a random walk. Investor expectations that uncovered interest rate parity will continue to fail drives many global investment flows, including carry trades.

[4] Other risks include performance risk (the risk that the deposited funds will not be returned) and settlement risk (the risk that the currency will not be received in the foreign exchange transaction).

[5] Brunnermeier, Nagel, and Pedersen (2008) document that target currencies are more likely to experience large depreciations. Two classic examples of rapid yen-carry trade unwinding occurred on October 7th 1998 and February 27, 2007. On October 7th, 1998, the U.S. dollar depreciated 7% against the yen, the largest one-day movement of the dollar-yen exchange rate.

Exchange Traded Funds (ETFs) and Exchange Traded Notes (ETNs)

The only direct evidence on the carry trade comes from exchange traded funds (ETFs) and exchange traded notes (ETNs), whose returns are linked to carry-trade strategies that involve borrowing in low-yielding currencies and investing in high-yielding currencies.[6] Two such investment vehicles are the Deutsche Bank Global Currency Harvest Index ETF and Barclay's Capital Intelligent Carry Index ETN.[7] The return on these indexes is an indication of the ex post profitability of carry trade strategies, though these indexes are constructed using a fairly complicated mix of leverage and investment products and may not accurately represent the profitability of carry trade strategies in general. As shown in the top panel of Figure 1, during 2006–2007 when there were reports of widespread investment in yen-funded carry trades, the performance of these carry trade indexes was mixed. Barclay's index slightly outperformed the S&P 500 index, while Deutsche Bank's index had about the same return as the S&P 500 index. In contrast, the bottom panel shows that both indexes outperformed the S&P during 2009 when U.S. dollar-funded carry trades were reported to be popular. Shares outstanding in Deutsche Bank's carry trade index ETF, a measure of carry-trade demand shown in Figure 2, grew during 2009 and indicates increasing interest in these strategies.[8] Unfortunately, ETFs and ETNs are mostly used by retail investors and are unlikely to represent a large percentage of overall carry-trade activity should it exist.

U.S. Commodity Futures Trading Commission (CFTC) Large Trader Reporting Data

A frequently cited measure of carry-trade activity, which provides some information regarding favored funding and target currencies, is the net position of non-commercial (speculative) traders in exchange rate futures on the Chicago Mercantile Exchange, as collected and reported by the CFTC.[9] Of course, traders use these contracts for many purposes other than the carry trade. Moreover, hedge funds, which are considered to be prominent in the carry trade, reportedly trade more in forward markets (which are over-the-counter and are not subject to CFTC reporting requirements) than in futures markets. Nevertheless, engagement in carry trades could be indicated by a net short futures position in the funding currency, paired with a net long futures position in the target currency.

In Figure 3 we plot net positions of traders designated as speculators in a long-favored target currency, the Australian dollar (grey bars), and in a long-favored funding currency, the Japanese yen (black bars).[10] Positive net positions indicate that speculators are going long

---

6 An exchange-traded note is a senior, unsecured debt security issued by an underwriting bank. Similar to other debt securities, ETNs have a maturity date and are backed only by the credit of the issuer. ETNs, like ETFs, are usually linked to the return of a benchmark index and trade on an exchange. However, because ETNs are debt securities, investing in them has an additional risk compared to an ETF; upon any reduction of credit ratings or if the underwriting bank goes bankrupt, the value of the ETN will be eroded.

7 Specifically, the Deutsche Bank Currency Harvest Index tracks the performance of a portfolio that systematically invests in the 5 highest-yielding currencies and goes short in the five lowest-yielding currencies out of a pool of ten advanced economy currencies and ten emerging market currencies. Deutsche Bank implements the strategy as follows: it ranks currencies by 3-month LIBOR rates and invests in 3-month exchange rate forwards. The strategy is re-balanced quarterly.

8 We do not have data on the shares outstanding of Barclay's carry trade index ETN.

9 For example, the Financial Times article titled "Dollar becoming top carry trade currency," published on September 15, 2009, cites these data as a measure of carry-trade activity.

10 The CFTC aggregates net positions in the foreign exchange futures market according to investor type – commercial and non-commercial traders. A trader's reported futures position is determined to be commercial if the trader uses futures contracts for the purposes of hedging as defined by the CFTC regulations. The non-commercial or speculator category includes participants who are not involved in the underlying cash business; this includes hedge funds, floor brokers/traders etc.

the foreign currency and shorting the U.S. dollar. Conversely, negative net positions indicate that speculators are shorting the foreign currency and investing in the U.S. dollar.[11] In 2006 and 2007, when a carry trade funded by Japanese yen and invested in Australian dollars was reportedly very popular, net short positions in USD/JPY futures (the black bars) and net long positions in USD/AUD futures (the grey bars) also peaked, consistent with these reports. In Figure 4 we plot net positions of speculators in several additional currencies and observe that in 2006 and 2007, net short positions in USD/CHF futures (aqua bars) also peaked, consistent with media accounts that the Swiss franc was also a favored funding currency at the time.

Returning to Figure 3, starting in mid-2009 there was a noticeable shift and speculators held short positions in the U.S. dollar against the Australian dollar (the grey bars). However, Figure 4 shows that during 2009 speculators also held net long positions in many other currencies. Although this is consistent with some rise in dollar-funded carry trades, the fact that speculators had net long positions in both high-interest currencies and low-interest rate currencies such as the Japanese yen and the Swiss franc suggests that there might simply have been a general expectation of further U.S. dollar depreciation rather than an actual increase in carry trades.[12] A similar configuration of positions was evident in 2002–2004, when the dollar was starting its long decline.

Carry-to-Risk Ratios

We next discuss a measure frequently used to assess the attractiveness of the carry trade. The carry-to-risk ratio measures the ex-ante, risk-adjusted profitability of a carry-trade position. This measure is based on the interest rate differential that the carry trade will earn, adjusted for the risk of future exchange rate movements that could erase the trade's profits. We measure this risk using the option-implied volatility of the exchange rate. A higher value of the carry-to-risk ratio indicates a greater risk-adjusted ex-ante profitability of a carry trade.

In Figure 5 we show the carry-to-risk ratio for a carry trade funded by U.S. dollars and invested in Australian dollars (blue line) and carry trades funded by Japanese yen and invested in either Australian dollars or U.S. dollars (red and green line, respectively).[13] Consistent with media accounts of a buildup in carry trades funded by Japanese yen and invested in Australian and U.S. dollars in 2006–07, the carry-to-risk ratios associated with these two strategies were highest during that period (the red and green lines). In January 2008, as the FOMC lowered interest rates, the expected profitability of a carry trade funded by U.S. dollars and invested in Australian dollars (the blue line) began to increase and became as attractive as that of the JPY – AUD carry trade (the red line). However, all three carry-to-risk ratios declined quickly in September and October of 2008 due to a sharp increase in the implied volatilities, as the financial crisis intensified following the bankruptcy of Lehman Brothers.

In early 2009, as implied volatilities declined and U.S. dollar and Japanese yen interest rates remained low, the carry-to-risk ratios of both dollar- and yen-funded carry trades into the

---

[11] Data are available only for positions for which one of the currencies is the U.S. dollar; thus, for example, we have no direct data on positions that are short yen and long Australian dollar.

[12] This expectation may not necessarily materialize. Klitgaard and Weir (2004) estimate a 75% contemporaneous correlation between changes in the net position of speculators and exchange rate movements. But net positions of speculators cannot forecast exchange rate movements one week ahead.

[13] The USD-AUD carry-to-risk ratio is defined as the 3-month interest rate differential between the Australian dollar and the U.S. dollar divided by the implied volatility of 3-month at-the-money AUD/USD exchange rate option. The other carry-to-risk ratios are defined similarly. Most carry trades tend to be short-term, so comparing 3-month rates or shorter should be representative of the profits involved.

Australian dollar began to rise again. The expected profitability of dollar-funded carry trades (the blue line) was higher than that of yen-funded carry trades (the red and green lines) from the beginning of 2009, leading to some discussions of a buildup of dollar-funded carry trades as a replacement of yen-funded carry trades over this period. However, the risk-adjusted profitability of these trades was relatively low, which throws some doubt on the claim that interest in the carry trade was particularly high.

BIS and Treasury International Capital (TIC) Data

Yet another frequently cited measure of carry-trade activity is the amount of cross-border lending. Banks may lend the funding currency to other firms that are engaged in the carry trade, or increase their foreign-currency deposits and engage in the carry trade for their own accounts. BIS data show that global cross-border yen-denominated lending to hedge funds and other non-bank financial firms (grey bars in Figure 6) remained fairly constant during 2006–2007, and the amount outstanding was substantially lower than that denominated in U.S. dollars, despite substantially higher dollar interest rates. These data also show that U.S. dollar lending to non-banks ticked up very slightly in the second quarter of 2009 (black bars in Figure 6), but claims in other currencies (the white bars) increased more noticeably in the second half of 2009, and U.S. dollar claims remained below the levels recorded in 2007 and 2008. More recent Treasury International Capital (TIC) data show that cross-border lending in U.S. dollars reported by U.S. banks vis-à-vis investors in all countries (black bars in Figure 7) and Caribbean financial centers (black bars in Figure 8) trended upward starting in the first half 2009, but there is no evidence of an increase in foreign-currency deposits (grey bars). U.S. dollar appreciation in the last quarter of 2009 and first quarter of 2010 should have induced some unwinding of carry trade positions, resulting in lower decreased outstanding claims. So either the pick-up in U.S. dollar lending originating from U.S. banks associated with the global recovery was so large that it more than compensated for the unwinding of carry trade positions, or else there never was substantial carry trade borrowing originating from the United States.

The Carry Trade, Exchange Rate Movements, and Capital Flows

Our final measures of carry trade activity are based on exchange rate and capital flow correlations between high- and low-interest rate currencies. If a low-interest rate currency-funded carry trade is driving up investment flows into high-interest rate countries, then we might expect high-interest rate currencies to appreciate against the low-interest rate currency. In Figure 9 we plot the exchange rate appreciation of major advanced-economy and emerging-market currencies against the yen during 2006–2007 against the average differential between local-currency 3-month interbank interest rates and 3-month yen LIBOR.[14] When the yen-funded carry trade was thought to be at its peak, the correlation between exchange rate appreciation against the yen and interest-rate differentials across a broad range of countries was statistically significant. Figure 10 plots this for the U.S. dollar from mid-March 2009 to January 2010, and shows a similar positive and statistically significant correlation. Although most currencies appreciated against the dollar, high-interest rate currencies have appreciated more. However, the existence of a positive correlation between exchange rate appreciation and interest rate differentials does not imply that carry trades per se, rather than a broader range of financial transactions, underpin this relationship.

[14] We do not adjust the interest-rate differential for risk, since option-implied exchange rate volatilities are not available for many of the currency pairs.

A more direct piece of evidence in support of the carry-trade hypothesis would be relatively higher capital flows to high-interest rate countries. To test this hypothesis, Figure 11 plots net portfolio flows (net foreign purchases of equity and debt less net domestic purchases of foreign equity and debt), expressed as a percent of GDP, against the same interest rate differentials plotted in Figure 9. During 2006–07 there was a positive and statistically significant relationship between capital flows and yen interest-rate differentials. However, Figure 12 shows no evidence that high-interest rate countries attracted greater capital inflows in 2009. This may be, in part, because other determinants of capital flows – such as the level of domestic financial market development or the pace of economic growth – are likely to be important. But in any event, it suggests that the carry trade may not have been a prominent factor in international capital flows and associated macroeconomic outcomes in 2009.

IV. Data Needs for Measuring Carry-Trade Activity

As we have mentioned, it is difficult to measure carry-trade activity because the data needed to definitively assess how widely this strategy is used are not available. In this section we discuss potential new data sources and changes to existing systems that could help measure the size of carry-trade activity.

Trade Repositories

Because of the prominent role played by derivative products in the recent financial crisis, the Group of 20 has called for all standardized derivatives to be centrally cleared and reported to trade repositories. Firms including the Depository Trust and Clearing Corporation (DTCC), CLS Bank and TriOptima have trade repositories which are operational or in development for many types of derivatives.[15,16,17] Since derivatives are frequently used to implement carry trade strategies, these data would improve our ability to assess carry-trade activity because they would include details on the positions of all types of counterparties, including hedge funds, and could be used to identify investors who simultaneously hold short positions in low-interest rate currencies, and long positions in high-interest rate currencies.

In order for regulators to use data from trade repositories to assess exposure, however, there must be cooperation among platforms to consistently identify counterparties or classes of

---

[15] CLS Bank International is owned by the foreign exchange community and it operates the largest multi-currency cash settlement system. This system was created to eliminate settlement risk. Seventeen currencies are currently eligible for CLS settlement: US Dollar, Euro, UK Pound, Japanese Yen, Swiss Franc, Canadian Dollar, Australian Dollar, Swedish Krona, Danish Krone, Norwegian Krone, the Singapore Dollar, the Hong Kong Dollar, the New Zealand Dollar, the Korean Won, the South African Rand, the Israeli Shekel and the Mexican Peso. CLS reportedly settles 75% of the world's interbank foreign exchange payment instructions for spot, forwards, options, and swap transactions, and according to the Committee on Payment and Settlement Systems of the central banks of the G10 countries, it settles 55% of FX obligations from the surveyed institutions. CLS is regulated and supervised by the Federal Reserve and is subject to a cooperative oversight arrangement established by the central banks of the 17 currencies mentioned above.

[16] The DTCC is user owned and provides clearance, settlement, and information services for equities, corporate and municipal bonds, unit investment trusts, government and mortgage-backed securities, money market instruments, and over-the-counter derivatives. In 2007 DTCC settled the vast majority of securities transactions in the United States. On June 9th, 2009, the Depository Trust and Clearing Corporation (DTCC) called for maintaining a single trade repository for over-the-counter (OTC) derivatives contracts during testimony before a subcommittee of the House Financial Services Committee.

[17] TriOptima is a privately owned financial technology company that specializes in solving post-trade processing problems in the OTC derivatives market.

counterparties. Further, regulators must be sensitive to the confidential nature of these data, and legal safeguards must be created to ensure that this confidentiality is not violated, or trading firms will be reluctant to use these facilities.

Expanded Reporting on Exchange-Traded Futures Positions

Information from futures exchanges is currently used to estimate the size of carry trade activity, but additional information could substantially improve the usefulness of these measures. For example, the U.S. Commodity Futures Trading Commission (CFTC) has a Large Traders Reporting Program (LTRP), which requires firms to report their daily market close positions in any futures or options contract if their position is above a certain level. The CFTC publishes long and short positions aggregated by trader type (commercial and non-commercial traders), and these are the data we plot in Figures 3 and 4. Even though these data are informative, we do not observe how many firms are simultaneously holding long positions in high-yielding currencies and short positions in low-yielding currencies. Such firms are more likely to be engaged in carry-trade activity than are other firms. The CFTC and other futures exchanges could produce reports that identify long and short positions of "carry trade investors," defined as firms that simultaneously hold long positions in high-yielding currencies and short positions in low-yielding currencies in the futures market.

Expanded Reporting of Foreign Currency Positions

Local foreign exchange committees conduct semi-annual foreign exchange market turnover surveys, and the BIS also collects turnover data for the Triennial Central Bank Survey.[18] By expanding these surveys to include position data, regulators would have a better sense of the amount of carry trade activity. Additional breakdowns could include separate reporting for each of the spot, futures and forward markets, long and short positions held by carry trade investors (defined as individuals who simultaneously hold long positions in high-yielding currencies and short positions in low-yielding currencies in the forward market), and separate reporting of end-user positions and the positions of non-dealer banks and non-commercial banks. Finally, these institutions could conduct the surveys on a more frequent basis.

The U.S. Treasury currently publishes the Weekly Consolidated Foreign Currency Report of Major Market Participants. The report shows long, short, and net positions of large market participants aggregated across three different markets: spot, forward, and futures markets. The report currently only covers five major foreign currencies (Canadian dollar, Japanese yen, Swiss franc, pound sterling, and euro) but could be extended to include large and small market participants and additional currencies, and could aggregate the data in a fashion similar to that described above. In addition, in its current form this report comingles the worldwide positions of U.S.-based firms with the positions of the U.S. operations of foreign-based firms. This hinders comparison of these data with other statistics which typically segregate firms by either nationality or location.

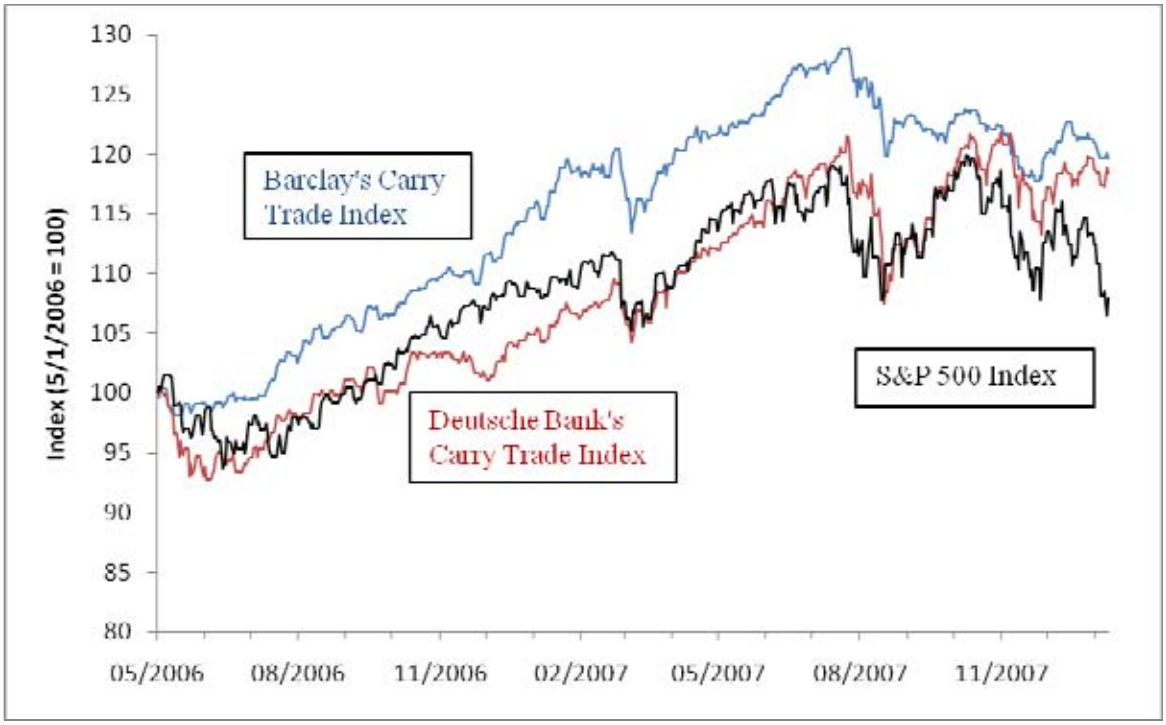
Regulatory reports filed by U.S. banking organizations contain a large amount of information on balance sheet assets and liabilities, but not the currency composition of these positions. For example, the FX composition of balance sheet positions of U.S. banks vis-à-vis U.S. residents is not available. Separate identification of FX-denominated balance sheet positions on existing reports would allow reporting of the amount of FX-denominated lending to different sectors of the economy, and would give us a better estimate of the amount of borrowing associated with carry trade activity.

---

[18] Such committees include the Foreign Exchange Committee in New York, and the Foreign Exchange Joint Standing Committee in London.

Figure 1

Panel A: S&P 500 and Carry Trade Index ETFs and ETNs, 5/1/2006 Index = 100



Panel B: S&P 500 and Carry Trade Index ETFs and ETNs, 10/1/2008 Index = 100

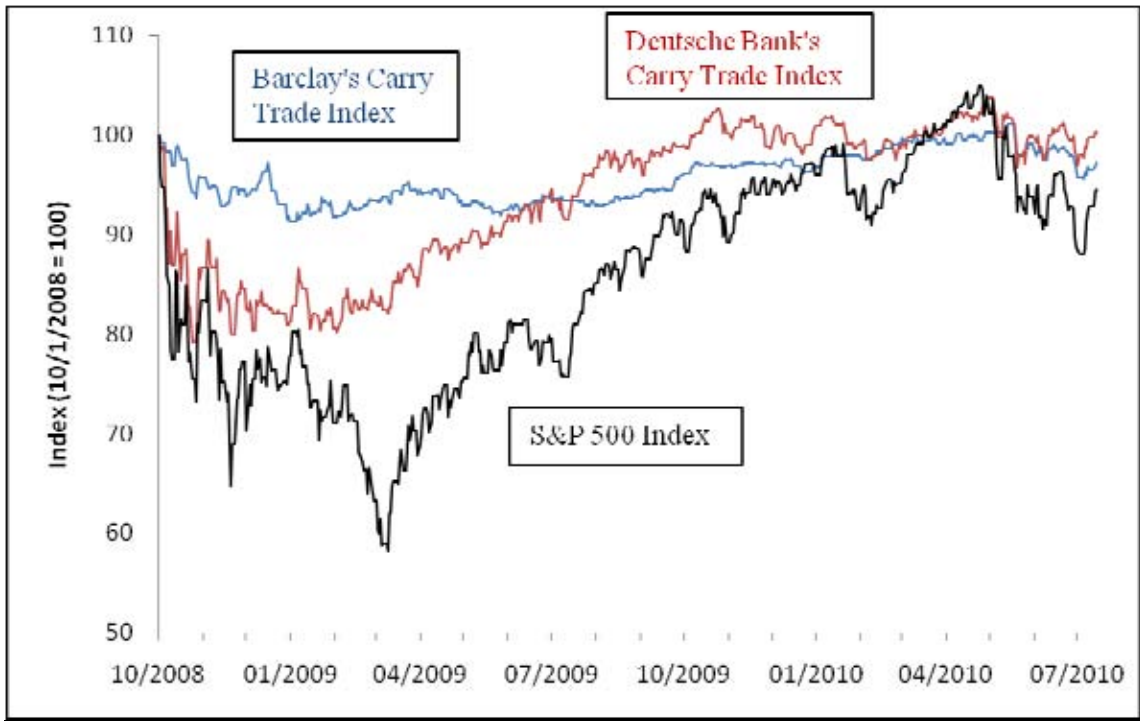


Figure 2

Shares Outstanding of Deutsche Bank's Carry Trade Index ETF

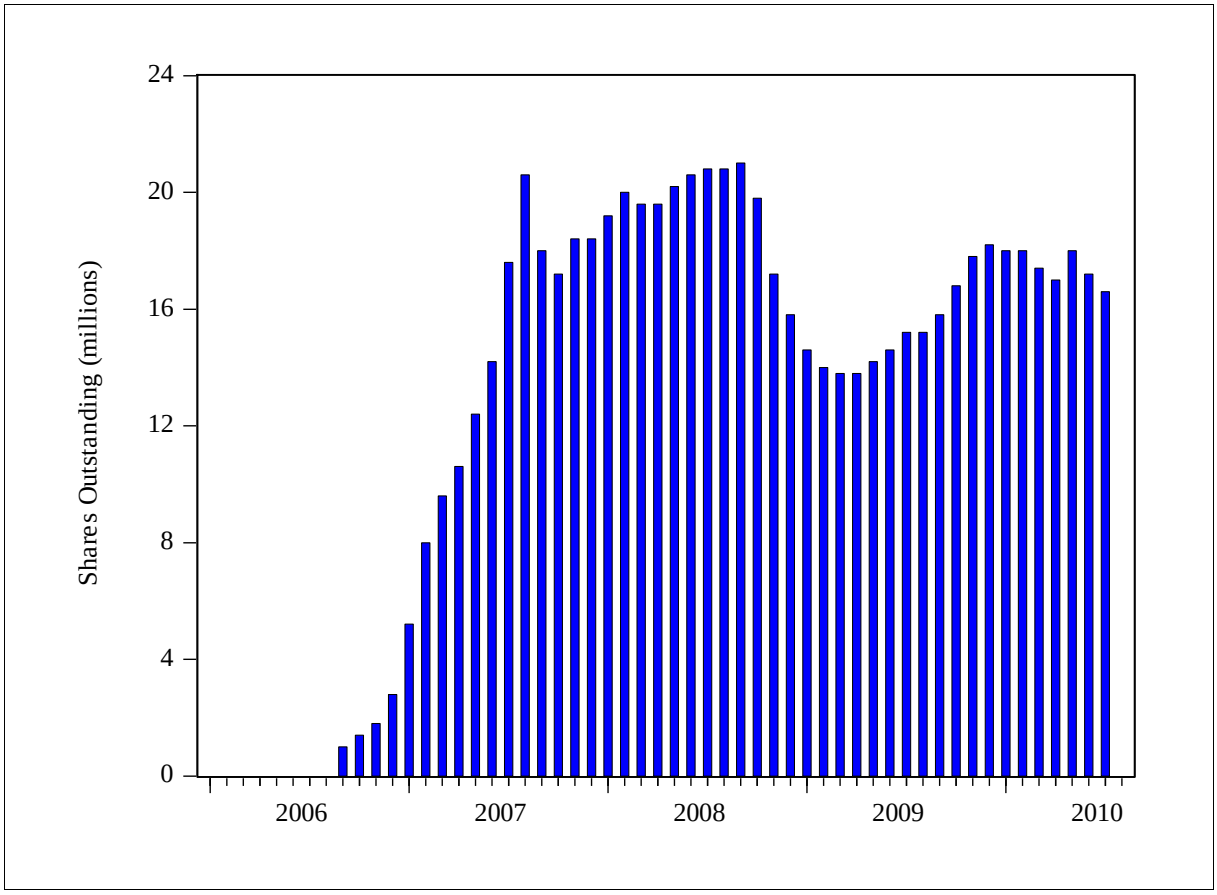
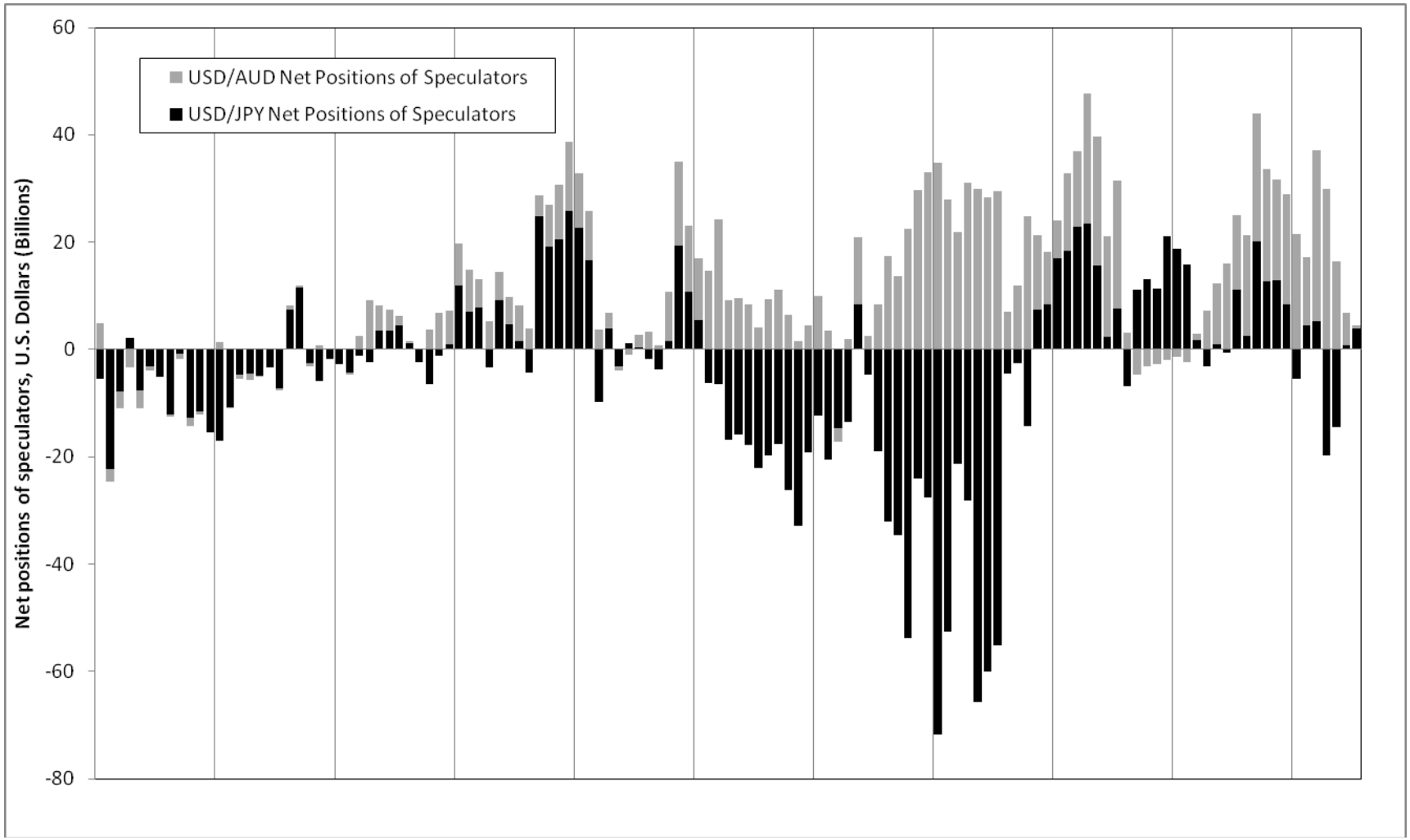


Figure 3

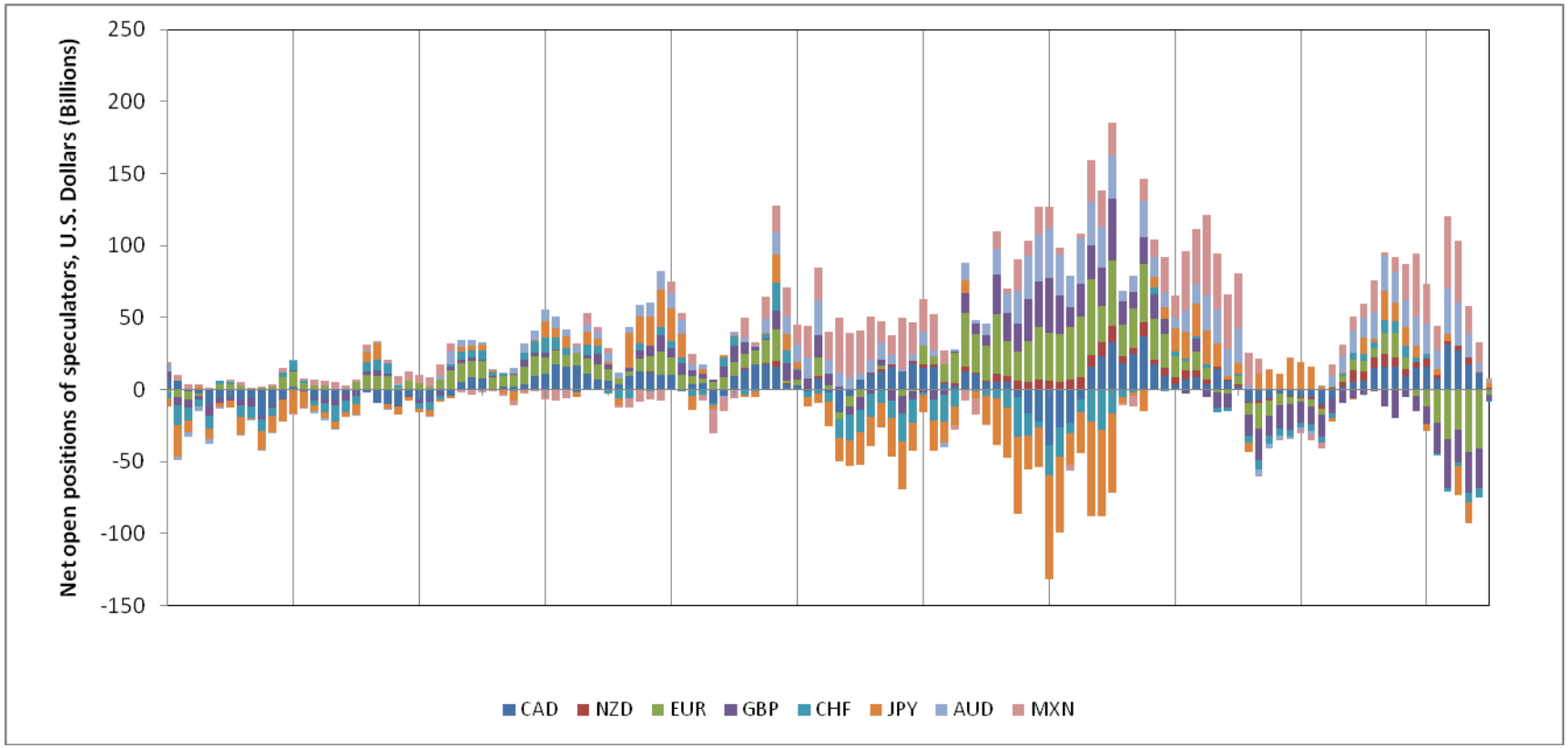
Net open positions of speculators in the Japanese yen and Australian dollar



Source: U.S. Commodity Futures Trading Commission (CFTC) Large Trader Reporting data.

Figure 4

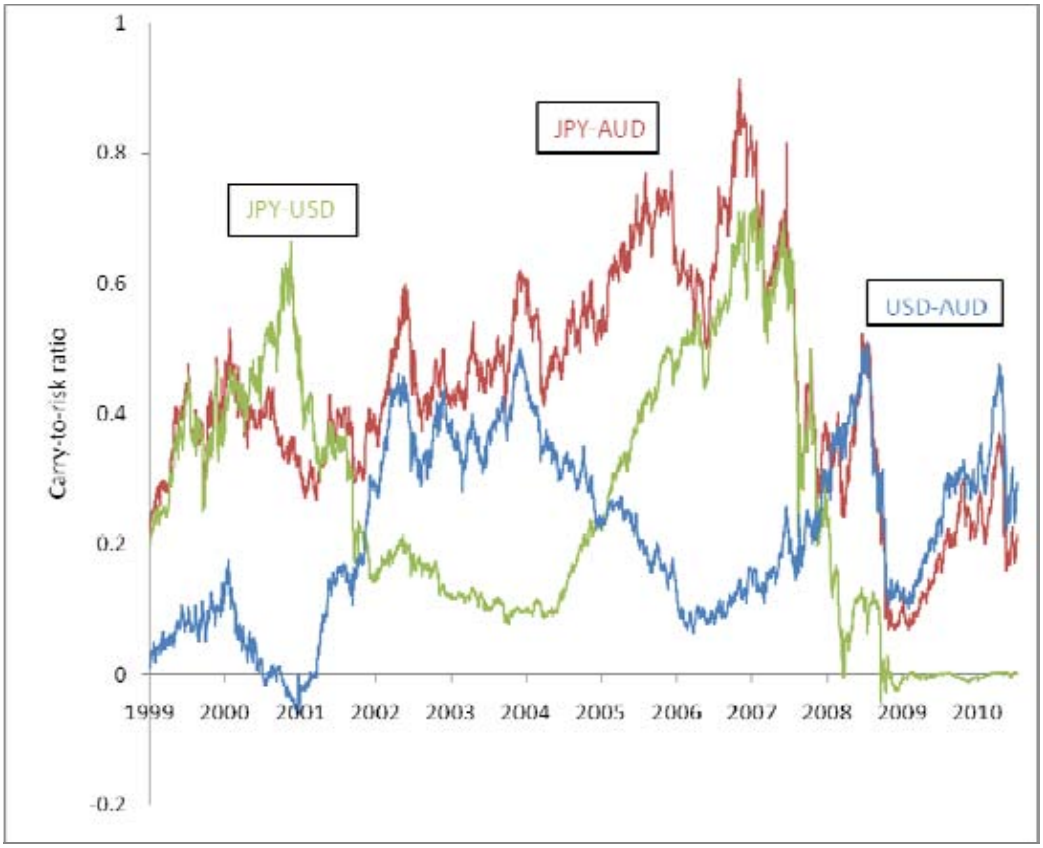
Net positions of speculators in several currencies



Source: U.S. Commodity Futures Trading Commission (CFTC) Large Trader Reporting data.

Figure 5

Carry-to-risk ratios



Note: The JPY-USD carry-to-risk ratio is defined as the 3-month interest rate differential between the US dollar and Japanese yen divided by the implied volatility of 3-month at-the-money JPY/USD exchange rate option. The other carry-to-risk ratios are defined similarly.

Figure 6

BIS-reported cross-border banking claims on non-banks

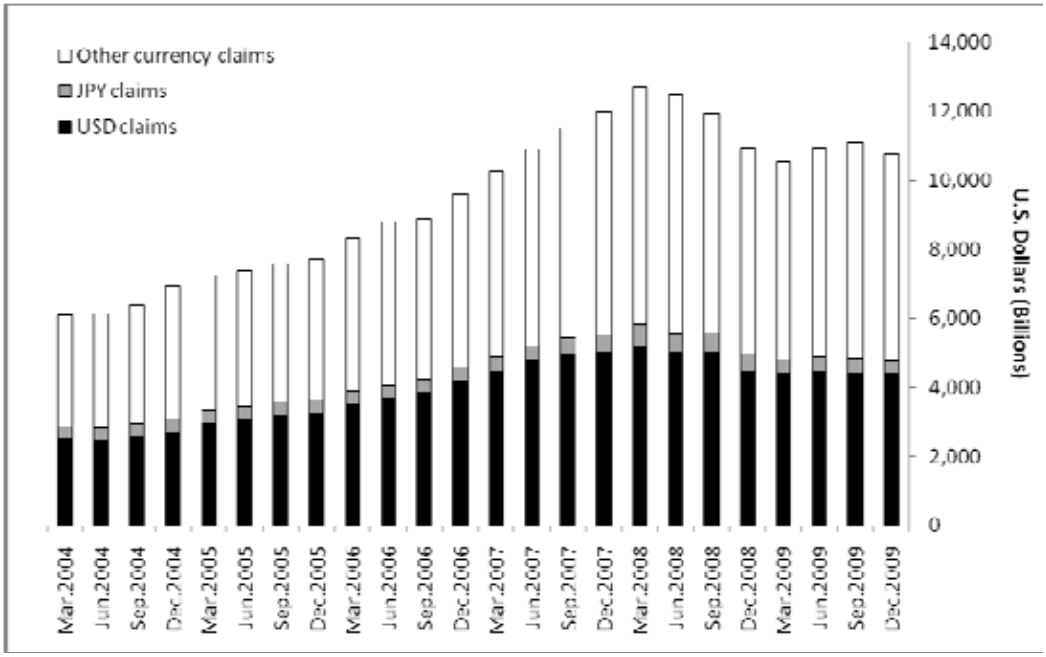


Figure 7

Treasury International Capital (TIC) data on cross-border claims of banking offices in the United States

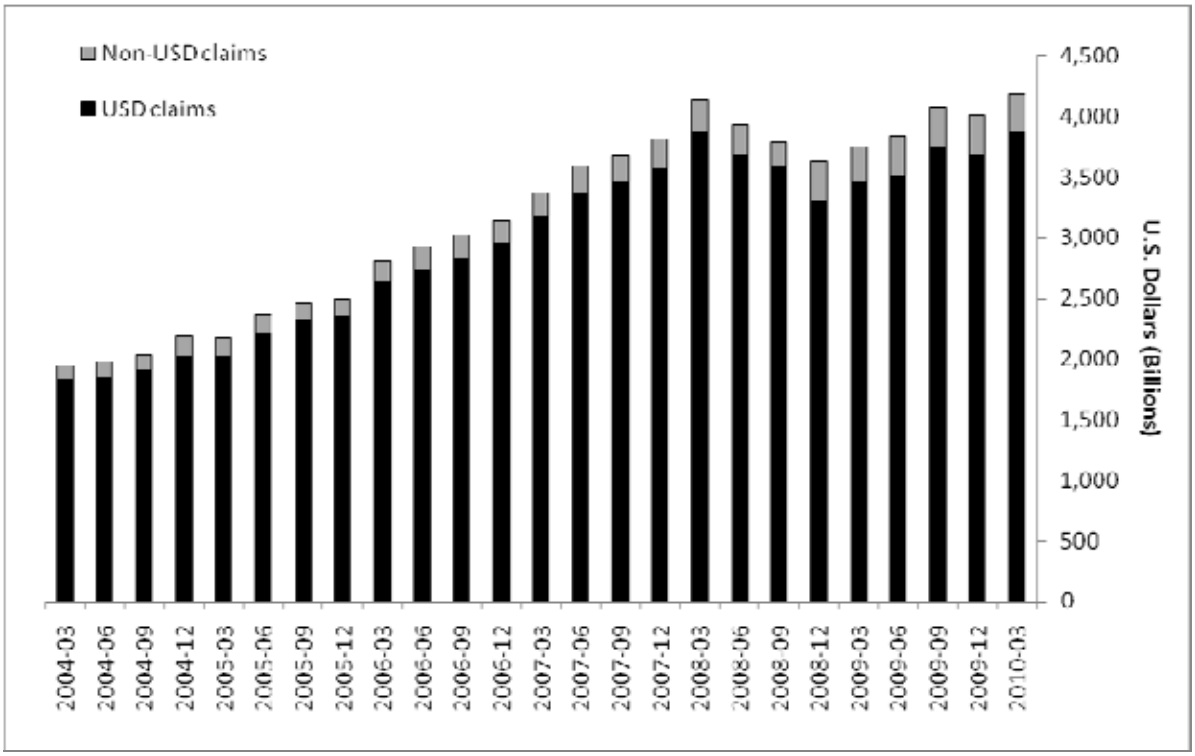


Figure 8

Treasury International Capital (TIC) data on cross-border claims of banking offices in the United States vis-à-vis Caribbean counterparties

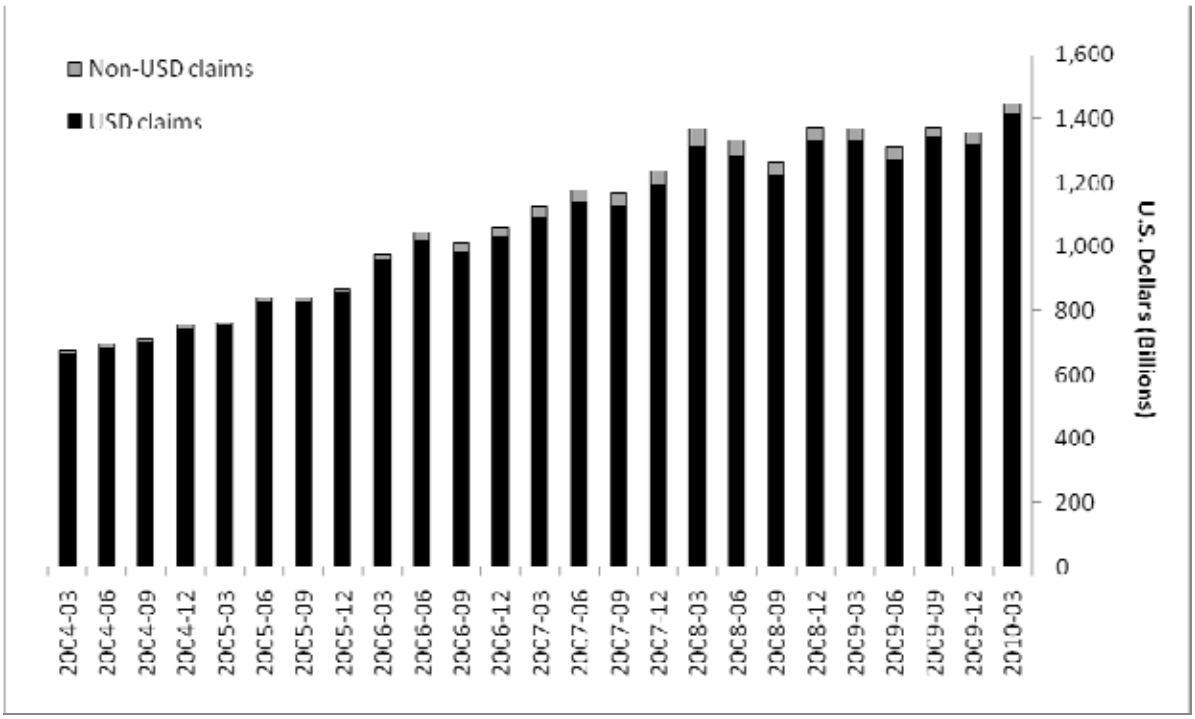
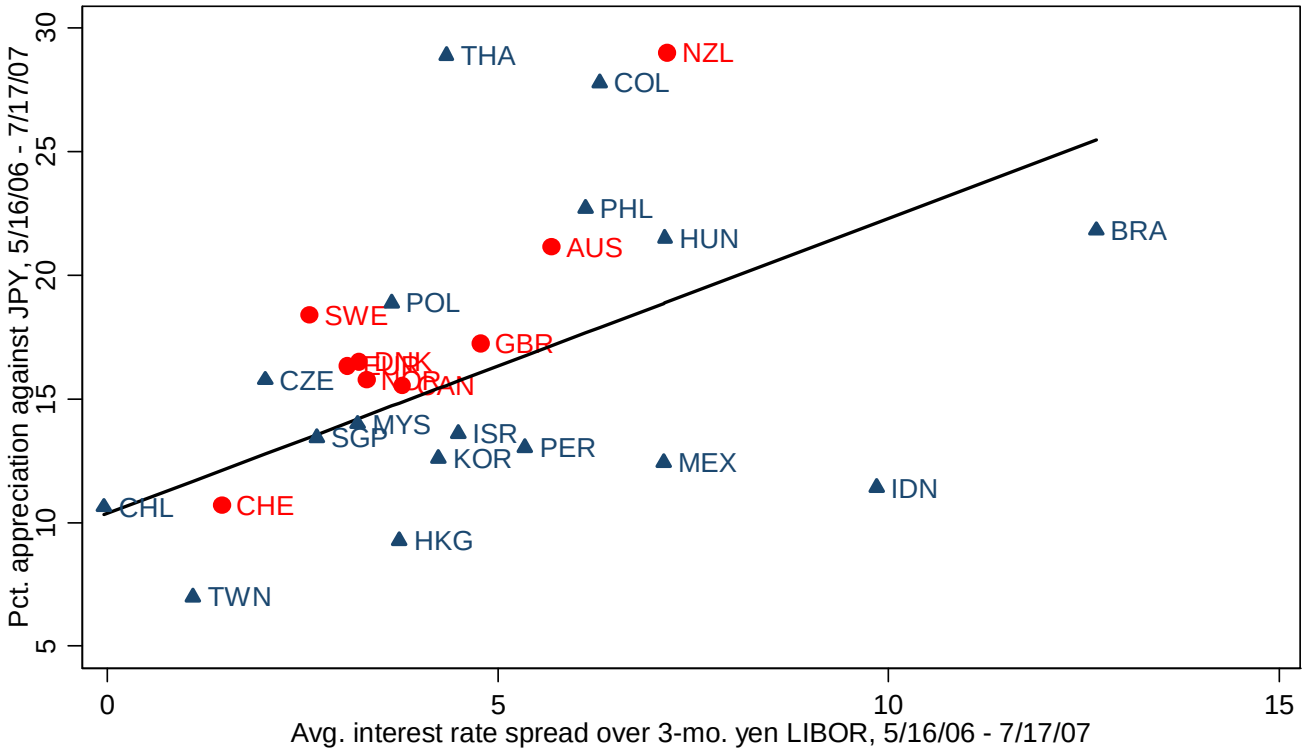


Figure 9

Exchange rate appreciation against the Japanese yen v. interest rate differentials vis-à-vis 3-month Yen LIBOR, May 2006–July 2007

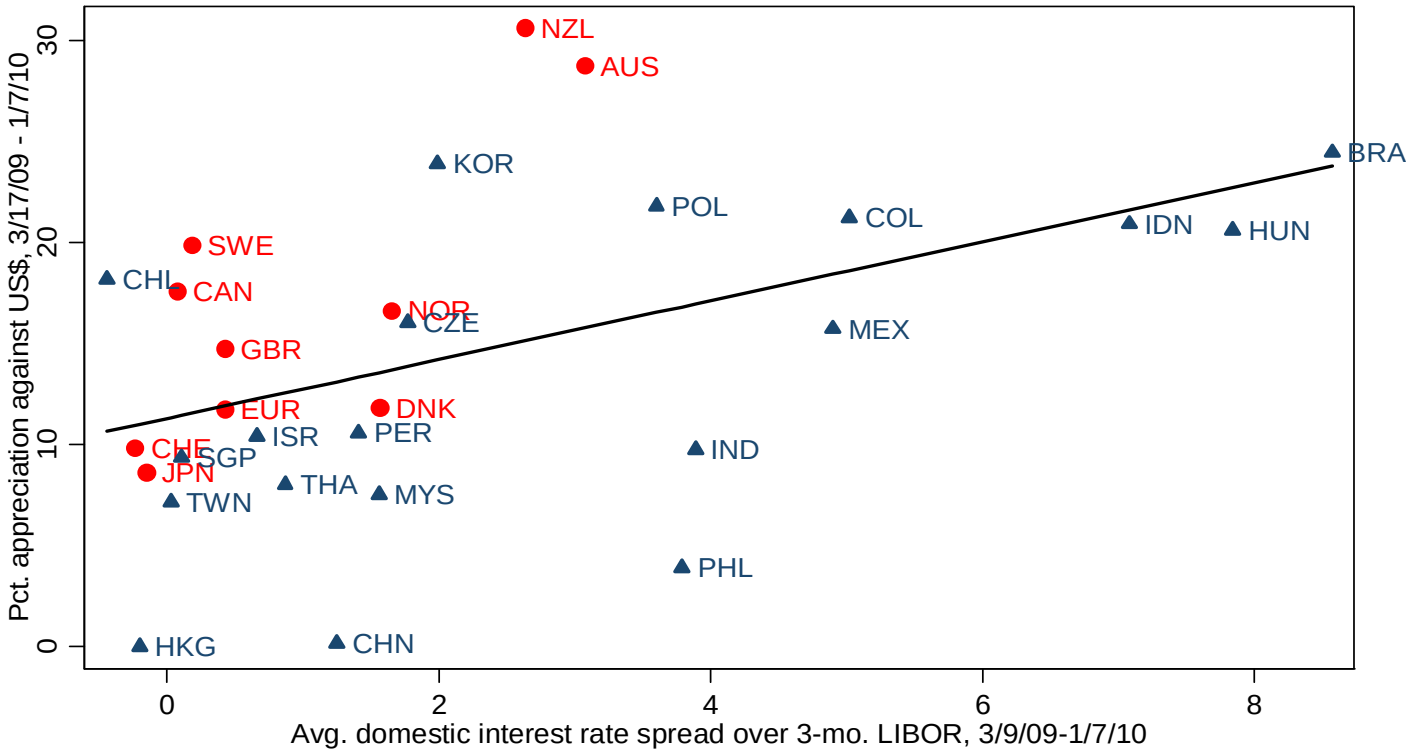


Source: Bloomberg

Note: Blue triangles are emerging markets. Red circles are advanced economies.
Regression: R-squared=.18; slope=.93 (t-stat=2.33)
Domestic interest rates used to calculate interest rate differentials are local currency 3-month unsecured interbank rates, except Colombia, where 90-day deposit rate is used.

Figure 10

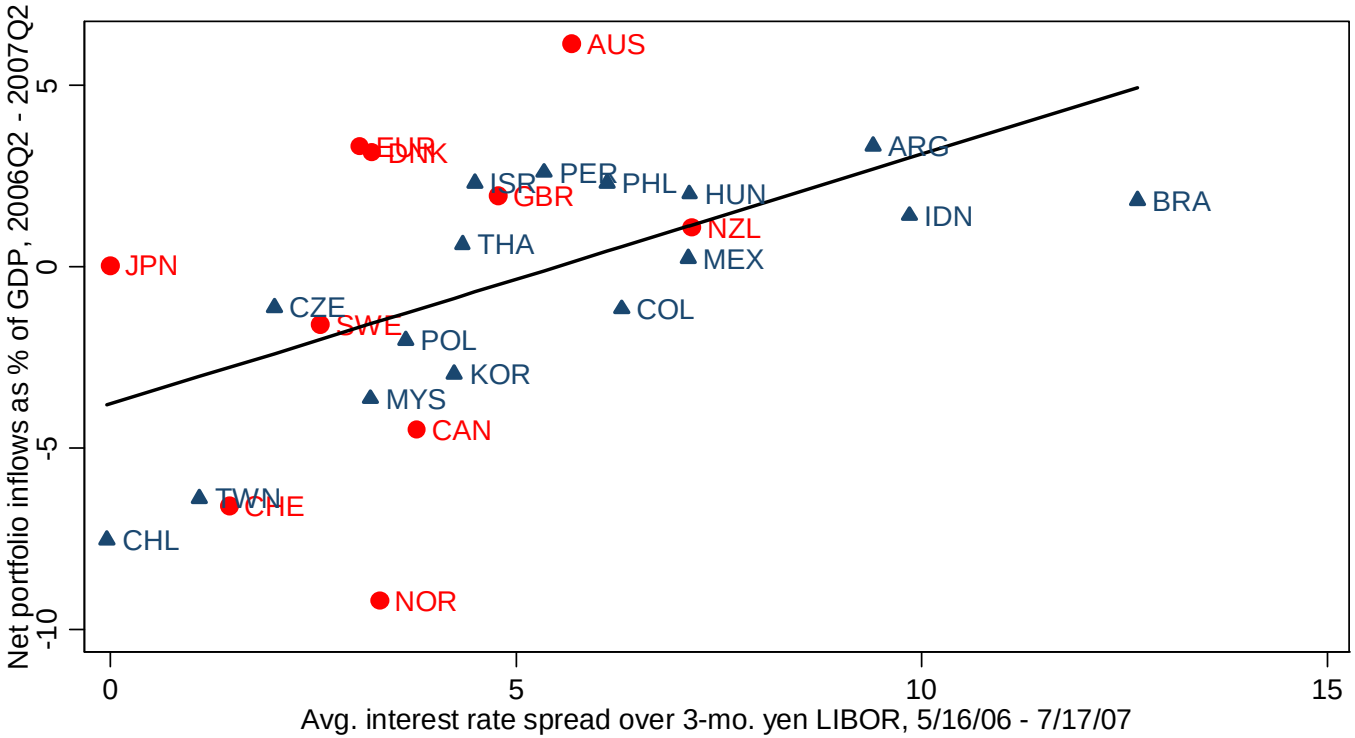
Exchange rate appreciation against the U.S. dollar vs. interest rate differentials vis-à-vis 3-month U.S. dollar LIBOR, March 2009–January 2010



Source: Bloomberg
Note: Blue triangles are emerging markets. Red circles are advanced economies.
Regression: R-squared=.22; slope=1.46 (t-stat=2.73)
Domestic interest rates used to calculate interest rate differentials are local currency 3-month unsecured interbank rates, except Colombia, where 90-day deposit rate is used.

Figure 11

Net portfolio capital inflows v. interest rate differentials vis-à-vis 3-month yen LIBOR, 2006Q2–2007Q2

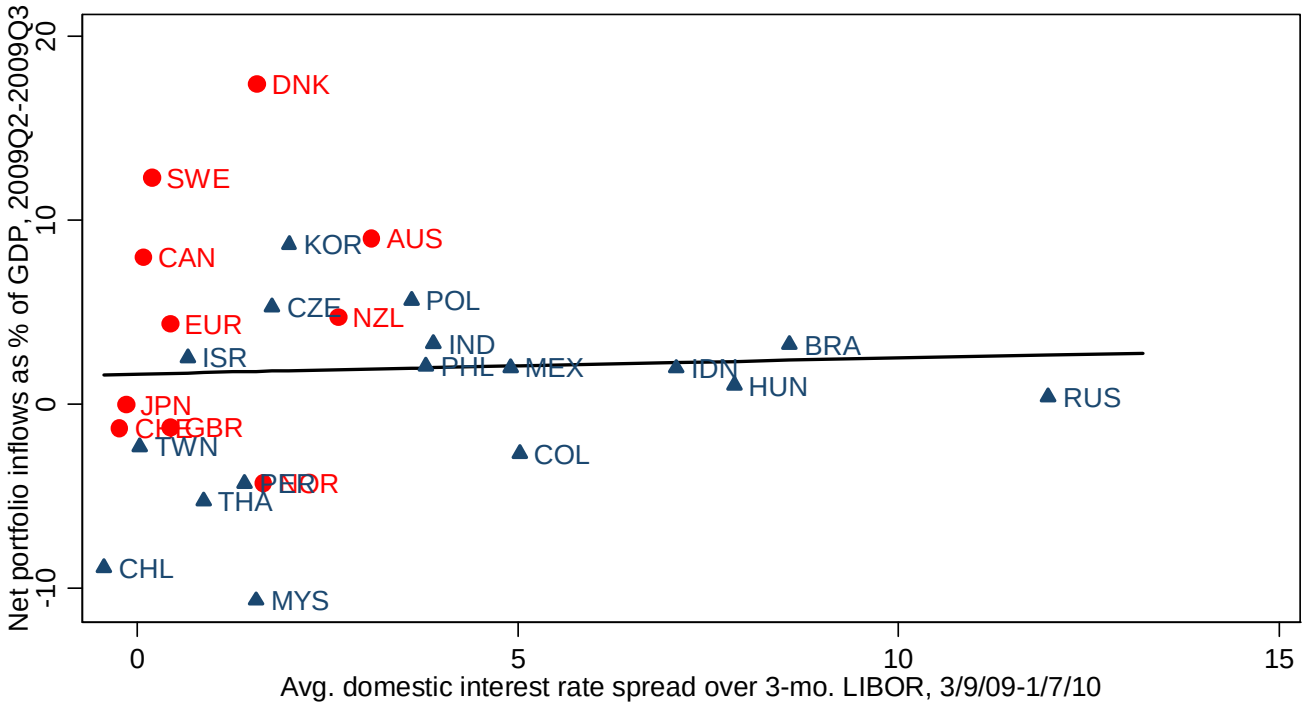


Source: Haver, Bloomberg

Note: Blue triangles are emerging markets. Red circles are advanced economies.
Regression: R-squared=.29; slope=.69 (t-stat=3.13)
Domestic interest rates used to calculate interest rate differentials are local currency 3-month unsecured interbank rates, except Colombia, where 90-day deposit rate is used.
For Malaysia, total net financial account flows used instead of net portfolio flows.
For Mexico, gross portfolio inflows used. Excludes offshore financial centers.

Figure 12

Net portfolio capital inflows v. interest rate differentials vis-à-vis 3-month U.S. dollar LIBOR, 2009Q2–2009Q3



Source: Haver, Bloomberg
Note: Blue triangles are emerging markets. Red circles are advanced economies.
Regression: R-squared=.002; slope=.087 (t-stat=0.22)
Domestic interest rates used to calculate interest rate differentials are local currency 3-month unsecured interbank rates, except Colombia, where 90-day deposit rate is used.
For Malaysia, total net financial account flows used instead of net portfolio flows.
For Mexico, gross portfolio inflows used. Excludes offshore financial centers.

References

Brunnermeier, M., Nagel, S., Pedersen, L., 2008, Carry Trades and Currency Crashes, NBER Working Paper 14473.

Klitgaard, T., and Weir, L., 2004, Exchange Rate Changes and Net Positions of Speculators in the Futures Market, FRBNY Economic Policy Review, 17–28.

The current crisis and macroeconomic statistics: statistical initiatives and challenges at the Central Bank of Nigeria

Muhammad A Bamanga[1]

1. Introduction

As for how and where this financial crisis began, Adedipe (2009) quotes British comedians John Bird and John Fortune, putting it succinctly: "A collapse of the US sub-prime mortgage market and the reversal of the housing boom in other industrialized economies have had a ripple effect around the world. Furthermore, other weaknesses in the global financial system have surfaced. Some financial products and instruments have become so complex and twisted that, as things started to unravel, trust in the whole system started to fail."

UNCTAD's *Trade and Development Report 2009*, however, summarized five factors as causes of the global financial crisis (GFC):

1. The global fallout from the financial crisis in the United States.
2. The bursting of the housing bubbles in the US and in other large economies.
3. Soaring commodity prices.
4. Increasingly restrictive monetary policies in a number of countries.
5. Stock market volatility.

According to Nigeria's Central Bank Governor, Mallam Sanusi Lamido Sanusi (2010), "the world economy was hit by an unprecedented financial and economic crisis in 2007–09, tipped into recession by the sub-prime crisis in the US in August 2007. This crisis led to the collapse of many world-renowned financial institutions and even caused an entire nation to be rendered bankrupt. In Nigeria, the economy faltered and the banking system experienced a crisis in 2009, triggered by global events. The stock market collapsed by 70% in 2008–09 and many Nigerian banks had to be rescued. In order to stabilize the system and return confidence to the markets and investors, the Central Bank of Nigeria (CBN) injected ₦620 billion of liquidity into the banking sector and replaced the leadership at eight Nigerian banks. Since then, the sector has considerably stabilized." He also stated that, in Nigeria, eight main interdependent factors led to the creation of an extremely fragile financial system that was tipped into crisis by the global financial crisis and recession. Each of these factors is serious in its own right. Acting together they brought the entire Nigerian financial system to the brink of collapse.

These eight factors were:

1. Macroeconomic instability caused by large and sudden capital inflows.
2. Major failures in corporate governance at banks.

---

[1] Assistant Director, Statistics Department, Central Bank of Nigeria. The views expressed in this paper are those of the author and do not represent those of the Central Bank of Nigeria.

I wish to thank the staff and management of Statistics Department, Central Bank of Nigeria for the useful inputs given during the preparation of this paper. I am also grateful to anonymous BIS editors for their comments and observations which eventually raised the quality of the paper to its present position.

3. Lack of investor and consumer sophistication.
4. Inadequate disclosure and transparency with respect to the financial position of banks.
5. Critical gaps in regulatory frameworks and regulations.
6. Uneven supervision and enforcement.
7. Unstructured governance and management processes at the CBN and weaknesses within the CBN.
8. Weaknesses in the business environment.

In tackling the menace of the GFC, Nigeria's Central Bank Governor stated that the CBN was pursuing a four-pillar reform program that called for CBN to take the lead in implementing reforms in most areas, while in other areas, CBN would play a key advocacy role.

The four pillars are:

Pillar 1: Enhancing the quality of banks.

Pillar 2: Establishing financial stability.

Pillar 3: Enabling healthy financial sector evolution.

Pillar 4: Ensuring that the financial sector contributes to the real economy.

While elaborating further on the reforms, the CBN Governor stressed that in the first part of the first pillar, the industry remedial programs will include a set of initiatives to fix the key causes of the crisis, namely **data quality**, enforcement, governance, risk management and financial crime. Likewise, in terms of monetary policy the CBN Governor categorically observed that informed decision-making by the Monetary Policy Committee and the Financial Services Regulation Coordinating Committee (FSRCC) will be possible with **better data and analysis** following investment in the CBN's analytical function.

From the above statements of Central Bank Governor Sanusi, it's obvious that Nigeria also suffered its share of the repercussions of the GFC and is striving strategically to mitigate the effects.

This paper discusses how the Statistics Department of the CBN is strategically repositioning itself to provide the macroeconomic statistics needed to fill the gaps revealed by the GFC and meet domestic data needs. The initiatives and challenges involved in trying to capture all the informational gaps are highlighted. After this introduction, the next section gives the background and functions of the Statistics Department. The initiatives and challenges of capturing the general macroeconomic statistics for domestic needs and informational gaps revealed by the GFC are discussed in Section 3. In Section 4, some more data gaps are enumerated, while in Section 5 some recommendations are given.

2. Background and functions of the Statistics Department

The CBN is the top regulatory authority in the Nigerian financial system. It was established by the CBN Act of 1958 and commenced full operation on 1 July 1959 with an initial capital of £17.0 million. The Bank is responsible for formulating and implementing monetary and financial policies to achieve and maintain economic stability. The core mandates of the Bank, as spelled out in the new CBN Act (2007), are to: (1) ensure monetary and price stability, (2) issue legal tender in Nigeria, (3) maintain Nigeria's external reserves to safeguard the international value of the legal currency, (4) promote a sound financial system in Nigeria, and (5) act as banker and provide economic and financial advice to the Federal Government of Nigeria.

Over the years, the Bank has consistently ensured discreet macroeconomic management and a sound financial system through a prudent regulatory framework; enhanced payment system; strengthening/restructuring of weak institutions under its supervision; and, when necessary, closure of insolvent institutions.

As part of the process of reengineering the CBN under project EAGLES, especially with respect to the production of statistics to support monetary policy formulation and implementation, the Bank's management approved the creation of the Statistics Department (SD), which was carved out of the former Research and Statistics Department in February 2008. This move was aimed at improving the quality and timeliness of the monetary, financial and balance of payments statistics, which are key inputs for achieving the Bank's strategic goals. The SD, under the Economic Policy Directorate, is therefore mandated to collect, analyze and manage data on all sectors of the economy, in order to provide statistical support to the Bank, the government, international organizations and other stakeholders. Thus, beyond supporting the Bank with the statistics it requires to deliver on its core mandate, the SD also responds to data requests from other stakeholders, such as the government, MDAs, OPS, international organizations and academia, among others.

The major functions of SD are:

1. To collect and compile monetary and financial data in particular and data on macroeconomic variables, in general, of various periodicity.
2. To prepare methodological manuals for macroeconomic statistics compilation in conformity with the provisions of GDDS, SDDS and System of National Accounts (SNA).
3. To manage the central repository of all data produced by the CBN to avoid data conflict.
4. To compile leading and financial stability/soundness indicators that would aid policy analysis.
5. To compile international banking and other statistics for benchmarking Nigeria's economic progress and attainment.
6. To undertake statistical modeling and forecast the future paths of major economic indicators.
7. To publish and disseminate economic and financial statistics to government, policymakers and other users on a timely basis in accordance with the best statistical practices and standards.
8. To conduct collaborative periodic surveys on consumer confidence, business conditions and expectations, inflation attitudes and other surveys using standard survey methodology.

The CBN disseminates statistics through different media. These include press briefings, publications, seminars, workshops and the CBN's website – http://www.cbn.gov.ng. The Bank's library, which is accessible to the general public, holds various publications on diverse subjects, including the latest journals of the international statistical associations and societies. Some of the Bank's publications include the *CBN Annual Report and Statement of Accounts*, *Statistical Bulletin*, *CBN Briefs*, *Occasional Papers*, *CBN Economic and Financial Reviews*, *CBN Bullion* and, most recently, *CBN Journal of Applied Statistics*.

3. Statistics Department and the GFC: domestic and international data requirements

The establishment of CBN's Statistics Department coincided with the onset of the GFC. The SD took off in February 2008 and by September the GFC had already started affecting the Nigerian economy. The question then is should the SD focus on domestic data requirements or on the data gaps revealed by the GFC? Both are extremely important and are the uphill tasks that must be accomplished by the SD.

It is a fact that the principal reason for the establishment of the SD was the production and dissemination of macroeconomic statistics for domestic monetary policy formulation, but with the eruption of the GFC the Department had no option other than to take the bull by the horns and address holistically and comprehensively both domestic and GFC data needs. The Department has since been receiving technical assistance from the IMF Statistics Department on the compilation and dissemination of macroeconomic statistics. The most recent IMF mission visited the Statistics Department during 4–17 March 2010 to provide technical assistance on the compilation of monetary, external, fiscal and national accounts statistics.

Initially, the SD had three divisions and nine offices, as well as 18 branch offices in some states of the federation. However, in order to effectively address data gaps created by the GFC, the SD has been restructured to comprise five divisions, 10 offices and 12 branch offices. As at July 2010 there were 85 staff members out of the 166 required, and most of them require rigorous training in collection, compilation, analysis and dissemination of macroeconomic statistics.

Notwithstanding the shortage of highly skilled manpower, the Department has been trying to weather the storm. Summarized in Table 1 are some of the Department's initiatives and challenges and the proposed way forward.

Table 1

Statistical Initiatives, Challenges and Way Forward at the Central bank of Nigeria

Sector	Initiatives in addressing domestic and GFC data needs	Challenges	Way forward
Financial Sector (money and banking statistics)	*Monthly Monetary survey Report.* *Central Banking Activities* Report. *Deposit Money Banks (DMBs) Activities Report.* *Discount Houses Activities Report.* DMBs interest rates compilation. Money market statistics update. IFS-IMF statistics update. *Finance Companies Activities Report.*	Non-reporting of other deposit taking institutions (PMI, MFB) and other non-bank financial institutions on electronic Financial Analysis and Surveillance System (eFASS).	Incorporation of PMIs and MFBs templates on the eFASS and their commencement of rendition of returns. There is also need for effective collaboration with other institutions/agencies both local and international.

Table 1 (cont)

Statistical Initiatives, Challenges and Way Forward at the Central bank of Nigeria

Sector	Initiatives in addressing domestic and GFC data needs	Challenges	Way forward
Financial Sector (money and banking statistics) (cont)	*Primary Mortgage Institutions (PMI) Activities Report.* *Microfinance Banks (MFB) Activities Report.* *Insurance Operations Report.* *Capital Market Activities Report.* *Quarterly Other Financial Institutions (OFI) Activities Report.* *Pension Fund Activities Report.* Compilation of financial soundness indicators (FSIs).		
Fiscal Sector (Govt. Finance Statistics)	Compilation of budgets statistics. Compilation of domestic debt statistics. Compilation of expenditures statistics. Compilation federation account allocation statistics. Compilation of functional and economic classification of government expenditure. Compilation of grants and other international aid statistics. Compilation of revenue statistics. Migration from the IMF GFSM 1986 to GFSM 2001.	Staff skills gap in transformation to GFSM2001	Training of Staff to bridge the skills gap in transformation to GFSM2001.
Real Sector (Real Sector Statistics)	*Standardized Monthly Inflation Report* *standardized Report on Quarterly / Annual Gross Domestic Product (GDP) (Nominal and Real)*	Availability of timely data from the National Bureau of Statistics (NBS).	There should be effective collaboration and support to the NBS.

Table 1 (cont)

Statistical Initiatives, Challenges and Way Forward at the Central bank of Nigeria

Sector	Initiatives in addressing domestic and GFC data needs	Challenges	Way forward
External Sector (BoP and other external sector statistics)	*Quarterly External Sector Monitor.* *Quarterly and Annual Balance of Payments (BOP) and International Investment Position (IIP) Statistics.* Compilation of monthly trade (imports and exports) and invisibles receipts/payments Compilation of external sector data for various international organizations, such as the IMF, UNCTAD, World Bank, WAMA, WAMI and WAIFEM.	Lack of timely and reliable data from data generating agencies and ministries. Low response rate in establishment surveys such as the Coordinated Direct Investments Survey (CDIS). Over reliance on banks returns in the Electronic Financial Analysis and Surveillance System (e-FASS) for data for BOP and IIP compilation.	More stakeholders meetings with data generating agencies to ensure availability of administrative data on regular and timely basis as well as conduct of surveys. Specialized BOP/IIP tailored establishment surveys. Specialized BOP/IIP tailored establishment surveys. Need to involve the organized private sector bodies such as the Manufacturing Association of Nigeria (MAN) with respect to surveys. There should be more technical meetings with relevant officials of DMBs to ensure their understanding of items in the e-FASS. Exposure of compilers to more training especially the IMF courses. Enhanced relationship management between the CBN and Nigeria Custom Services (NCS). Organization of frequent stakeholders/“know your respondents” forum.
Survey Management Unit	Conduct of monthly business sentiment surveys. Conduct of nation-wide retail price survey for the production of retail price index (RPI) Conduct of nation-wide quarterly business expectations survey. Conduct of quarterly consumer expectations and inflation attitudes surveys.	General apathy to data gathering and difficulty in collecting reliable, timely and adequate secondary data from other institutions.	More stakeholders meetings with data generating agencies to ensure availability of administrative data on regular and timely basis as well as conduct of surveys.

Table 1 (cont)

Statistical Initiatives, Challenges and Way Forward at the Central bank of Nigeria

Sector	Initiatives in addressing domestic and GFC data needs	Challenges	Way forward
Statistical Systems Management (Data quality and dissemination)	Establishment of Statistics Data warehouse *Bi-annual CBN Journal of Applied Statistics* *Handbook of Statistical Methodologies* *Annual Statistical Bulletin.* *Handbook of Key Financial and Statistical Terms.* *CBN Statistics Policy / code of practice.*	Manpower shortage, especially trained statisticians/data analyst.	Recruitment of trained statisticians to meet full staff complement. Structured training to fill identified skill gaps on Statistical computing and methodology. The staff should be exposed to requisite skills in the macroeconomic accounts as taught by the IMF and other capacity building institutions Staff exposure/attachment to key Institutions (IMF, BIS and other relevant statistical institutions, etc)

4. Data gaps

The Statistics Department of the Central Bank of Nigeria was established during the GFC. The Department therefore had no option other than to holistically address the domestic data needs (of monetary policy) and the conspicuous data gaps created by the GFC as can be observed from the initiatives in the above table.

However, there are still some more initiatives that are needed to make data more accessible and timely as well as to address new data needs arising from the crisis. They include:

1. Compilation of aggregate leverage and maturity mismatches in the financial system.
2. Compilation of risk transfer instruments, including data on the credit default swap markets.
3. Data collection on international financial network connections.
4. Compilation of information on the financial linkages of systemically important global financial institutions.
5. Data collection on cross-border banking flows, investment positions and exposures, in particular to identify activities of non-bank financial institutions.
6. Sectoral coverage of national balance sheet and flow of funds data.
7. Compilation of data on real estate prices and housing statistics.
8. Improvement of the dissemination of official statistics.

5. Recommendations

1. Work is needed to address the data gaps listed above.
2. SD should tailor most of its training to the understanding and use of SRF and IMF manuals.
3. SD staff should be seconded to the IMF Statistics Department, Eurostat, UNSD and other central banks worldwide for training.
4. A committee of SD and FPRD should be set up to provide better indicators of systemic risks and address data gaps.
5. The FSRCC should cooperate and coordinate the identification of data gaps resulting from the GFC and strengthen data collection and dissemination of principal financial indicators through its website.
6. NBS should reactivate the National Committee on Dissemination of Nigeria's data on the IMF's GDDS and SDDS website. The last posting of GDDS for Nigeria was in 2005.

Acronyms

ABS	Analytical Balance Sheet
BIS	Bank for International Settlements
CBN	Central Bank of Nigeria
CPI	Consumer Price Index
DHs	Discount Houses
DMBs	Deposit Money Banks
DSS	Data Submission System
eFASS	Electronic Financial Analysis and Surveillance System
FGN	Federal Government of Nigeria
FPRD	Financial Policy and Regulation Department
FSRCC	Financial Services Regulation Coordinating Committee
GDDS	General Data Dissemination System (GDDS)
GFC	Global financial crisis
GFSM	Government Finance Statistics Manual
GFSO	Government Finance Statistics Office
IFS	International Financial Statistics
IMF	International Monetary Fund
MDAs	Ministries, Departments and Agencies
NBS	National Bureau of Statistics
OAGF	Office of the Accountant General of the Federation
OFI	Other financial institutions
OPS	Organized private sector
Project EAGLES	Efficiency Accountability Goal Orientation Leadership Effectiveness and Staff Motivation
SNA	System of National Accounts
SDDS	Special Data Dissemination Standard
SSDS	Sector Strategy for the Development of Statistics
SD	Statistics Department
RSSO	Real Sector Statistics Office
TA	Technical assistance
UNCTAD	United Nations Conference on Trade and Development
UNSD	United Nations Statistics Division
WAIFEM	West African Institute for Financial and Economic Management
WAMA	West African Monetary Agency
WAMI	West African Monetary Institute

References

Biodun Adepipe (2009), “Impact of Global Financial Meltdown on the Nigerian Financial System and Suggested Way Out” Seminar presented at the Central Bank of Nigeria. Downloadable at: (http://www.cenbank.org/fican/2009/overview_of_the_Global_Economic Crisis.ppt).

Sanusi Lamido Sanusi (2010), “The Nigerian Banking Industry: what went wrong and the way forward”. A Convocation Lecture delivered at the Bayero University, Kano, Nigeria. Downloadable at: (http://www.cenbank.org/out/speeches/2010/the Nigerian Banking Industry: what went wrong and the way forward_final_260210.pdf).

United Nations Conference on Trade and Development’s Trade and Development Report, 2009. Downloadable at: (http://www.unctad.org/en/docs/tdr2009_en.pdf).

Session 5 C

Improving external statistics

Chair: Rosabel Guerrero, Bangko Sentral ng Pilipinas

Papers:

Improved measurement of cross-border positions, exposures and flows in South Africa using data obtained from banks and formalised exchanges
Johan van den Heever, South African Reserve Bank

Trade collapse, data gaps and the impact of the financial crisis on official statistics
Andreas Maurer, Hubert Escaith and Marc Auboin, World Trade Organization

Toward FATS and beyond: the case of Thailand
Ornicha Tattawasart, Bank of Thailand

External debt statistics of the euro area
Jorge Diz Dias, European Central Bank

Improved measurement of cross-border positions, exposures and flows in South Africa using data obtained from banks and formalised exchanges

Johan van den Heever[1]

Introduction

During the financial crisis problems in many instances spilled over from one jurisdiction to another, and did so very rapidly. This has underlined the need for close monitoring of cross-border positions and flows, and for minimising the time lags involved. This paper describes some of the progress on this front which has been made in South Africa, which should be relevant to the theme of this conference – "Initiatives to address data gaps revealed by the financial crisis".

To provide context to the discussion, the impact of the financial crisis on South Africa is reviewed in the next section of the paper. Thereafter the participation of South Africa in the BIS locational banking statistics is described. This is followed by a review of the use of data obtained from the bond and share market in South Africa. A few examples of the kinds of analysis which can be done utilising the data are also provided.

However, addressing data gaps should not be seen as a panacea for all possible ills in the financial system; limits regarding the contribution which economic statistics can make are briefly touched upon, before concluding.

Impact of the financial crisis on South Africa

While progress has been made in measuring external exposures and flows in South Africa, this should be seen in context. South African financial institutions had very little ***direct*** exposure to the financial instruments and markets where the turbulence erupted most forcefully. In several mature economies an overly enthusiastic expansion of securitisation activity and accumulation of complex derivative instruments was observed in the run-up to the crisis, largely aligned to overoptimistic views about prospects for the fixed property market. By contrast, in South Africa banks and other financial institutions expanded their activity briskly and profitably from 2004 onward, focusing on conventional business. During the past decade nominal interest rates in South Africa never declined to such extreme lows as in some of the mature economies where the "search for yield" stood central in financial strategies. However, a growing economy, rising income levels, backlogs in housing and a high propensity to consume were reflected in strong demand for credit, particularly from 2004 to 2008. Accordingly, credit extension expanded strongly in South Africa alongside a buoyant economy and booming property market, without a need to venture into exotic financial products.

A handful of South African financial institutions did have some exposure to the troubled assets of the northern hemisphere, mainly through their foreign subsidiaries or associates. However, the overall amounts involved were quite modest. Much more important was South

---

[1] Deputy Chief Economist, South African Reserve Bank. The author is indebted to Marian van Deventer, Lisa de Nysschen, Zeph Nhleko and Helene Coetzer for the provision of statistical information. Remaining errors are his own. The views expressed are those of the author and are not necessarily in agreement with those of the South African Reserve Bank.

Africa's ***indirect*** exposure to the crisis; the contraction in global output and international trade was forcefully transmitted to the South African economy, culminating in real gross domestic product declining by 1.8 per cent in 2009. This weakened firms' turnover, cash flow and confidence; lifted banks' impaired advances; and resulted in a weakening of both the supply of and the demand for credit.

South Africa therefore did not participate in the excesses which were at the core of the international financial crisis. However, the crisis again underlined how interconnected the global financial system had become, and how much the South African economy had become integrated with that of the world since the first fully democratic election in South Africa, held in April 1994. It also demonstrated that individual country responses to shocks and turbulence can differ markedly, posing risks of their own. The magnitude of the exposure of a country to every other country individually therefore is of considerable importance.

Participation in BIS locational banking statistics

South Africa did not decide to participate in the compilation of BIS locational banking statistics because of the international financial crisis. The decision to participate dates back to well before the turbulence of 2007–09. However, the timing was influenced by the pressures on banks and bank regulators to implement the Basel II framework. In South Africa the Basel II framework was implemented in January 2008, with a considerable amount of preparation in the year before and aftercare in the year following that date. This left both the regulators and the regulated stretched to the point where simultaneously starting the reporting of locational banking statistics would have been extremely difficult.

Final preparation for participating in BIS locational banking statistics began early in 2009, when the Basel II-oriented systems had been in place for about a year and the addition of further reporting requirements could be accommodated. The dedicated work of the banks and compilers culminated in South Africa becoming a reporter of locational banking statistics from September 2009.

Previously South Africa's external position data on a geographical basis – by individual country – were compiled as at year-end and disseminated with a lag of one calendar year. External position data by country for the end of 2008 were, for instance, published in December 2009. This practice had the advantage that the positions covered not only the banks, but all sectors with foreign assets and liabilities. However, the lag was long.

Table 1

Geographical areas identified in reporting South African banks' assets on the DI 500 credit risk return

Area
South Africa
Other African countries
Europe
Asia
Russian Federation/former USSR
North America
South America
Oceania and other

Source: South African Reserve Bank, Bank Supervision Department, DI 500 credit risk return. Available on www.resbank.co.za

For the banks only, data on external assets on a geographical basis could previously be obtained on a monthly basis from the DI 500 return which dealt with credit risk. However, the geographical areas identified were broad, as shown in the accompanying table.

Much more detailed analysis, detailing data by individual country with quarterly frequency, became possible when South Africa joined the locational banking statistics. Those familiar with BIS locational banking statistics will know that several data dimensions are covered by the datasets. Banks' international claims and liabilities are broken down by broad instrument group, currency, sector, country of residence of counterparty and nationality of reporting banks. Only some illustrative extracts are included in this paper. Summary data on South African reporting banks' international claims and international liabilities vis-à-vis each country are provided in an appendix table. Table 2 below condenses the lengthy country-by-country table by focussing on the major country groupings identified by the BIS.

Table 2

International claims and liabilities of South African banks: Major country groupings, end-March 2010

Million US dollars

Vis-à-vis country	Claims	Liabilities	Total business	Net claims
Developed countries	47,082	34,034	81,116	13,047
Offshore centres	2,294	4,808	7,103	–2,514
Developing Europe	29	3	32	26
Developing Latin America and Caribbean	901	23	924	878
Developing Africa and Middle East	1,593	4,220	5,814	–2,627
Developing Asia and Pacific	334	615	949	–281
International organisations	3	0	3	3
Unallocated	483	0	483	483
All countries	**52,718**	**43,703**	**96,421**	**9,014**

Note: The table should be interpreted as follows: at the end of March 2010 South African banks had claims on parties in developed economies amounting to US$ 47,082 million (having extended loans to those parties, having acquired debt securities issued by them or having other claims on them). At the same time South African banks owed parties in developed countries US $34,034 million (having attracted deposits from them, having issued own debt securities to them or having other liabilities to them). A similar interpretation applies to the other country groupings. "Total business" is the sum of "claims" and "liabilities", and "net claims" is the difference.

Source: South African Reserve Bank locational banking statistics dataset in respect of 31 March 2010.

From Table 2 it is clear that South African banks conduct the bulk of their international business with counterparties in the developed countries. Before the international financial crisis that would probably have been considered a strong point. Furthermore, the South African banks' international claims exceed their international liabilities by a significant margin. While the table shows the "net claims" of South African banks on each country grouping, it is likely that the debtor and creditor parties in each country grouping are different entities, so that if difficulties should arise, very little netting of positions would be possible. In other words, the gross exposure to each country or country grouping would be the important variable to monitor, should there be concerns regarding the financial health of that country or group of countries.

Within the major country groupings of Table 2, individual countries may experience divergent conditions and pose different levels of risk. In Table 3 the 12 most important countries are identified, based on total business (claims plus liabilities) with South African banks. The dominance of the United Kingdom stands out, well above Germany and the United States, which take the second and third place. South African banks report significantly more claims on parties in the United Kingdom than liabilities to the same country. The reverse is true in the case of the Isle of Man, Namibia and China. However, as mentioned above, the gross claims and gross liabilities vis-à-vis a country are probably more relevant than net claims when assessing the riskiness of banks' exposure to that country.

Table 3

International claims and liabilities of South African banks: Top 12 countries, end-March 2010

Million US dollars

	Claims	Liabilities	Total business	Net claims
United Kingdom	27,432	18,320	45,752	9,112
Germany (including ECB)	6,951	6,181	13,132	770
United States	5,913	5,150	11,064	763
Isle of Man	1,270	4,594	5,864	–3,324
France	1,904	1,053	2,957	851
Switzerland (including BIS)	1,080	1,063	2,143	18
Canada	650	633	1,283	17
Netherlands	847	432	1,280	415
Namibia	143	1,034	1,177	–892
Ireland	610	358	969	252
Brazil	899	0	899	899
China	109	500	609	–391

Source: South African Reserve Bank locational banking statistics dataset in respect of 31 March 2010.

It is possible to provide various further disaggregations of the locational banking statistics. For instance, total international claims can be subdivided into three broad categories. For the South African banks, loans are the largest category on the asset side of the balance sheet, as can be seen in Table 4.

Statistical and supervisory authorities usually restrict the information made available to the public to aggregate data or data combined in such a way that the numbers for any single institution cannot be inferred. This is also the case with the BIS locational banking statistics. However, for internal analyses of risk in the central bank the data for individual institutions can be utilised – for instance to establish if a specific bank is increasing or decreasing its exposure to a specific country at a pace which seems exceptional.

Table 4

International claims of South African banks by type, end-March 2010

Million US dollars

International claims: loans	26,596
International holdings of debt securities	1,732
Other international assets	24,390
All claims	**52,718**

Source: South African Reserve Bank locational banking statistics dataset in respect of 31 March 2010.

All in all, participation in BIS locational banking statistics has made it possible to undertake a country-by-country analysis of external positions for the domestic banking sector on a quarterly basis. It serves to track the development of external positions in more detail than before and adds a further tool to enhance the compilation of the balance of payments. With the Special Data Dissemination Standard (SDDS) of the International Monetary Fund also set to require quarterly reporting of international investment position data in four years' time (Financial Stability Board and International Monetary Fund 2010, p 8), this may be a helpful data source to already have in place.

Utilising data from formalised exchanges to improve measurement of cross-border flows

The South African bond and share markets are liquid and are underpinned by a well-developed infrastructure. The exchanges and the central bank have cooperated over many years to establish efficient mechanisms for the transfer of relevant data to facilitate analysis of the bond market.

As a consequence, it is possible to disaggregate the transactions flowing through the bond and share market using a variety of perspectives. Transactions between residents and non-residents can be identified since the trading system captures the necessary classification codes for buyers and sellers.

There are many perspectives which can be investigated using the comprehensive sets of data from the formalised exchanges. The full underlying datasets include all dimensions required to administratively carry through each transaction, from the specific instrument traded and the quantity, price and relevant dates, to the details of the buyer and seller. The extracts below are illustrative only, and analysts and compilers can pursue further dimensions as required. The compilers of the South African balance of payments and the flow of funds accounts have intensified the analysis of data from the exchanges in order to improve measurement and understanding of what is measured in this area, picking up exceptional transactions and pursuing the story behind them.

Table 5 shows the purchases and sales of shares and bonds by non-resident parties in respect of the second quarter of 2010, based on the data obtained from the formalised exchanges. The gross and net amounts are substantial, as is clear when expressing the various transaction flows as a percentage of gross domestic product. In linking this data to the balance of payments, however, one should be careful not to assume that the net purchase amounts are matched by a net inflow of foreign currency into the South African economy. In many instances non-residents have rand deposit accounts in South Africa and may for instance buy shares from South African residents drawing down those deposits. In such cases, while there may be a net inflow of *portfolio capital*, it would be matched by an

outflow of *other capital* as the deposit liabilities of the domestic banking sector to non-residents are reduced. This is not to deny that sustained net purchases of shares and bonds by non-residents at some point have to be funded (or prefunded) by net inflows of foreign currency into the country. However, there could be substantial lags involved.

Table 5

Non-resident transactions on the South African share and bond markets, 2nd quarter 2010

	Purchases	Sales	Net purchases
R millions:			
Shares	113,019	104,207	8,812
Bonds	469,188	449,081	20,107
Percentage of GDP:			
Shares	17.7%	16.3%	1.4%
Bonds	73.3%	70.2%	3.1%

Source: South African Reserve Bank, Capital Market and Flow of Funds Division, based on underlying data obtained from JSE Limited; and author's estimates.

The South African bond market is very liquid, with overall turnover in six to eight weeks equal to one year's gross domestic product. Typically non-residents account for around 10 to 15 per cent of total turnover in this market. A further notable feature is the importance of repurchase transactions in the bond market. On a monthly basis, repurchase transactions typically constitute between 50 per cent and 72 per cent of total turnover in this market (Coetzer and Tlali (2009, p 87)).

For Table 6 the bond market dataset was used to show non-resident activity, split between outright and repurchase transactions. The table shows that, as for all (resident plus non-resident) bond market transactions, non-residents' repurchase transactions also constitute a larger part of total turnover than the outright transactions they enter into. Repurchase transactions are essentially collateralised lending over money market time horizons – typically from one day to two or three months. The purchase and repurchase prices are such that they yield a money market rate of return, although the underlying bond may have a very long maturity. With current money market interest rates in South Africa around 6.5 per cent per annum and such rates in the mature economies much lower – even close to zero – there is a fair amount of interest by non-residents in the South African repurchase market.

Table 6

Outright and repurchase transactions by non-residents on the South African bond market, 2nd quarter 2010

R millions

	Purchases	Sales	Net purchases
Repurchase transactions	277,059	277,248	–189
Outright	192,129	171,833	20,296
Total	469,188	449,081	20,107

Source: South African Reserve Bank, Capital Market and Flow of Funds Division. Based on underlying data obtained from JSE Limited.

Table 7 provides more particulars regarding the countries from which non-resident participants in the South African bond market operate. For both repurchase and outright transactions, the United Kingdom is overwhelmingly the most important counterparty country. This is not unexpected, given the historical linkages between South Africa and the United Kingdom and the fact that so many institutions from various countries have offices in London through which they conduct a significant part of their financial business. Namibia, Belgium and the United States are also responsible for significant transaction values in the bond market.

Table 7

Non-resident transactions on the South African bond market by residency

R millions

	Purchases	**Sales**	**Net**
Repurchase transactions			
United Kingdom	269,459	269,640	–181
Namibia	6,685	6,694	–9
United States	915	914	1
Total	**277,059**	**277,248**	**–189**
Outright transactions			
United Kingdom	182,795	165,895	16,900
Belgium	3,628	2,177	1,451
Namibia	3,212	2,184	1,029
United States	1,838	1,411	428
Ireland	399	0	399
Lesotho	138	19	118
Euro countries not elsewhere	0	105	–105
Mauritius	63	11	52
France	52	30	22
Swaziland	2	1	1
Switzerland	0	1	–1
Unidentified (invalid country code)	3	0	3
Total	**192,129**	**171,833**	**20,296**

Source: South African Reserve Bank, Capital Market and Flow of Funds Division. Based on underlying data obtained from JSE Limited.

It follows from the above remarks that it is possible for an institution in, say, the United Kingdom to purchase South African bonds, but in fact to be doing so on behalf of an ultimate beneficiary in another country. Since the transaction is booked from the United Kingdom, the South African bond exchange information would not reveal that. For this reason data from an exchange should be treated with some caution, as compilers know. The ideal of data revealing the country of the ultimate beneficiary in each and every instance is unlikely to be met by data from exchanges.

Limits to the contribution economic statistics can make

In dealing with and preventing financial crises, one should be careful not to underplay but also not to overplay the role economic statistics can play. There are great benefits in consistent, reliable and timely data compiled utilising the guidance provided in the major international statistical frameworks such as the *System of National Accounts* and the *Government Finance Statistics Manual*. Sensible improvements are also under way in the area of financial soundness indicators, following recent work and initiatives.

Economic statistics will always be crucial in getting the facts on the table and analysing events. And when a particular data series escalates or declines very rapidly, it is well worth investigating, usually to gain an understanding of the forces driving the trend and sometimes to initiate corrective action, provide guidance, issue warnings, revisit regulations, etc.

Nevertheless, one should not expect economic statistics to reveal each weakness and pre-empt each crisis. However detailed the classification system and rigorous the analysis of the data, there are micro-details which are not revealed by the data. For instance, even if derivative instruments are split into the most detailed classes with transactions and balances being reported timeously, the individual contracts are likely to require detailed micro-examination to determine their level of health before coming to a conclusion. Even then some risks may evade detection. Furthermore, elements somewhat removed from economic and financial statistics, such as the conduct of policymakers and of financial regulators themselves during a period of high systemic risk, may be of a more crucial nature in preventing certain types of financial crises.

One should be mindful that economic data are generally not good at revealing the true underlying motives of transactors. For instance, investment in long-term securities by an institution managing long-term savings seems to imply a long-term investment time horizon. However, in the presence of secondary markets, which are nowadays no longer confined to the mature economies, it is possible for such an investment to be liquidated very quickly – and perhaps despite the initial intention of keeping the investment until maturity.

A related issue is the escalation of reporting burdens and compliance costs. A balance needs to be struck here, too. While it seems ideal to know everything about everything and develop elaborate reporting systems with this in mind, there is a real cost to pushing the reporting boundary further and further out. One unintended consequence is increasing the attractiveness of disintermediation, pushing business previously done through regulated financial institutions to unregulated ones or encouraging direct transactions between ultimate savers and ultimate borrowers. It seems sensible to make special efforts so that the true cost of compliance is revealed to regulators and compilers of economic statistics, before making changes to the reporting boundary.

Conclusion

The South African authorities have recently enhanced the monitoring of cross-border positions and flows, while at the same time reducing the time lags involved. Enhancements include the compilation of BIS locational banking statistics and more detailed analysis of the comprehensive datasets obtained from the South African bond and share markets. These enhancements form part of a general drive to embrace good practices and meet international statistical standards, but are of course helpful in the context of the various initiatives in the wake of the international financial crisis. The crisis strongly demonstrated the highly interconnected nature of the global financial system, and the importance inter alia of information regarding the magnitude of the exposure of each country to every other country.

However, addressing data gaps – whether in response to the gaps revealed by the crisis or propelled by the perpetual drive to improve economic statistics – should not be seen as a panacea for all possible ills in the financial system. Economic statistics can make a significant contribution towards financial stability and sound policymaking, but there are limits to how much they contribute, and the reporting boundary should be determined with due regard to both the costs and the benefits involved. The South African authorities are satisfied with the ratio of benefits to costs of the statistical initiatives described in this paper and a few more initiatives in the pipeline.

Appendix

Table A1

International claims and liabilities of South African banks: All countries, end-March 2010

Million US dollars

Vis-à-vis country	Claims	Liabilities	Total business	Net claims
Austria	192	19	211	173
Belgium	370	52	422	318
Denmark	334	102	437	232
Finland	3	8	11	–5
France	1,904	1,053	2,957	851
Germany (including ECB)	6,951	6,181	13,132	770
Greece	0	18	18	–18
Iceland	15	0	15	15
Ireland	610	358	969	252
Italy	140	12	152	128
Luxembourg	18	235	253	–217
Netherlands	847	432	1,280	415
Norway	10	10	20	0
Portugal	48	5	53	43
Spain	56	3	59	
Sweden	22	6	28	16
Switzerland (including BIS)	1,080	1,063	2,143	18
United Kingdom	27,432	18,320	45,752	9,112
Australia	149	50	198	99
Canada	650	633	1,283	17
Japan	71	43	114	28
New Zealand	2	2	4	0
United States	5,913	5,150	11,064	763
Residual developed countries	262	277	539	–15
Developed countries	**47,082**	**34,034**	**81,116**	**13,047**
Bermuda	0	3	3	–3
Cayman Islands	3	19	22	–16
Guernsey	59	22	81	37
Hong Kong SAR	167	26	193	141
Isle of Man	1,270	4,594	5,864	–3,324
Jersey	1	2	3	–1
Macao SAR	0	1	1	–1
Mauritius	332	114	446	218
Netherlands Antilles	13	3	16	10
Singapore	335	18	353	317

Table A1 (cont)

International claims and liabilities of South African banks: All countries, end-March 2010

Million US dollars

Vis-à-vis country	Claims	Liabilities	Total business	Net claims
West Indies	0	6	6	–6
Residual offshore centres	114	0	114	114
Offshore centres	**2,294**	**4,808**	**7,103**	**–2,514**
Estonia	1	0	1	1
Russia	5	1	6	4
Serbia	0	1	1	–1
Turkey	21	0	21	21
Ukraine	1	0	1	1
Developing Europe	**29**	**3**	**32**	**26**
Brazil	899	0	899	899
Chile	0	1	1	–1
Haiti	1	0	1	1
Paraguay	0	16	16	–16
Uruguay	0	6	6	–6
Venezuela	1	0	1	1
Developing Latin America and Caribbean	**901**	**23**	**924**	**878**
Algeria	0	1	1	–1
Angola	52	518	570	–466
Benin	1	0	1	1
Botswana	52	76	128	–24
Burundi	0	2	2	–2
Cameroon	1	1	2	0
Congo, Republic of	23	11	34	12
Congo, Democratic Republic of	82	0	82	82
Côte d'Ivoire	0	3	3	–3
Egypt	27	7	34	20
Eritrea	0	3	3	–3
Ethiopia	1	21	22	–20
Gabon	1	1	2	0
Ghana	99	7	106	92
Iran	0	469	469	–469
Israel	3	3	6	0
Jordan	0	1	1	–1
Kenya	66	100	166	–33
Lesotho	10	488	499	–478
Libya	0	2	2	–2
Madagascar	6	2	8	4

Table A1 (cont)

International claims and liabilities of South African banks: All countries, end-March 2010

Million US dollars

Vis-à-vis country	Claims	Liabilities	Total business	Net claims
Malawi	26	16	42	10
Mozambique	161	99	260	63
Namibia	143	1,034	1,177	–892
Niger	1	0	1	1
Nigeria	84	134	218	–50
Qatar	50	0	50	50
Rwanda	2	0	2	2
Saudi Arabia	2	102	104	–100
Seychelles	7	1	8	6
Swaziland	22	554	576	–533
Tanzania	97	39	136	58
Uganda	39	17	56	22
United Arab Emirates	10	11	21	–1
Zambia	111	58	169	52
Zimbabwe	204	76	280	128
Residual Africa and Middle East	208	358	567	–150
Developing Africa and Middle East	**1,593**	**4,220**	**5,814**	**–2,627**
Afghanistan	1	0	1	1
China	109	500	609	–391
Chinese Taipei	3	72	75	–69
India	74	19	93	54
Indonesia	0	1	1	–1
Kazakhstan	24	0	24	24
Malaysia	20	1	21	19
North Korea	1	0	1	1
Pakistan	1	4	5	–3
South Korea	0	8	8	–8
Thailand	101	8	109	93
Residual Asia and Pacific	0	1	1	–1
Developing Asia and Pacific	**334**	**615**	**949**	**–281**
International organisations	3	0	3	3
Unallocated	483	0	483	483
All countries	**52,718**	**43,703**	**96,421**	**9,014**

Note: Countries where South African banks have no claims or liabilities have been excluded from the table. Components may not add to totals due to rounding.

Source: South African Reserve Bank locational banking statistics dataset in respect of 31 March 2010.

References

Coetzer, H and Tlali, M. 2009. *Note on the profile of repurchase transactions on the JSE Limited*. South African Reserve Bank *Quarterly Bulletin*, December. Pretoria: South African Reserve Bank.

Financial Stability Board and International Monetary Fund. 2010. *The financial crisis and information gaps: Progress report, action plans and timetables*: http://www.imf.org/external/np/g20/pdf/053110.pdf, accessed on 23 June 2010.

South African Reserve Bank. 2010a. *Bond and share market data extracts*. Internal documents compiled by the Capital Market and Flow of Funds Division, South African Reserve Bank, based on underlying data obtained from JSE Limited.

South African Reserve Bank. 2010b. *Locational banking statistics dataset in respect of 31 March 2010*. Internal document compiled by the Money and Banking Division, South African Reserve Bank.

Trade collapse, data gaps and the impact of the financial crisis on official statistics

Andreas Maurer, Hubert Escaith and Marc Auboin[1]

Global merchandise trade collapsed in the first quarter of 2009 at an unprecedented rate but not evenly across the globe. Demand for durable goods in developed countries declined with prices of oil and minerals falling drastically. Disruptions affecting trade finance and international supply chains were often cited as a contributing factor to the steep fall of trade flows. While trade in transport and travel services also dropped, trade in other commercial services showed more resilience (apart from financial services).

Many economists were caught short by these developments, while some had warned as early as 2003 that global imbalances might lead to a meltdown of the financial system.[2] While we may ask why economists failed to forecast this global recession, the question for statisticians is whether relevant statistics have been provided, that is:

1. Do statistics **describe economic reality adequately?** Do statistics offer information that helps monitor the most recent economic developments?
2. Did the crisis reveal **data gaps** that indicate structural weaknesses of statistical systems?
3. If there are gaps, how should these be addressed? Should **non-official sources** be used to fill this gap?
4. On the other hand, if the right data sets were compiled, did statistics fail "to...explain these in terms that the people can understand"?[3] Is there a **need to turn statistics into knowledge** for an improved decision-making of politicians?

These questions will be discussed further in the context of the WTO's ongoing monitoring and surveillance of trade developments.

1. More details – the need for disaggregated data

Implementation of statistical frameworks

Media and policymakers use expressions such as global value chains, vertical trade, trade in intermediates, intra-firm trade or trade costs. Economists speak of trade in tasks and the "new" new trade theory.[4] Analysts of these aspects turn to statisticians to receive information on the impact of international supply chains on trade flows, trade in intermediate goods, the size of intra-firm trade or the impact of the crisis on export processing zones, etc. Trade flows by mode of transport and the use of preference schemes are additional topics that demand

---

1 This paper represents the opinion of the authors; it is not meant to represent the position or opinion of the WTO or its Members, nor the official position of any staff member.

2 Heise, A (2009) and Duncan, R (2003).

3 UNECE (2009), p 3.

4 WTO (2008).

constant attention. Because the crisis was not affecting all sectors identically, it increased the appetite of users for more disaggregated data to identify the impacts at firm or product level.

World merchandise trade statistics are based on the “crossing borders” principle of customs for recording international transactions. That is, each crossing of the border, whether it be an intermediate good that is input into further processing or a final good for end user consumption, is considered a trade flow. Intermediates may cross several borders before being included in a good for final consumption in the destination country. Thus, trade flows are a global gross measure, and the crisis revealed this structural weakness of the official statistics on trade as regards their economic interpretation.

Gross recorded flows do not lend themselves to the analysis of the above-mentioned analytical questions. For example, it is very difficult to establish an estimate of the size of intra-firm trade worldwide; in fact, in the literature only anecdotal evidence is provided, putting it at a third of world trade flows in merchandise. Further, measuring (or, better say, estimating) trade flows in value added terms to analyse what value is created in the country and which sector contributes to this creation requires linking of trade statistics with input-output tables. These input-output tables are not readily available in a cross-country comparable form; in addition, sectoral averages may not provide adequate information for the type of firms more actively engaged in export activities (an issue related to firm heterogeneity).

The consequences of the revision of the balance of payments (BOP), relocating goods for processing to manufacturing services on inputs owned by others (from goods to services), are not yet fully known with respect to the discussion on value added. While net recording may contribute to a better analysis of value added, it is feared that this change may contribute to losing information on this phenomenon in some countries, in particular for the purpose of establishing suitable input-output tables. The options suggested are to produce two sets of input-output tables, or to keep on recording supply-use tables on a gross basis, and to reconcile economic statistics with BOP conventions at a later stage, when establishing the national accounts.

As for analysing trade costs, measuring trade by mode of transport is crucial. In fact, the monitoring of trade flows according to trade in tasks is demanding a decomposition of trade flows by modes of transport. However, not many countries provide this information in a systematic way in their regular dissemination programmes. While the new IMTS2010 is reinforcing some of the needs from a conceptual point of view by recommending recording of trade sent/received for processing, detailing trade flows by mode of transport or recording trade between related parties, it is up to countries to implement the recommendations and collect the information.

However, many developing or transition countries are still struggling to fully implement the SNA 1993, and these new issues may not receive priority in data collection and dissemination programmes. The increased demand for this information, resulting from the information needs of users during the crisis, may change the priorities of statistics budgets, emphasizing the importance of improving data availability for the analysis of these questions.

2. Data gaps – faster availability of analytically relevant data?

High-frequency data

During the crisis, the demand for high-frequency statistics on trade in goods and services, quarterly or monthly, comparable across countries, increased exponentially, not only for the countries’ total exports and imports as a start, but also for their trade flows broken down by major trading partner and/or product for the analysis of regions and sectors. Related statistics, such as industrial production and foreign trade prices, were equally in demand.

There did not seem to be a freely available international database that could meet these data needs

In response, the international statistics systems set up coordination mechanisms to identify data gaps and analyse availability, periodicity and timeliness of high-frequency statistics in accessible and analytically useful formats.[5] Political pressure, for example from the G20, helped to implement such initiatives.[6]

Accessibility should, however, be complemented with improving data quality. Full implementation of international standards across countries (including the respective revisions of international classifications) of concepts and definitions of merchandise trade statistics helps to provide not only more frequent data (monthly), but also more detail in terms of products distributed, by origin and destination. Information on trade in constant prices was and still is more difficult to collect; however, in times of crisis it is even more relevant to separate price (exchange rate) movements from volume developments.[7]

For trade in services, while current values for quarterly trade developments are available only for major countries, for most developing countries this information is absent. The lack of disaggregation is particularly acute in this sector as well as the absence of trade data by major partner country or in constant prices. While this is often compensated by the use of quantitative or key performance indicators to judge market developments, a widespread, up-to-date database comparable across countries is not available either.[8] Often, information not produced in the official statistics framework – such as that obtained from business associations (construction, professional services, etc) – is used.

While high-frequency data requirements on merchandise trade statistics were partially satisfied by providing a new database on short-term merchandise trade statistics on the WTO's website[9] – the WTO traces countries' monthly data releases online and collects the respective data – requests were often accompanied by demands for more detail.

Now- and forecasts – what is going to happen?

The press is looking not only for indicators measuring backward developments but also for estimates of the current-year development or even forecasts covering a number of years. While this demand is not linked only to the crisis years, requests are increasing. Whereas official statistics do provide backward-oriented statistics with a time lag, non-official sources more easily use preliminary data and alternative data sources to describe short-term developments.

Trade finance – what existed once is what is needed once again

Up until 2003, some trade finance (trade credit and insured trade credit) statistics were published in the Joint Hub on External Debt Statistics of the IMF, the World Bank, the BIS and the OECD. Cost-quality ratios seem to have caused their discontinuation. At present, the only available source is the Berne Union of export credit agencies. It collects from its

---

5 OECD (2009).

6 See for example the inter-agency database at http://www.principalglobalindicators.org.

7 Silver, Mick (2010).

8 The WTO has started such a database for around 90 countries.

9 See WTO Resources – trade and tariff statistics, http://www.wto.org/english/res_e/statis_e/quarterly_world_exp_e.htm.

100 members quarterly data on insured trade credits (perhaps 5 to 10% of total trade credits). These data are used by the BIS in its online database.

Information on trade finance is crucial for the analysis of constraints affecting international trade; however, the international community has no comprehensive and reliable source of information on trade credit supply, despite its key role in trade operations. Most short-term trade credit transactions are now lost in the "black hole" of interbank lending cross-border movements. The issue is therefore to provide hard data on trade finance derived from balance of payments or from cross-border banking data generated by the BIS.

A very large share of international trade requires some form of credit, insurance or guarantee. This stems from the fact that international trade involves particular forms of commercial risk relative to domestic trade: payment risk,[10] risks related to the value of the expected payment linked to possible fluctuations of the exchange rate or the price of commodities, transportation risk. Exporters and importers are unwilling to bear such risk, which is traditionally assumed by banks.

The payment of international trade has historically relied on a relatively standard, securitised lending instrument – the letter of credit. Importers, which will eventually pay the exporter at delivery (at the earliest), ask their banks to extend a guarantee to pay the exporter's bank against specific documentation or collateral. Against these, the exporter's bank will endorse the letter of credit as a guarantee of payment. In turn, importers can extend lending to the exporter, for example in the form of working capital to produce the goods for export. Other instruments such as promissory notes and bank acceptances are recognised as similar securities involving an obligation to pay. Given the small likelihood of payment default on international trade operations, these securities are traded on the secondary market and are usually highly regarded by investors. According to the Bankers' Association on Trade and Finance (BAFT) and the International Chamber of Commerce's (ICC) banking commission, most trade credit flows, in particular letters of credit, are short term, reflecting the one to three months average delivery lead times in international trade.

For a decade, with the fragmentation of the value added process across countries through international supply chain operations, multinational firms tried to speed up the payment and credit cycle at the various stages of the import and export of parts and finished products. Instead of relying on documented credit, which involves a comprehensive check of documentation, firms asked their banks to handle their flows of receivables and payables across the value chain process – and possibly net it out. This involved banks' accepting to take up the payment risk on behalf of their customers, by automatically rediscounting receivables against liquidity provided to their clients. With the large availability of liquidity internationally, the so-called trade financing in "open account" developed rapidly. According to a BAFT and ICC survey, conducted during the peak of the crisis, letters of credit and open account financing represented roughly equal shares of trade credit provision (secured and unsecured lending), although these surveys were only qualitative in nature (there are no hard numbers).

A large part of the international statistical reporting system is relying on the definition of trade credit as being a letter of credit or a bank acceptance issued or endorsed by a bank (BPM5 and BPM6). For that reason, data collected internationally do not take into account open account trade financing. Besides, banks have poorly reported flows of letters of credit – and these flows are probably dissolved somewhere and aggregated to other interbank lending data (an endorsement of a letter of credit by the endorsing bank is counted as such).

[10] Payment risk, since almost none of international trade is paid in cash.

There is also a longer-term segment to trade credit (two to five years or more, generally), which involves investment goods and large equipment (eg aircraft, ships). Such credit is most generally securitised and benefits from the coverage of trade credit insurance, which is provided either by private players (Lloyds, Swiss Re, AIG) or by national credit agencies (Coface, US Ex-Im Bank).

A growing but still small proportion of short-term credit is also subject to trade insurance. The players indicated above are providing such short-term credit insurance at market rates (with no government guarantees). Statistics on insured trade credit are collected by the professional association of export credit agencies, both privately and publicly owned, the Berne Union. Outstanding amounts of insured credit are collected quarterly, but, according to the Berne Union Secretariat, account only for a limited part of trade credit internationally. Insured trade credits entail large costs, which add to the banking fees charged to importers and exporters for handling letters of credit or open account transactions. This insurance might account for less than 10% of world trade finance.

All in all, the state of existing statistics on trade finance is not satisfactory, and such statistics were missed by analysts in past years, for the analysis of both short-term and long-term trends of the markets. Collecting trade credit data would be of considerable value for policy analysis.

In 2008, severe supply shortages of trade credit were identified by the WTO. Anecdotal evidence from trade finance providers indicated that liquidity constraints had reduced the ability of leading banks to finance trade, at a time when the secondary market for trade bills seized up. Similar problems on a smaller scale had been observed previously during the Asian crisis. Existing balance of payments data could not be used for analysis because they were not consolidated and not very comprehensive in coverage. To fill the information gap in 2008, the IMF and the International Chamber of Commerce conducted fairly costly global but partial market surveys. On this basis exceptional and extensive official liquidity support was made available for trade credit purposes.

Since 2005, for the Joint External Debt Hub, the BIS has provided quarterly data on trade credit insurance, compiled by the Berne Union. During the crisis, the WTO analyzed these data, but found that they were not comprehensive enough to proxy accurately banks' total provision of trade credit. The concern is that during crisis times, exporters' risk aversion rises, shifting the boundary between insured and uninsured trade credit to the advantage of the former, thus obscuring the possible extent of a liquidity squeeze in the data reported by the Berne Union.

The WTO proposal therefore was to ask central banks to slightly expand their reporting in the BIS banking statistics by providing an "of-which" item on short-term bank credit related to trade financing. This is seen as providing superior information at much lower cost than would be possible with a continuation of ad hoc surveys.[11]

Reporting of this sub-item could be envisaged either in the *locational* (by residence) or in the *consolidated* banking statistics. Technically, the costs to the BIS are similar and rather low for both solutions. According to the WTO, major international banks are showing willingness to supply data on a regular basis. Including this reporting in an existing regular reporting system would also seem to be the most cost-efficient solution for banks. Since trade credit will gain a specific risk weighting in regulatory reporting, exact definitions and internal reporting systems should be available without additional cost. Moving from ad hoc crisis surveys to regular reporting would also provide time series as benchmarks for qualitative surveys and a clear background for analytical research.

[11] At the time of writing, discussion on a possible reintroduction of this statistical programme is under way.

- The advantage of reporting in the *locational* system is the currency breakdown of the data. Short-term fluctuations due to exchange rate movements could be corrected and changes in the currency denomination of trade finance could be monitored.
- The advantages of reporting a trade credit sub-item in the *consolidated* statistics are:
  - The provision of trade credit by consolidated bank groups (by country) could be monitored.
  - Short-term bank credits are already reported, so an "of which" on "trade-related" short-term credit would fit naturally into this reporting system, as would additional information on trade credit commitments.
  - Since trade and credit data are both reported in USD, temporary currency fluctuations would cancel out in the ratio. Comparative measures of economic activity are also reported in USD.

3. Official statistics and non-official data sources

Non-official data sources become more important during crisis times. In the absence of official data and under the pressure of time, users (journalists as well as politicians) turn to non-official (private) data sources to find real-time information. As for some domains where no information was available (trade finance), private data sources stepped in to report the latest data, for example, by either carrying out surveys or collecting national data through fast access (eg monthly trade statistics by country, partner and product distribution). Although some of these statistics may be reported by national authorities, there is either a considerable time lag as to their processing by international organisations, or there is no comprehensive database that helps disseminate these data. Private databases close this gap as their business model through payment allows getting fast access to the source data with timely subsequent processing and dissemination.

For example, up-to-date trade flows by origin and destination, compiled from national sources, could be found in private databases, while data on international transportation could be gathered from business sources (port authorities or chambers of commerce). A similar situation occurred for the trading environment.

In some instances, non-official data providers (chambers of commerce or similar business organisations) are the only source for information of great relevance for monitoring the international economic context. Take data on the shipping costs for specific maritime routes – a very pro-cyclical indicator often used to nowcast the strength of international trade. This information is available only through non-official sources. Similarly, most key financial indicators, starting with stock exchange indices, are produced by non-official statistics sources.

Private databases have also been collecting material on protectionist measures. For trade finance, survey-based data of the ICC and the BAFT helped to provide estimates. More recently, the ICC, in collaboration with SWIFT, collected information on letters of credit – although SWIFT data come at a cost. That is, in a situation where operators had to take quick decisions, non-official data sources had to fill the gaps left by official statistics.[12]

[12] For a more detailed discussion of non-official data sources in imputations, see Escaith, H (2009).

During the last crisis, official statistics agencies initiated a number of efforts to close the gaps. Examples are GIVAS (UN/DESA), which was put in place to build up a mechanism that helped disseminate high-frequency data from various organisations. The strategy is to focus on systemic countries (risk analysis) to be able to provide early warnings.

4. Turn statistics into knowledge

Sometimes, the limiting factor for decision-makers is not the lack of data, but the supply of indicators that blur the underlying trend. Because economic factors are of increasing complexity and should be approached from a multifaceted angle, turning this mass of data into knowledge is a critical issue. That is, it is not only important to adapt statistics or their interpretation in the context of economic developments, but also to combine data in integrated accounts to derive "knowledge". This is not the place to tackle such a challenging task, but a couple of examples could be identified from international trade.

First, take into consideration that modern business models spread production over several countries. Through international supply chains, trade in intermediate products has increased. Measuring the domestic content of trade is now an urgent priority to understand exactly what is at stake when national authorities review their national trade policy. Similarly, national actors participating directly or indirectly in these global supply chains have in general different characteristics in respect of firm size, labour qualifications and remunerations than the rest of the enterprise population. The present economic statistics do not allow us to identify all these characteristics easily. For example, a large share of the value added incorporated in manufacture exports of developed countries originates in fact in their services sector, considered usually as non-tradable.

Second, official statistics as a robust system should incorporate multidimensional changes in a constantly developing societal and economic environment, and extract meaningful and understandable signals out of them. An example of such a systemic arrangement of economic statistics or integrated accounts that emerged after the Great Depression of the 1930s is the System of National Accounts. Boiling down production, consumption, investment and trade data into a single indicator, the Gross Domestic Product, provided decision-makers with an easy-to-use and easy-to-understand indicator of the national economic cycle. The irruption of globalization into the everyday life of most economic agents, be they producers or consumers, calls for a similar effort to extract similar "signals" out of the international economy statistics. We recommend therefore the construction of some kind of "satellite account" of the exporting sectors, similar to the "tourism satellite accounts", to put and relate in a single place all relevant information dealing with international trade activity and its domestic actors.

An additional aspect is the development of messages or "factual story lines" built on existing statistics to assess developments of economies and support analysis. "Evidence-based decision-making" is crucial, as DJ Johnston, Secretary-General of the OECD, points out.[13] Current statistical dissemination practices centre around providing data in interactive databases or spreadsheets. While it is useful to summarise data available across international agencies in a single database, interpreting these data in a context that a layman can understand is of utmost importance. Given advances in technology, statistics producers may go the extra mile in complementing their statistics by providing "stories" alongside. In turn, the media can play their own role in communicating such stories to the broad general public.

[13] OECD (2004).

References

Duncan, R (2003), *The Dollar Crisis*, Wiley.

Escaith, H (2009), "Use of non-official data in imputations/estimations made by international organizations", Committee for the Coordination of Statistical Activities, internal document, September.

Heise, A (2009), Toxische Wissenschaft? – Zur Verantwortung der Ökonomen für die gegenwärtige Krise, in: *Wirtschaftsdienst, Zeitschrift für Wirtschaftspolitik*, December.

OECD (2004), *Observer*, No. 246-247, December 2004–January 2005.

OECD (2009), *The Statistics Newsletter*, Issue No. 46, October.

Silver, Mick (2010), "Accurate Trade Data Key to Understanding Depth of Crisis", *IMF Survey Online*, 10 March.

UNECE (2009), *Making Data Meaningful, Part 2, A Guide to Presenting Statistics*, United Nations.

WTO (2008), "Trade in a Globalizing World", *World Trade Report 2008*.

Toward FATS and beyond: the case of Thailand

Ornicha Tattawasart[1]

1. Introduction

As a national compiler for some of the key economic statistics, the Bank of Thailand (BOT) has collected data and compiled a wide range of economic indicators to support macroeconomic analysis as well as monetary policy formulation. As globalization evolves, adequacy of these indicators will need to be reassessed to keep up with the changing environment and ensure that necessary indicators are compiled and made available to analysts and policymakers.

Foreign direct investment (FDI) is considered to be a key element in accelerating the globalization process, but only general information and indicators on FDI are provided. Data on transactions and positions between direct investors and their affiliates could not adequately reflect in-depth information on the activities of these multinational enterprises and the linkages they have created through supply chain networks. Foreign Affiliate Statistics (FATS) have thus been introduced to fill the gap.

FATS have never before been compiled in Thailand, partly due to the wide scope of these statistics and Thailand's decentralized statistical system. Considering the role of FDI in this country, inward FDI has long been one of the major stimulating factors behind the expansion of the manufacturing and exporting sectors. Thus, a comprehensive set of statistics such as FATS that could meaningfully reveal FDI-related activities is called for. The primary content of this paper discusses the concept of FATS, based mainly on the *OECD Handbook on Economic Globalization Indicators* (2005), Eurostat's *Recommendations Manual on the Production of FATS* (2007) and the proposed framework of data sources and methodology for forming inward FATS for Thailand. This paper also explores beyond the generally recommended variables and examines the linkages in the area of financial indicators. The results of the compilation of the target variables and other findings are charted and exhibited in the Appendix. Limitations of the methodology are addressed in the final two sections, together with concluding remarks.

2. FATS

2.1 What are FATS?

Foreign Affiliate Statistics (FATS) can be defined as statistics that describe the activities of resident enterprises conducted in a certain economic territory and controlled by enterprises (MNEs) located outside that economic territory. These types of enterprises are known as foreign affiliates. FATS consist of two opposite sides of investment activities: inward and outward. Inward FATS describe the activities of foreign affiliates within the compiling economy and outward FATS describe the activities of the compiling economy's own affiliates abroad.

[1] Bank of Thailand, Data Management Department, Bangkok 10200, Thailand. E-mail: ornichat@bot.or.th

In the compilation of FATS, identifying enterprises under foreign control is crucial. To achieve this, the concept of control needs to be clarified. Based on OECD (2005), the notion of control indicates "the ability to appoint a majority of administrators empowered to direct an enterprise, to guide its activities and determine its strategy". In most cases where there is a single investor holding a majority (more than 50%) of the shares with voting rights, the economic activities of a certain affiliate can then be easily attributed to one single unit in control. In practice, however, this is not always applicable since there are other special cases of minority shareholders and indirectly controlled enterprises that are more difficult to identify. One recommendation suggested that "in any event, whenever the national authorities are not in the position to prove that the company is under foreign control, the said company should be considered to be controlled by residents of the compiling country" (OECD (2005), §305). Therefore, the concept of a single investor holding a majority of shares or voting power can be used as an initial identification of enterprises under foreign control.

2.2 What do FATS offer?

FATS provide insight into and information on the economic impact that MNEs' investments have on the economy of the affiliates' country of residence. Such impact could be in the form of job creation, turnover, shares of other economic activities such as investment and trade, value added, technological and managerial skill transfers, etc. In other words, FATS help depict the ramifications of MNE activity for the host country – the pros and cons, benefits and risks associated with investors' countries – which would be of particular interest to analysts and economists of investment promotion agencies, trade negotiation and investment liberalization units and the like. Macroeconomic analysts, policymakers or even researchers could also make use of FATS to measure sectoral vulnerability (to external shock in the home country) and spillover effects these foreign affiliates may bring about.

3. Data Collection of Inward FATS for Thailand

Undeniably, inward FDI has long played a vital role in stimulating the Thai economy, especially the manufacturing sector. This is evidenced not only by several empirical studies, but also by the government's effort to attract foreign investors through investment promotion packages. The importance of inward FDI has also been perceived at a regional level. ASEAN member states have collectively formed committees and working groups in charge of strategic planning and statistical enhancement particularly on FDI. FATS are among the statistics/indicators that member states are encouraged to consider working on. Through development of FATS, the impact of inward FDI on the Thai economy – both direct and indirect effects – would be, to some extent if not entirely, measurable and explicitly revealed. This kind of information is especially useful for assessing the effectiveness of investment promotion measures and supporting trade and investment negotiation, not to mention uncovering the risks that could potentially be transmitted from ultimate investor countries to the host economy.

3.1 Scope of study

This pilot study focuses on the compilation of inward FATS only. Therefore, related issues concerning outward FATS will be omitted at this point. The scope of the study is determined by the target population and time frame.

Target population

The target population for Thailand's inward FATS comprises foreign affiliates resident in Thailand that are majority owned (ie more than 50% of the shares or shareholders' voting power) by foreign enterprises located outside the territory of the Kingdom of Thailand.

Time frame

Data on inward FATS will be captured and combined from different sources, most of which are collected on an annual basis. From the point of view of users, FATS variables generally do not change rapidly over a short period of time and are not meant to serve as short-term indicators. Based on this, it would be plausible to initially propose an annual compilation of Thailand's inward FATS.

3.2 Proposed variables

The criteria used in selecting the series of variables in this paper are based mainly on data availability and the fundamental characteristics commonly required in forming inward FATS. A set of inward FATS variables proposed for the compilation and their definitions[2] can be described as follows:

Number of enterprises: A count of the number of active enterprises listed in the business register population in line with the conceptual framework under the FATS target population.

Turnover: The aggregates invoiced by the observed entity during the reference period that correspond to the market sales of goods or services supplied to third parties, including all other charges and duties invoiced, with the exception of the VAT.

Personnel costs: The total emolument[3] paid by an employer to an employee, regardless of the latter's employment status (permanent or temporary), as compensation for the work done by the employee during the reference period. This also includes taxes and employee's social security, as well as other social contributions made by the employer.

Number of persons employed: Number of persons employed consists of everyone who is on the payroll and working in the observed entity, except those who are absent for an indefinite period.

Exports and imports of goods: Exports can be defined as the sales of goods by residents to non-residents, and imports are defined as purchases of goods by residents from non-residents.

3.3 Data sources and methodology

To obtain FATS variables, first all of the data sources relating to the subject of interest have to be examined so that available resources are fully incorporated. During this examination, it was realized that some of the components required for the compilation of the inward FATS variables already existed but were scattered across different data-compiling institutions. Given the characteristics of Thailand's decentralized statistical system, a high degree of cooperation among involved parties is a key factor for success.

---

[2] The definitions of these variables were adopted from §I.3.3 of the Eurostat *Recommendations Manual on the Production of Foreign Affiliates Statistics* (2007), which is also where the full definitions and details can be found.

[3] Due to limitations of data sources, personnel costs captured in this pilot study are limited to emoluments "in cash".

Direct reports on financial statements relating to international investment positions (*SBC3/1 Form*) are the main source for foreign direct investment statistics compilation in Thailand. Any entity located in Thailand as a resident with a non-resident shareholder of 1% or above or holding 1% or more of the voting shares of a non-resident enterprise abroad is mandated by law to submit such a report to the Bank of Thailand within five months of the reference year-end date. The collection of FDI statistics is based on the direct investment relationship between residents and non-residents determined by the notion of influence, which is reflected in the holding of 10% or more of the voting shares (according to the BPM6 concept). Although the formation of FATS adopted this FDI framework as a primary data source, the two subjects are defined by very different principles.

The compilation of FATS is grounded in the notion of control, which implies the ability to use the majority administrating power in possession to direct an enterprise, define its strategy and conduct its activities. This way, the economic activities of the affiliates can then be attributed to the controlling investor. In order to attribute the activities to an appropriate investor, it is usually necessary to identify the ultimate controlling institutional unit (UCI). In this paper, since the number of enterprises for the inward FATS is collected through the FDI statistical framework,[4] the UCI is unidentifiable. The use of the concept of majority-owned foreign affiliates is introduced and is therefore adopted as an alternative and a primary identification tool for inward FATS.

FATS enterprises that are identified through the mentioned procedure are then linked to other sources in order to extract the rest of the proposed inward FATS variables. The sources of these variables are described in Table 1:

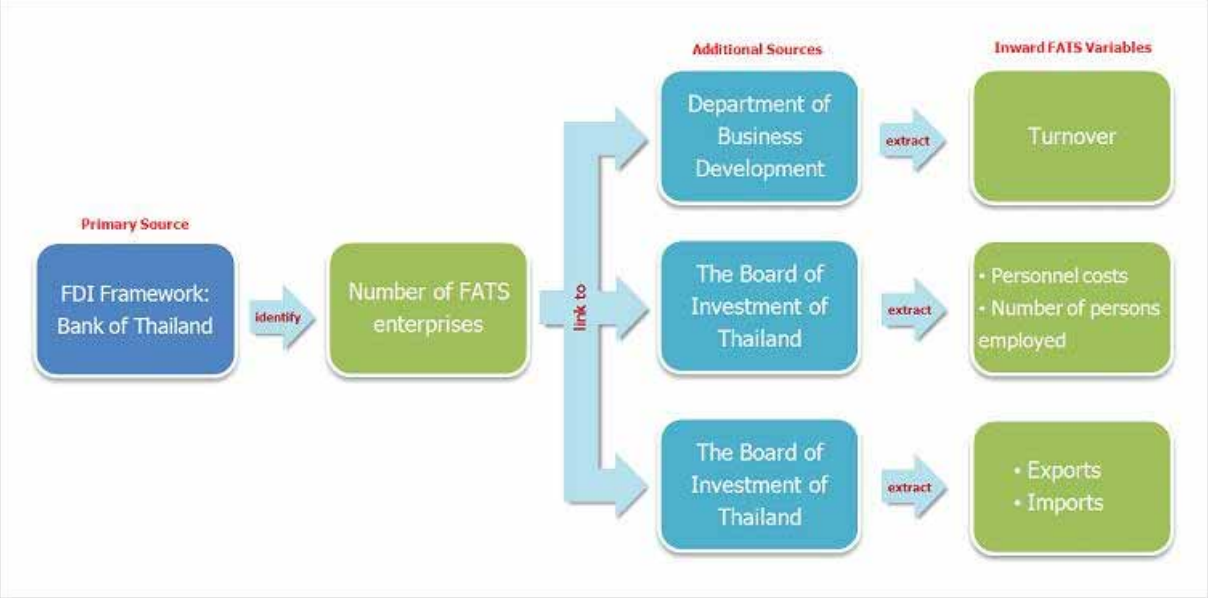
Table 1: Data sources of the proposed inward FATS variables

Inward FATS Variables	Data Sources
Turnover	Reports on financial statements of commercial companies registered in Department of Business Development (DBD), Ministry of Commerce
Personnel costs Number of persons employed	Employment database of the promoting group of foreign investors The Board of Investment of Thailand
Exports and imports of goods	Export and import declarations from the Thai Customs Department, Ministry of Finance

The following diagram illustrates the identification and extracting process of the aforementioned variables.

[4] The principle of FDI statistics compilation considers only the first foreign parent or immediate foreign ownership with a resident unit. Therefore, data extracted can only capture immediate, not ultimate, foreign control.

Diagram 1: The inward FATS variables identification process



3.4 Results of the data collection

The year 2007 is used as the reference year of this study on inward FATS for Thailand as it is the year with the most up-to-date list of foreign affiliates.[5] Since the UCI cannot be identified in this initial attempt at FATS compilation, the country breakdown of FATS would not be compiled because breakdown by immediate investors would be misleading in the context of FATS usage. The results are instead categorized by industrial sector, illustrating the concentration pattern of each FATS variable. The results are exhibited in the charts and tables provided in the Appendix.

Chart 1 illustrates the proportion of turnover accounted for by foreign affiliates in each industry and in the overall total. It can be perceived from the chart that the biggest contributors in terms of value are in the manufacturing sector, which is also the largest sector in the economy. Next in line is the wholesale and retail sales sector, though in terms of percentage, the proportion of the total amount within the industry is very small – only 8% (Table 2 in the Appendix). If the result is instead viewed in terms of percentage of contribution, it would indicate that foreign-owned enterprises played the most significant role in the mining and quarrying sector as they contributed up to 86% of the industry turnover. However, it does not amount to a large sum compared to total turnover in the system and therefore would have little impact on the country's turnover as a whole. Henceforth, only the overall analysis will be applied to the evaluation of each FATS characteristic.

Charts 2 and 3 demonstrate foreign affiliates' contribution in terms of employment, covering two variables, namely, personnel costs and number of persons employed. For both variables, once again, foreign-owned enterprises clearly played an important role in the manufacturing sector, accounting for the majority of the sector's employment. However, foreign affiliates accounted for a noticeably larger proportion of "personnel costs" than of "number of persons employed", possibly implying higher average remuneration and perhaps a lesser degree of "labor intensiveness" of foreign affiliates compared to resident firms.

[5] The list of foreign affiliates is available only in the year in which the population survey on IIP is conducted.

Charts 4 and 5 refer to the activities of foreign affiliates in the area of exports and imports of goods. The charts illustrate the proportion of foreign affiliates' exports and imports in the total for each industry. The attributed contributions turn out to be almost the same for both variables, major contributors being in the manufacturing sector, followed by a fraction of the total sum in the wholesale and retail sales sector.

In conclusion, this set of "pilot variables" suggest that foreign affiliates are highly concentrated in the manufacturing sector, contributing to approximately one third of total employment and generating about two thirds of total labor income. Most striking, yet not surprising, is the foreign affiliates' share of total exports and imports. Over 70% of the country's total exports and imports were accounted for by foreign affiliates, although there were only around 1,200 of these, representing around one fifth of the total number of firms nationwide. This may suggest a high degree of intrafirm trade, raising awareness of the impact on the country's exports and imports should there be any factor triggering investment relocation. Backward linkages seem to have been created to a very limited extent, if at all, as reflected by the comparatively high proportion of imports generated by foreign affiliates. Several other implications could also be drawn once additional FATS variables are compiled and further brought into the scope of analysis (eg expenditure on human resource development, R&D, etc). Last but not least, it should be kept in mind that foreign investment also comes with exposure to foreign control and management decisions that may not always be beneficial to the host country. Policymakers thus need to evaluate and balance the pros and cons of implementing promotion measures to attract these foreign investors more thoroughly. For details of the results in terms of the contribution of foreign affiliates to each industry for all of the variables, please see Appendix Tables 2–6.

4. Further Evaluation Beyond the Scope of FATS' Conventional Variables

The importance of foreign direct investment as a stimulating factor in the development of the economy was mentioned as one of the main reasons for the need to initiate a compilation for FATS. FDI is regarded as a major vehicle of economic growth in terms of strengthening firms' capabilities and competitiveness through transfer of technology and spillover, not to mention the amount of capital brought in to enhance the liquidity of the system. However, the idea that these foreign affiliates will continue to be the endless source of funds is unrealistic and our policy stance cannot always be based on this expectation. Initially, when a multinational enterprise first locates its affiliate in a certain host country, inflows of capital are necessary to nourish the "infant" business. Afterwards, as the affiliate matures and is able to sustain its growth and earnings, it relies less on funding from the parent company and may possibly be searching for domestic funds when needed. Even though FDI is considered as a stable and reliable long-term source of investment capital that seems to be less vulnerable than other forms of private capital flows, a reversal of funds could also occur. For example, a foreign affiliate may lend money back to the parent company with its domestic borrowings/earnings.

In this part of the paper, financial indicators are brought into consideration and examined in conjunction with conventional FATS variables. Domestic borrowing is thus incorporated into this extended evaluation and explored with respect to overall loans outstanding and non-performing loans (NPLs). Linking the two variables would enable analysts to assess the impact of foreign affiliates in the domestic credit market and the pressure they exert on its liquidity. The results are presented in Chart 6 in the Appendix.

Chart 6 shows the amount of loans outstanding and NPLs attributable to resident foreign affiliates as a proportion of the total for Thailand. The results indicate that there are domestic borrowings attributed to foreign affiliates. Although the ratio of loans outstanding of foreign

affiliates to total loans outstanding is not large, the total amount of these loans was considerable, with potential associated risks. As for the NPLs, the amount is so small that it is almost unnoticeable in the results presented in the chart. Further examination of the purpose of these loans is needed in order to determine the potential associated risks.

5. Limitations and Improvements

Through initial inter-agency collaboration, a set of "pilot FATS variables" are compiled. A number of limitations are encountered amid this initial stage of establishing FATS, leaving room for future improvements, specifically with respect to variables and classifications. Examples of these are summarized below.

(1) The primary source used in determining FATS variables is the IIP[6]-CDIS[7] statistical framework, which is primarily designed for classification of FDI by country of immediate investors. Hence, data on the ultimate controlling institutional unit cannot be extracted. The concept of majority ownership was adopted as an alternative, but this criterion cannot capture all aspects of foreign ownership due to the absence of minority-owned and indirect controlling units, which cannot be identified under this principle. Consequently, it is very likely that the number of companies for which FATS have been obtained through this process could be underestimated.

(2) As mentioned earlier, inward FATS variables are obtained by linking variables across different databases, some of which may not be fully consistent or fully matched. Further fine-tuning of the process to standardize coding to facilitate cross-database data matching would be required.

(3) Data on FATS (at least for this pilot study) could be considered a by-product of other data compilations. Therefore, some variables may not be available in a timely manner. Through continued collaboration with related agencies, the scope, coverage, frequency and timeliness of the surveys or other channels through which the inputs are obtained could be revisited, to the mutual benefit of all agencies involved.

(4) As a result of the unavailability of data concerning the UCI, it follows that the "true" foreign affiliates population is unknown. Nor is enough information available to form an appropriate estimate. Redesigning the survey forms to capture the UCI would allow the true foreign affiliates population to be identified, plausibly leading to a better representation of foreign affiliates' activities.

6. Conclusions and Recommendations

This paper proposed the initiation of FATS compilation in Thailand and examined the possibility of compiling inward FATS as a case study. Data sources were reviewed and a methodological framework was constructed. The empirical results indicated that foreign-owned enterprises were concentrated mostly in the manufacturing sector with respect to all

---

6 International Investment Position: statistics summarizing a country's financial assets and liabilities outstanding vis-à-vis non-resident counterparties (one of the external sector statistics that the IMF recommends member countries compile).

7 Coordinated Direct Investment Survey: the IMF encourages member countries to participate in this survey to allow better consolidation of data at the global level. Statistics concerning FDI stock classified by country of immediate investors are requested.

variables, suggesting that the sector is highly linked with the globalization stream and hence perhaps the most vulnerable to external shocks.

Loan variables were added into an extended evaluation of foreign affiliates to uncover the impact of foreign control on liquidity in the host country. The results show that there are potential debtors owing a considerable amount to domestic commercial banks, but associated risks are yet to be determined. This calls for further investigation with respect to the objectives of loans and other aspects in order to achieve a more comprehensive analysis.

Limitations to the compilation of FATS were also elaborated, which helps guide us as to the direction future improvements on FATS compilation should take. Given the decentralized characteristics of Thailand's statistical system, stronger bond and inter-agency collaboration is a key success factor. A more formal arrangement (eg in the form of a memorandum of understanding between related agencies, or an inter-agency task force) could be established to pave the way for successful FATS improvement.

Appendix

Chart 1: Proportion of foreign affiliates' turnover to the total amount by industry

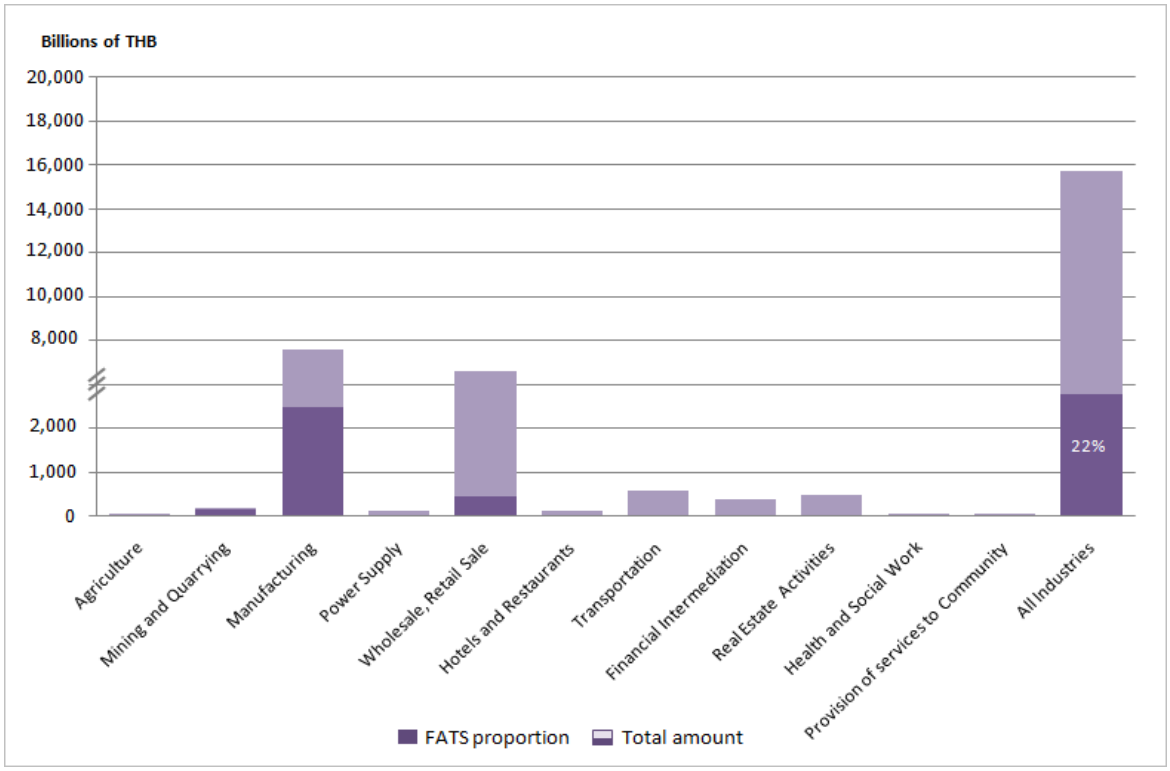


Chart 2: Proportion of foreign affiliates' personnel costs to the total amount by industry

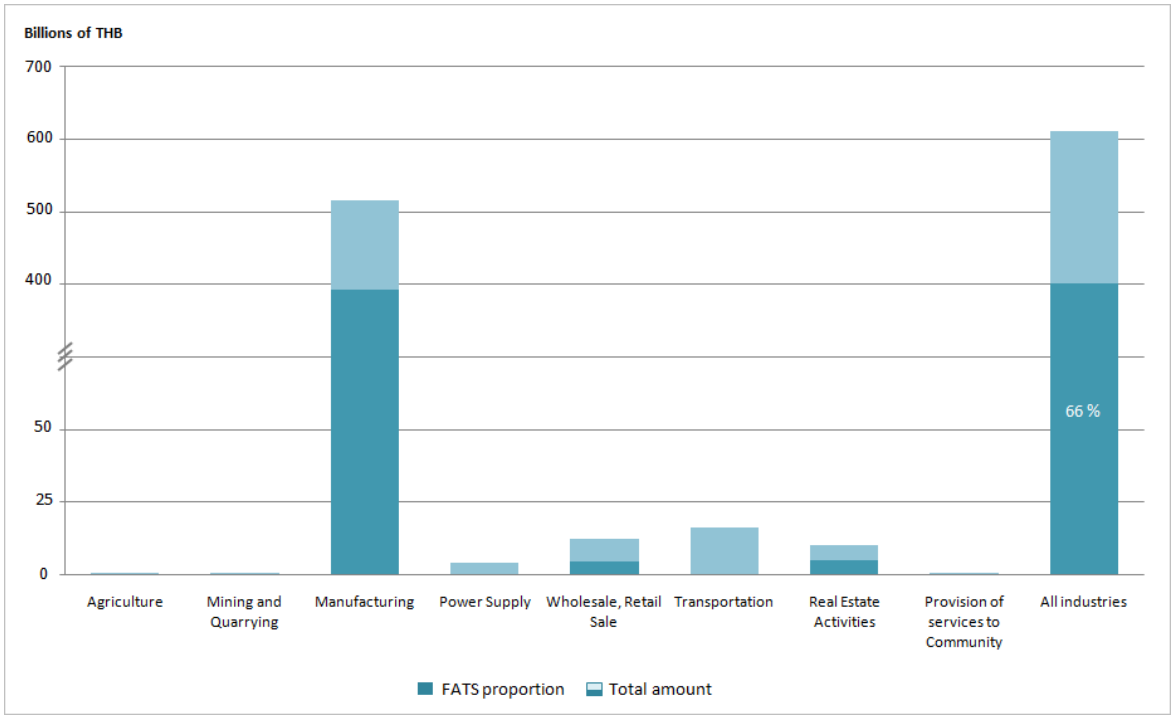


Chart 3: Proportion of number of persons employed by foreign affiliates to the total number employed by industry

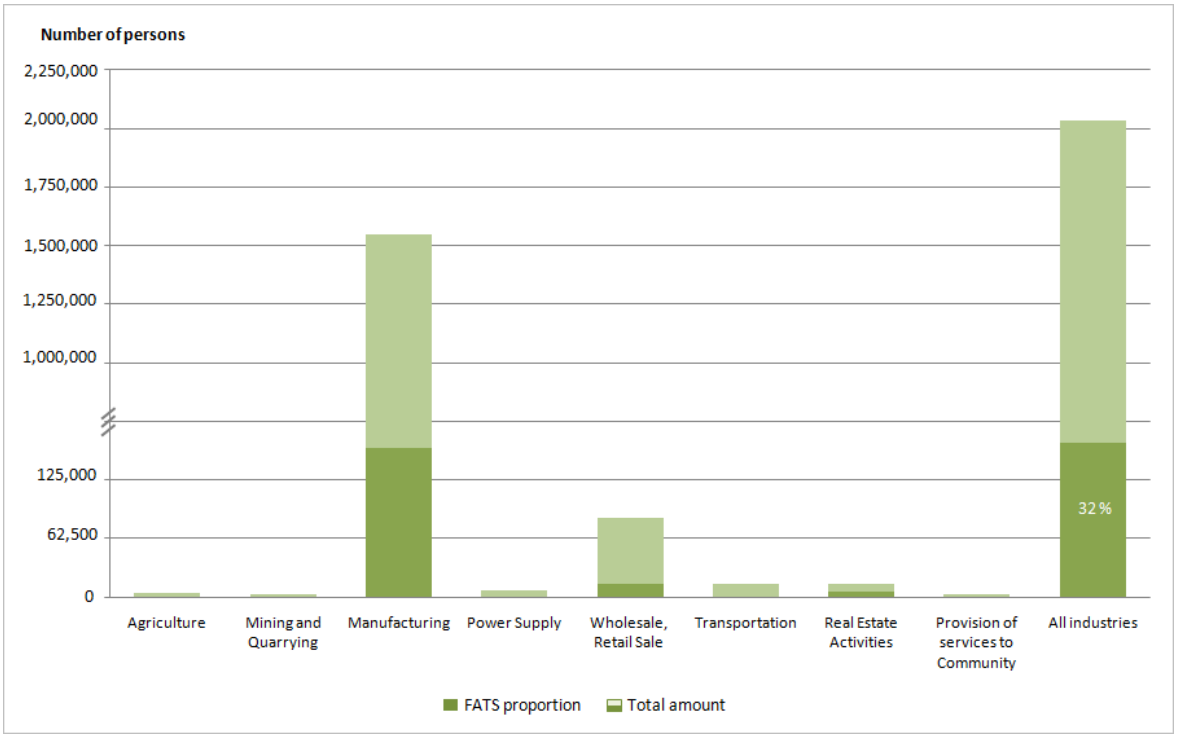


Chart 4: Proportion of foreign affiliates' exports to the total amount by industry

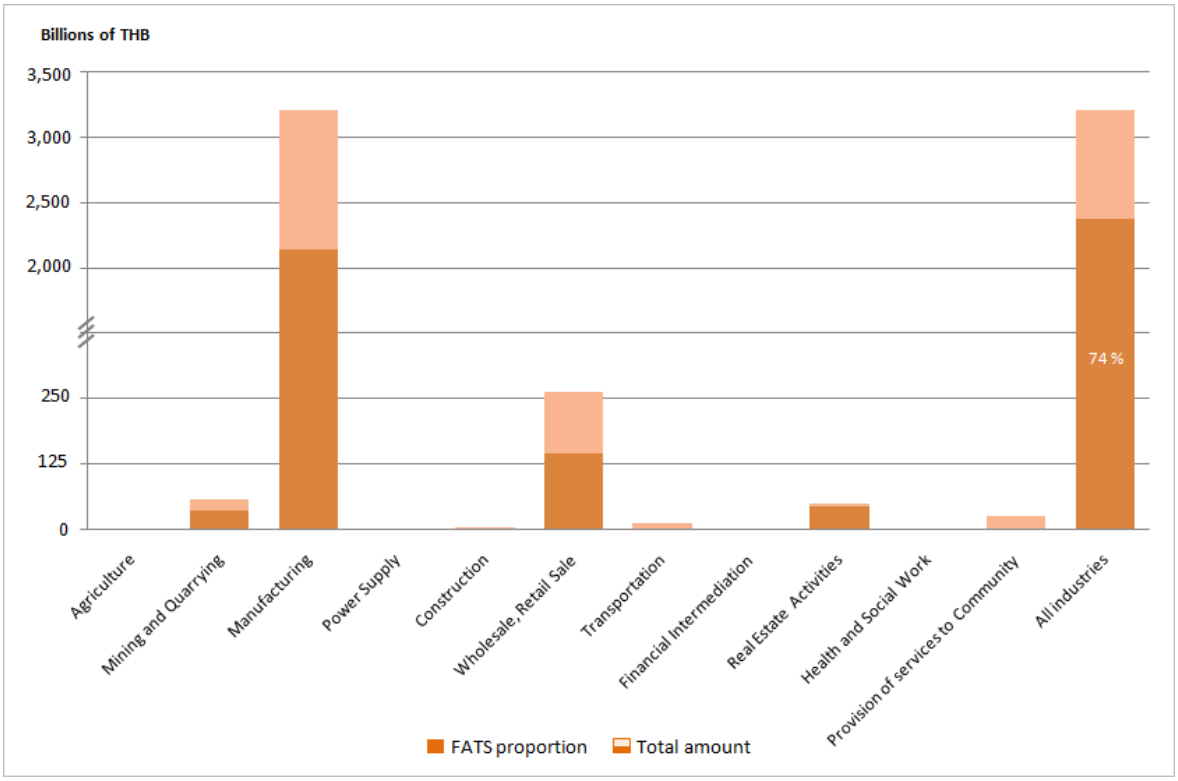


Chart 5: Proportion of foreign affiliates' imports to the total amount by industry

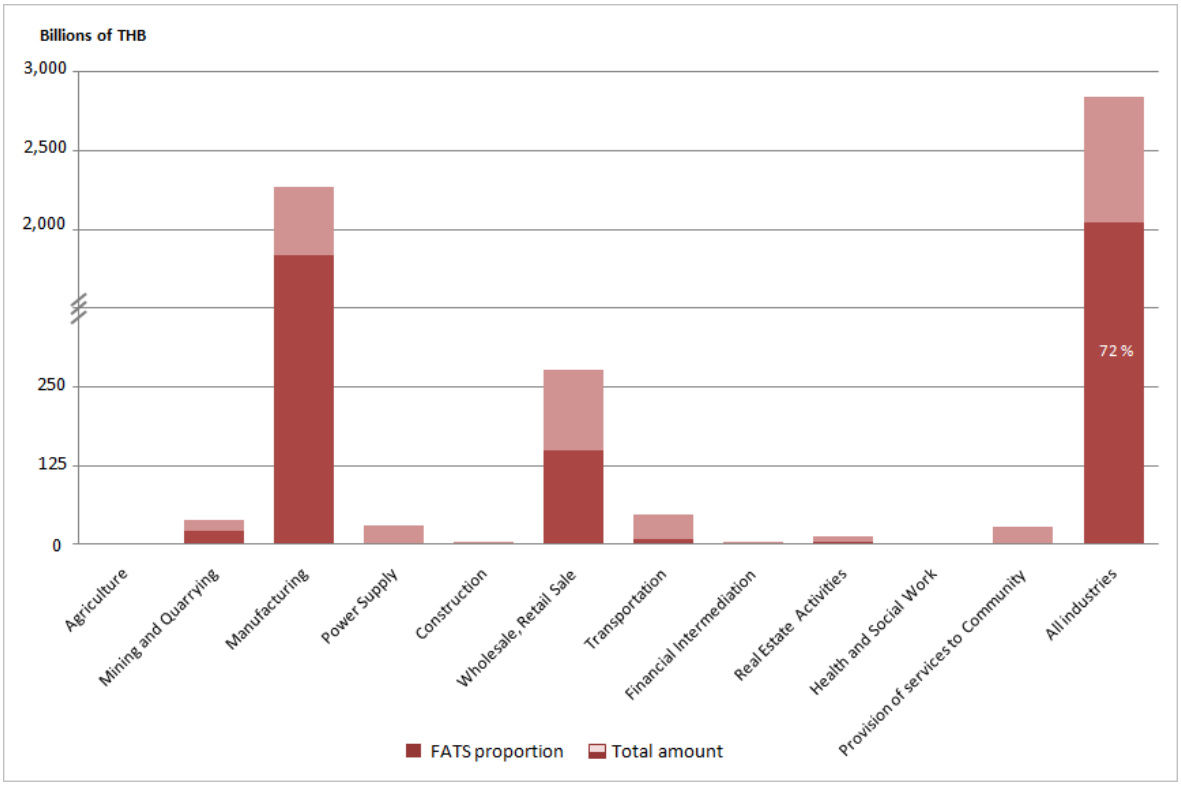


Chart 6: Loans outstanding and NPLs of foreign affiliates' companies in comparison with total amounts

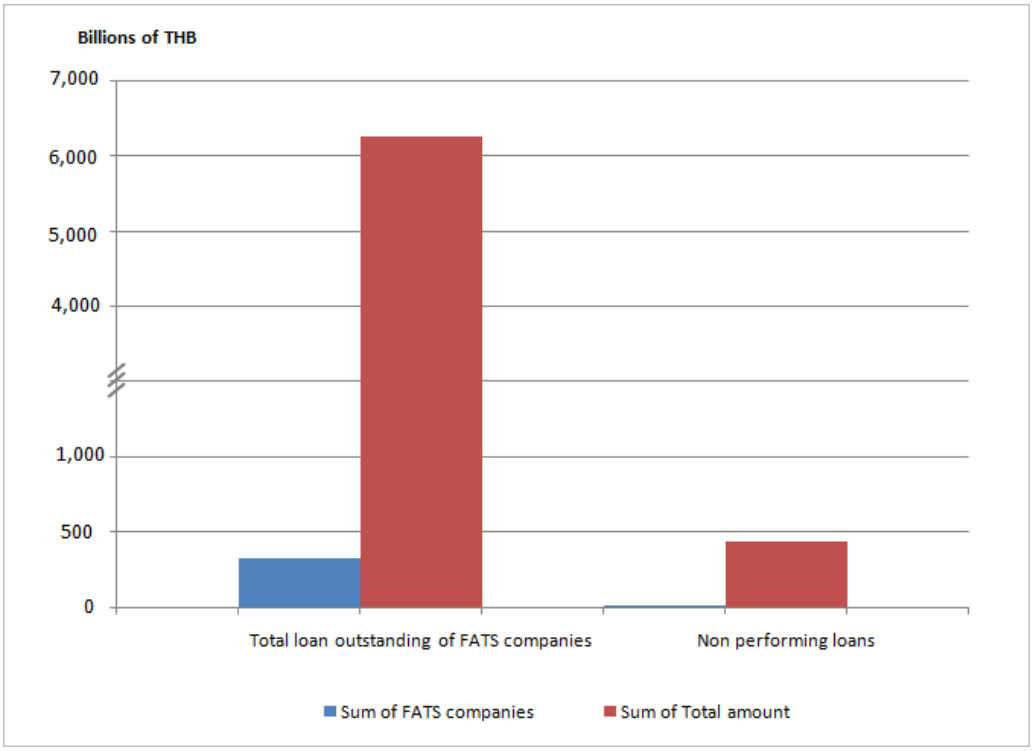


Table 2: Turnover accounted for by foreign affiliates, by industry

Industry Sector	Foreign affiliates' turnover in each industry (millions of THB)	Total turnover in each industry (millions of THB)	Percentage accounted for by foreign affiliates (%)
Agriculture, Hunting and Forestry	590	65,064	1
Mining and Quarrying	177,719	206,653	86
Production	2,766,874	7,593,142	36
Electricity, Gas and Water Supply	7,941	118,094	7
Wholesale, Retail Sale and Repair of Motor Vehicles, Motorcycles, Personal and Household Goods	451,546	5,391,099	8
Hotels and Restaurants	346	139,566	0
Transport, Storage and Transportation	10,251	600,508	2
Financial Intermediation	39,267	407,243	10
Real Estate Activities, Renting and Business Activities	21,711	503,935	4
Health and Social Work	16	62,744	0
Provision of Services to Community, Society and Other Private Sector	1,145	56,625	2
All Industries	3,477,407	15,713,433	22

Table 3: Personnel costs of foreign affiliates, by industry

Industry Sector	Foreign affiliates' personnel costs in each industry (millions of THB)	Total personnel costs in each industry (millions of THB)	Percentage accounted for by foreign affiliates (%)
Agriculture, Hunting and Forestry	65	343	19
Mining and Quarrying	141	438	32
Production	393,588	516,437	76
Electricity, Gas and Water Supply	106	3,318	3
Wholesale, Retail Sale and Repair of Motor Vehicles, Motorcycles, Personal and Household Goods	3,547	9,994	35
Transport, Storage and Transportation	84	13,122	1
Real Estate Activities, Renting and Business Activities	3,853	8,259	47
Provision of Services to Community, Society and Other Private Sector	215	545	40
All Industries	401,600	610,874	66

Table 4: Number of persons employed by foreign affiliates, by industry

Industry Sector	Foreign affiliates' number in each industry (persons)	Total number in each industry (persons)	Percentage accounted for by foreign affiliates (%)
Agriculture, Hunting and Forestry	259	3,347	8
Mining and Quarrying	277	2,147	13
Production	638,843	1,545,680	41
Electricity, Gas and Water Supply	316	5,429	6
Wholesale, Retail Sale and Repair of Motor Vehicles, Motorcycles, Personal and Household Goods	12,138	74,614	16
Transport, Storage and Transportation	125	11,587	1
Real Estate Activities, Renting and Business Activities	4,677	11,307	41
Provision of Services to Community, Society and Other Private Sector	387	2,300	17
All Industries	657,022	2,034,820	32

Table 5: Exports of goods and services of foreign affiliates, by industry

Industry Sector	Foreign affiliates' exports in each industry (millions of THB)	Total exports in each industry (millions of THB)	Percentage accounted for by foreign affiliates (%)
Agriculture, Hunting and Forestry	12	634	2
Mining and Quarrying	35,674	58,993	60
Production	2,142,147	2,674,221	80
Electricity, Gas and Water Supply	13	650	2
Construction	1,789	4,270	42
Wholesale, Retail Sale and Repair of Motor Vehicles, Motorcycles, Personal and Household Goods	144,933	262,176	55
Transport, Storage and Transportation	1,061	12,208	9
Financial Intermediation	6	386	1
Real Estate Activities, Renting and Business Activities	44,718	50,294	89
Health and Social Work	44	48	92
Provision of Services to Community, Society and Other Private Sector	3,004	26,326	11
All Industries	2,373,401	3,202,611	74

Table 6: Imports of goods and services of foreign affiliates, by industry

Industry Sector	Foreign affiliates' imports in each industry (millions of THB)	Total imports in each industry (millions of THB)	Percentage accounted for by foreign affiliates (%)
Agriculture, Hunting and Forestry	36	365	10
Mining and Quarrying	20,947	39,686	53
Production	1,837,015	2,267,893	81
Electricity, Gas and Water Supply	2,650	30,455	9
Construction	856	4,946	17
Wholesale, Retail Sale and Repair of Motor Vehicles, Motorcycles, Personal and Household Goods	169,835	317,058	54
Hotels and Restaurants	0.009	145	0
Transport, Storage and Transportation	8,615	47,537	18
Financial Intermediation	1,249	2,882	43
Real Estate Activities, Renting and Business Activities	4,808	12,158	40
Health and Social Work	705	1,114	63
Provision of Services to Community, Society and Other Private Sector	653	27,807	21
All Industries	2,047,370	2,841,056	72

Bibliography

Australian Bureau of Statistics (2004), “Economic Activity of Foreign Owned Business in Australia”.

Brimble, P., Brooker Group plc. (2002), “Foreign Direct Investment: Performance and Attraction, the Case of Thailand”.

European Commission (2007), *Recommendations Manual on the Production of Foreign Affiliates Statistics*, Eurostat Methodology and working papers.

Instituto Nacional de Estadística (2007), *Foreign Affiliates in the Services Sector Statistics: Inward F.A.T.S. (Foreign Affiliates Statistics)*.

Marth, M. (2003), “Foreign affiliate trade statistics – Canadian operations abroad, 1999 to 2001”, *Economic Analysis (EA), Research Paper Series*, Statistics Canada.

Loungani, P. and Razin, A. (2001), “How Beneficial Is Foreign Direct Investment for Developing Countries?”

OECD (2005), *OECD Handbook on Economic Globalization Indicators*.

External debt statistics of the euro area

Jorge Diz Dias[1]

1. Introduction

Based on newly compiled data recently released by the European Central Bank (ECB), this paper reviews the latest developments in the level and composition of the external debt statistics of the euro area and compares the situation with that of other economies.[2] The gross external debt positions of major advanced economies have increased considerably since 2003. In many countries, this increase was partly driven by higher financing needs of governments in response to the financial crisis that started in the summer of 2007. In addition, heightened global risk aversion on the part of investors contributed to higher external debt levels, through replacing equity with debt.

This paper proposes the combined use of the *net* external debt and net interest payments to identify risks of financial distress stemming from external indebtedness.

The first section of the paper describes the gross external debt of the euro area and its member countries; this is followed by a discussion of the gross external debt of general government, the net external debt and net interest payments. After this there is a section on external debt statistics of countries outside the euro area. Finally, there is a section on external debt indicators and debt crisis.

2. External debt statistics of the euro area

2.1 Gross external debt

The gross external debt of an economy represents the outstanding amount of its actual (i.e., non-contingent) current liabilities that require payment of principal and/or interest to non-residents at some point in the future. These liabilities include debt securities, such as bonds, notes and money market instruments, as well as loans, deposits, currency, trade credits and advances due to non-residents. The debt may be issued with different maturity profiles by the general government, banks, and other sectors.

The Directorate General Statistics (DG/S) of the ECB compiles the euro area balance of payments and international investment position statistics, in close cooperation with the national central banks and statistical institutes of the euro area countries. As of May 2010, the ECB started to publish the gross external debt of the euro area.[3]

---

[1] Directorate General Statistics, European Central Bank. The views expressed in this paper are those of the author and do not necessarily reflect the views of the European Central Bank. I would like to thank Melina Vasardani, Francis Gross, Rodrigo Oliveira-Soares, Aurel Schubert, and IFC Conference participants for their useful comments and suggestions. Please address correspondence to jorge.diz_dias@ecb.europa.eu.

[2] See ECB, "Euro area balance of payments in February 2010 and international investment position at the end of 2009", press release of 20 April 2010, and Table 7.3.8 in the May 2010 issue of the ECB's Monthly Bulletin.

[3] See Table 7.3.8 of the ECB's Monthly Bulletin and the ECB Statistical Data Warehouse (Home>Economic Concepts>External transactions and positions>International investment position>Gross external debt).

The compilation of the gross external debt of the euro area is based on the national totals of each euro area country. However, debt positions between euro area residents are netted out to ensure that only positions vis-à-vis residents outside the euro area are considered.[4] Typically, the intra-euro area debt positions account for about one-third of the total (unconsolidated) gross external debt of all euro area countries. As a result, the gross external debt-to-GDP ratios of individual euro area countries tend to be higher than the aggregate euro area ratio.

Table 1

Gross external debt of the euro area and its member countries
(percentages of GDP)

	2003	2004	2005	2006	2007	2008	2009	2003–2006 change	2006–2009 change	2003–2009 change
Slovak Republic	54.3	56.2	56.4	57.5	58.9	55.1	73.1	3.3	15.6	18.8
Slovenia	57.4	61.9	71.3	77.5	100.6	105.7	115.0	20.1	37.5	57.5
Italy	96.2	95.3	94.1	113.0	120.4	103.5	124.2	16.9	11.2	28.0
Germany	136.0	125.4	135.2	138.1	143.1	148.5	147.8	2.1	9.7	11.9
Spain	110.7	105.9	123.8	136.6	145.2	149.7	164.3	25.9	27.7	53.6
Finland	112.6	120.3	117.9	121.0	119.2	132.5	165.1	8.4	44.1	52.5
Greece	105.5	109.6	106.8	123.2	145.2	141.1	172.0	17.6	48.8	66.4
France	127.5	138.4	149.9	161.1	173.7	182.6	191.2	33.6	30.1	63.7
Austria	145.2	156.5	179.8	194.6	205.0	213.1	207.4	49.4	12.8	62.2
Portugal	172.6	173.3	182.4	191.6	202.2	209.2	232.3	19.0	40.7	59.7
Belgium	250.3	267.6	261.2	259.2	289.9	270.3	243.5	8.8	–15.7	–6.9
Netherlands	260.6	273.6	261.0	309.2	335.4	280.7	312.3	48.7	3.1	51.8
Cyprus	--	--	--	279.5	325.5	394.8	486.9	--	207.4	--
Malta	--	--	368.0	413.0	504.5	561.9	512.1	--	99.1	--
Ireland	464.6	567.6	661.7	794.4	871.8	931.6	985.3	329.8	190.9	520.7
Luxembourg	--	--	--	--	--	3,674.6	4,326.0	--	--	--
Euro area	**75.1**	**80.7**	**93.4**	**101.5**	**110.8**	**118.2**	**116.6**	**26.4**	**15.1**	**41.5**

Sources (as at June 2010): ECB, IMF and author's calculations.

The gross external debt of the euro area has increased noticeably over the past decade. At the end of 2009, it amounted to 116.6% of GDP, slightly down from the maximum value of 118.2% in 2008 (see Table 1). Expressed in terms of GDP, the gross external debt has risen by as much as 41.5 percentage points since the end of 2003, clearly outpacing the growth of nominal GDP in the euro area.

The increase in the euro area's gross external debt was due to considerably higher national debt levels in the majority of the euro area countries. Only three of the 16 countries recorded increases lower than 20 percentage points between 2003 and 2009. By the end of 2009, half of the euro area member countries had a gross external debt position that was more than double their GDP.

Stable macroeconomic conditions, notably between 2003 and 2006, and lower long-term real interest rates, partly accounted for the increase in the gross external debt in the euro area

[4] Changes in the national country totals can be related to intra-euro area counterparts or extra-euro area counterparts. When national totals increase due to only intra-euro area counterparts, the euro area aggregates do not change.

(see Chart 1). Indeed, evidence shows that, over the short term, favourable real interest rates provide an incentive to increase debt. However, excessive leverage may create difficulties with interest payments when real interest rates rise and/or income generation slows down, leading to the insolvency of some economic agents.

Chart 1: Real ten-year euro area government bond yield

(annual percentages; HICP deflated)

Source (as at June 2010): ECB.

Turning to the composition of the euro area's gross external debt by type of instrument, debt securities with an original maturity of over one year and intra-group lending (main inter-company loans) accounted for almost half of the total gross external debt at the end of 2009. Moreover, about two-thirds of the long-term euro area debt securities held by non-residents are denominated in euro. This is partly the result of strong demand for euro-denominated securities from other countries, as well as for international reserve purposes. The denomination in euro dampens the currency risk associated with the issue of debt by euro area residents (see ECB, 2009).

2.2 Gross external debt of the general government

Part of the rise in gross external debt in the euro area countries in the period from 2006 to 2009 reflects the increased borrowing undertaken by many governments in response to the crisis. Expressed in terms of GDP over this period, the gross external debt of the general government sector in the euro area as a whole rose by 8.3 percentage points, reaching about 21.4% of GDP at the end of 2009 (see Table 2). The increase in gross debt positions of the general government during the crisis may also have reflected portfolio re-allocation on the part of investors from equities to debt, against the backdrop of higher global risk aversion at the time (see Chart 2).

The gross external debt of the general government of ten euro area countries reached levels higher than 30% of GDP at the end of 2009. For example, since 2004, the value of the gross external debt of the general government sector in Greece has been larger than the reference level of 60% for total government debt, i.e., including both domestic and external debt positions. Membership in the Economic and Monetary Union provided Greece with a cushion for it to withstand several years of very elevated general-government external debt levels. Membership supported investors' confidence, risk assessment and willingness to lend in cases of such exceptionally high external government debt.

Table 2

Gross external debt of the general government sector in the euro area and its member countries

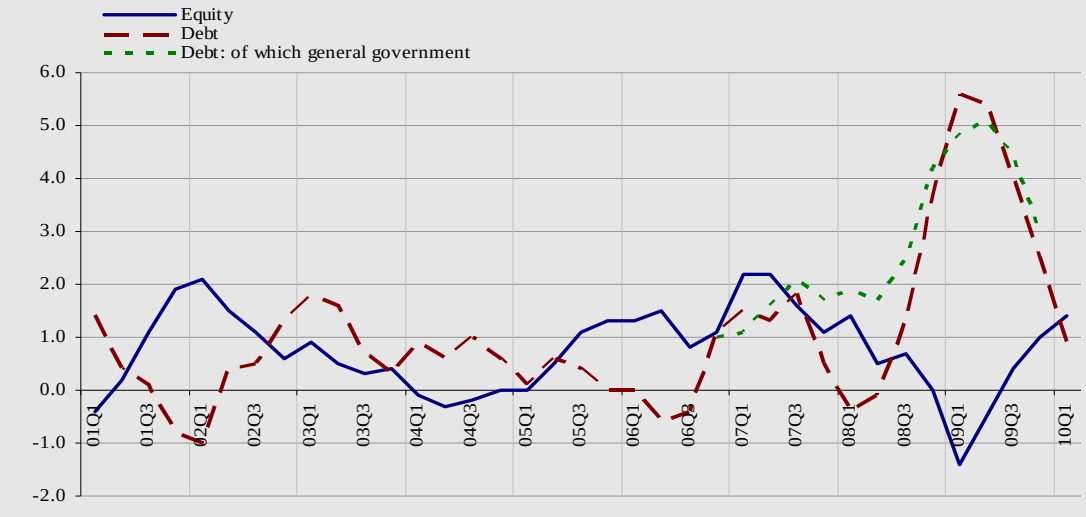
(percentages of GDP)

	2003	2004	2005	2006	2007	2008	2009	2003–2006 change	2006–2009 change	2003–2009 change
Luxembourg	0.0	0.0	0.1	0.1	0.1	2.4	2.8	0.1	2.6	2.7
Malta	4.9	4.5	3.8	3.0	2.6	5.2	4.1	–1.9	1.1	–0.7
Slovak Republic	12.5	16.0	11.4	13.4	12.3	11.2	12.8	0.8	–0.6	0.2
Slovenia	9.4	8.4	7.4	7.7	8.8	10.0	18.8	–1.8	11.2	9.4
Cyprus	--	18.9	16.7	13.9	13.4	13.7	23.5	--	9.6	--
Spain	22.5	24.0	23.5	21.9	18.8	20.9	28.4	–0.6	6.5	5.9
Germany	24.7	27.3	31.0	30.3	30.5	33.9	37.4	5.6	7.0	12.7
Finland	36.5	39.2	36.1	33.3	29.6	28.4	38.5	–3.2	5.1	1.9
Netherlands	31.2	33.6	34.9	32.4	29.6	42.7	45.9	1.2	13.5	14.7
Ireland	16.9	17.2	16.6	15.4	15.9	31.8	46.0	–1.5	30.5	29.0
France	31.4	36.7	36.6	35.0	33.9	40.2	48.2	3.6	13.2	16.9
Italy	43.2	43.1	49.0	43.0	41.0	45.2	54.5	–0.1	11.5	11.3
Austria	47.9	49.9	52.3	50.8	49.8	53.6	55.3	2.9	4.4	7.4
Belgium	46.1	44.8	46.4	44.2	51.9	56.6	58.6	–1.9	14.4	12.4
Portugal	40.2	43.4	49.5	48.5	48.0	53.0	59.6	8.3	11.1	19.4
Greece	58.3	67.1	74.3	73.5	78.2	80.3	91.4	15.2	18.0	33.1
Euro area	**--**	**--**	**14.1**	**13.0**	**13.8**	**18.3**	**21.4**	**--**	**8.3**	**--**

Sources (as at 25 June 2010): ECB, IMF and author's calculations.

Chart 2: Net inflows in portfolio investment of the euro area

(four-quarter cumulated sums; percentages of GDP)



Source (as at 25 June 2010): ECB.

The fiscal consolidation process that is moving forward in the euro area is expected to reduce the gross external debt of the general government in coming years, which will also alleviate the cost of (risk premium for) financing private sector debt. However, additional fiscal consolidation efforts may be needed to successfully reduce the external debt-to-GDP ratio, as GDP growth may be relatively subdued in the years to come.

The share of the general government sector's external debt in the total gross external debt of the euro area reached 18.4% at the end of 2009, after a share of 12.8% at the end of 2006. The bulk of the gross external debt of the euro area, about 47.2% of the total at the end of

2009, was issued by monetary financial institutions in the euro area (banks, including the Eurosystem).

2.3 Net external debt

It is important to note that gross external debt per se only captures one side of an economy's external exposure to international debt markets. In effect, the *net* external debt position, obtained by subtracting the gross external debt assets from the liabilities, provides additional insights into the sustainability of external debt.[5]

The recently massive use of certain types of financial contracts, such as repurchase agreements, securities lending, collateralised loans and securitisation issues, tend to drive up gross external debt figures. This is because these types of financial contracts simultaneously create new debt positions in both assets and liabilities, which can only be offset by using the net external debt position as an indicator. Thus the net external debt provides a better gauge of a country's risk exposure to international financial debt markets.

Table 3

Net external debt of the euro area and its member countries
(percentages of GDP)

	2003	2004	2005	2006	2007	2008	2009	2003–2006 change	2006–2009 change	2003–2009 change
Luxembourg	--	--	--	--	--	–2,616.9	–3,087.4	--	--	--
Ireland	–285.3	–252.4	–199.9	–213.5	–227.6	–166.0	–231.1	71.8	–17.6	54.2
Malta	--	--	–81.5	–84.2	–84.3	–78.7	–94.2	--	–10.0	--
Cyprus	--	--	--	–37.6	–13.4	–37.3	–48.1	--	–10.4	--
Germany	18.4	12.1	8.9	–0.2	–4.3	–1.7	–8.6	–18.6	–8.4	–27.0
Netherlands	22.5	23.2	17.6	15.5	9.4	14.8	16.6	–6.9	1.1	–5.9
France	--	--	6.4	8.4	10.4	20.9	20.1	--	11.6	--
Slovak Republic	–5.6	–1.0	2.4	10.0	11.0	15.9	22.6	15.6	12.6	28.2
Finland	–7.1	–7.1	–4.9	–3.8	–3.1	8.6	24.4	3.3	28.2	31.5
Austria	24.0	22.7	22.1	19.4	22.7	28.0	26.3	–4.6	6.8	2.3
Belgium	--	--	--	–15.5	–12.3	–10.6	29.6	--	45.0	--
Slovenia	–5.2	–1.3	26.9	28.1	18.3	26.5	30.1	33.3	2.0	35.3
Italy	32.5	30.2	27.4	34.2	39.4	33.3	--	1.7	--	--
Greece	55.9	58.3	54.8	64.8	72.7	69.2	84.6	8.9	19.8	28.7
Portugal	31.8	34.0	49.5	56.1	65.1	75.9	85.1	24.2	29.0	53.2
Spain	34.7	35.0	44.5	57.8	68.1	74.9	87.2	23.1	29.4	52.5
Euro area	**8.1**	**8.2**	**7.7**	**6.4**	**6.6**	**14.6**	**12.6**	**–1.7**	**6.1**	**4.5**

Sources (as at 25 June 2010): ECB, IMF and author's calculations.

The net external debt position of the euro area, about 12.6% of GDP at the end of 2009, is significantly lower than its gross external debt position (see Table 3). The net external debt increased noticeably as a consequence of the financial crisis in 2008, reaching an all-time

[5] The overall net external financial position of a country, which includes, in addition to the net external debt, the net positions in equity and in financial derivatives, is provided by the net international investment position.

high of 14.6% of GDP. Spain, Portugal and Greece had a net external debt in excess of 80% of GDP at the end of 2009. Most of the euro area countries are currently net debtors.

The countries in which the financial sector plays an increased international role, relative to the size of the respective economy, tend to have high gross external debt, as holds true of Luxembourg, Ireland, Malta, Cyprus, the Netherlands and Belgium. However, the financial sector of such countries usually also holds a large amount of cross-border debt assets, thus lowering the net external debt substantially. It is important to note that in countries in which the investment fund industry is very important, the external debt statistics may portray high negative net external debt (meaning that they are creditor countries). This is due to the fact that the international statistical standards classify holdings of investment fund shares/units as equity (and not debt), so that they are not included in the gross external debt statistics (see IMF, 2003). In some cases, however, parts of these amounts are used by the investment funds to purchase external debt, thus increasing the country's gross external debt assets.

2.4 Net interest payments

A key macroeconomic aggregate in the analysis of the solvency risks related to external debt are the net interest payments. The net interest payments (i.e., interest payments minus interest receipts originated by the external debt positions) show how much of the income generated by an economy in a given year is to be allocated to servicing the costs through net external debt.

Net interest payments of the euro area amounted to 0.2% of GDP in 2009 and have been remarkably stable over the period 2003 to 2009 (see Table 4). As regards the member countries, some have reached net interest payments larger than 3% of GDP, increasing the risks of external debt insolvency and financial instability.

Table 4

Net interest payments of the euro area and its member countries
(percentages of GDP)

	2003	2004	2005	2006	2007	2008	2009	2003–2006 change	2006–2009 change	2003–2009 change
Luxembourg	–107.5	–106.7	–98.1	–107.1	–115.2	–112.6	–81.1	0.4	26.0	26.4
Malta	--	–3.9	–4.6	–5.6	–6.6	–7.1	–8.1	--	–2.5	--
Ireland	–7.6	–7.0	–6.2	–7.2	–9.0	–6.6	–3.3	0.4	4.0	4.3
Cyprus	–0.4	–1.2	–1.2	–2.0	–3.2	–2.0	–2.9	–1.6	–0.8	–2.4
Belgium	–1.1	–1.2	–1.4	–1.4	–1.7	–2.6	–2.2	–0.3	–0.9	–1.2
Germany	1.1	0.7	0.3	–0.1	–0.5	–0.7	–0.5	–1.1	–0.4	–1.6
France	0.4	0.2	0.2	0.2	0.0	–0.2	–0.2	–0.3	–0.4	–0.7
Slovak Republic	1.1	0.7	0.6	0.4	0.7	1.1	0.0	–0.8	–0.3	–1.1
Finland	1.0	0.0	0.2	0.1	0.0	0.2	0.6	–1.0	0.6	–0.4
Slovenia	--	--	0.4	0.6	1.3	1.9	0.9	--	0.3	--
Austria	0.7	0.8	0.7	1.0	1.5	1.3	1.2	0.3	0.2	0.5
Netherlands	1.0	0.6	1.5	1.9	2.0	1.8	1.7	0.9	–0.2	0.7
Italy	0.8	0.8	0.6	0.6	1.3	1.6	2.0	–0.3	1.5	1.2
Portugal	0.9	1.1	1.2	2.0	2.7	3.4	2.4	1.1	0.4	1.6
Spain	1.3	1.3	1.8	2.4	3.3	3.7	2.8	1.0	0.4	1.5
Greece	2.0	2.0	2.3	2.8	3.3	3.8	3.6	0.8	0.8	1.5
Euro area	**0.3**	**0.1**	**0.1**	**0.0**	**0.1**	**0.2**	**0.2**	**–0.2**	**0.2**	**0.0**

Sources (as at 25 June 2010): ECB, IMF and author's calculations.

3. Cross-country comparisons of external debt statistics

In this section, the indicators discussed for the euro area are compared with those of other countries. Starting with the gross external debt, several countries show figures in excess of 200% of GDP, as in the case of some euro area countries (see Table 5). The United States ended 2009 with gross external debt in the order of 96.5% of GDP, 12.9 percentage points higher than at the end of 2006.

In contrast to most of the euro area countries, most countries in Table 5 show ratios of the general government sector's external debt to GDP that are below 30%. The two exceptions are Argentina in 2003 and Hungary in 2009. The external debt of general government of the United States reached 25.9% of GDP at the end of 2009, an increase of 9.4 percentage points in comparison with the end of 2006.

Overall, the net external debt of the countries in Table 5 is larger than that of the euro area countries. This reflects the fact that euro area countries own considerable external debt assets. The United States show a growing imbalance in their net external debt, which reached 49.2% of GDP in 2008, partly as the result of strong demand for US dollar-denominated securities by other countries, as well as for international reserve purposes.

Table 5

External debt indicators for selected countries

(percentages of GDP)

	Gross external debt			Gross external debt of general government			Net external debt			Net interest payments		
	2003	**2006**	**2009**	**2003**	**2006**	**2009**	**2003**	**2006**	**2009**	**2003**	**2006**	**2009**
Switzerland	248.5	266.2	250.3	5.1	7.1	4.0	–117.0	–102.3	–120.9	–3.5	–3.0	–3.3
Japan	32.0	34.7	42.1	5.4	9.5	13.3	–39.0	–50.6	–48.1*	–1.3	–1.9	–1.8
Korea	24.4	27.3	50.2	1.8	1.1	3.5	–11.1	–10.9	3.1*	–0.4	–0.5	–0.8
Euro area	**75.1**	**101.5**	**116.6**	**--**	**13.0**	**21.4**	**8.1**	**6.4**	**12.6**	**0.3**	**0.0**	**0.2**
Denmark	139.7	164.6	198.0	18.1	11.7	16.7	23.4	36.1	29.9	1.3	1.0	0.3
Brazil	42.6	18.3	18.7	15.0	6.5	4.3	28.0	7.8	2.0*	2.4	1.0	0.6
Philippines	--	45.4	33.6	--	18.9	20.3	43.6	15.0	7.7*	2.3	1.5	0.9*
Argentina	129.3	51.1	39.1	70.8	28.7	19.6	–10.4	–24.2	--	5.7	0.5	0.8
Canada	66.9	54.3	71.3	16.0	11.3	15.5	35.7	22.2	19.5*	2.1	1.4	1.2
United Kingdom	290.2	378.2	416.4	6.8	11.5	18.2	37.3	48.8	38.0	1.0	1.7	1.3
United States	62.3	83.6	96.5	13.5	16.5	25.9	30.7	39.9	49.2*	0.8	1.3	1.3
Latvia	83.6	119.2	173.2	7.5	6.0	28.0	25.4	46.0	63.2	0.1	0.3	1.5
Sweden	118.3	157.6	221.6	24.1	14.7	17.3	48.3	50.2	69.7	2.4	2.1	1.8
Australia	79.4	84.7	111.5	3.7	3.4	7.8	51.9	54.6	52.0	1.4	2.2	2.4
New Zealand	--	--	133.7	--	--	12.2	67.4	80.6	85.8	1.8	3.5	2.8
Bulgaria	60.1	86.1	123.4	--	15.4	9.0	9.9	16.9	55.2	0.9	1.7	3.0
Ukraine	47.5	50.5	89.9	17.4	10.1	13.7	--	–1.7	1.7	1.3	1.2	3.1
Hungary	68.9	110.6	181.6	24.2	34.8	50.5	30.9	10.0	71.2	1.1	1.7	4.0
Iceland	--	444.4	1002.7	--	21.0	43.6	102.2	193.2	530.8	2.9	7.8	19.6

Sources (as at 25 June 2010): IMF, ECB and author's calculations.
* *Data for 2008, the most recent data available.*

Net interest payments show a similar picture. However, net interest payments reflect the risk premium embedded in the interest rates countries pay on their debt liabilities, and the interest rate obtained on their holdings of debt assets. This explains why, for the same level of net external debt, there can be different levels of net interest payments.

4. External debt indicators and debt crisis

Debt crises are multifaceted. They can be triggered by diverse factors, such as social, political, economic and financial developments. Findings by Reinhart and Rogoff (2008) indicate that a surge in gross external debt on account of a private borrowing boom, frequently accompanied by a build-up of government debt, usually precedes a banking crisis. The banking crisis precipitates public borrowing, to meet guarantees and to bail-out troubled financial institutions, which often leads to a sovereign debt crisis.

In this respect, the composition of external debt in terms of currency and remaining maturity are very important factors for the assessment of the sustainability of that external debt. Similarly, the quality of both the issuer and the debt instrument, as well as the currency denomination of the external debt assets held by investors, are key to reducing risks related to external debt.

Large and increasing gross external debt positions may become a concern for an economy in view of the liquidity risk associated with debt servicing (principal and interest). This is particularly true in periods of financial distress, when prices and interest rates are very volatile. In these circumstances, large gross external debt positions may pose a threat to the overall financial stability of an economy, for instance when low interest rate debt needs to be rolled over into higher interest debt. In extreme cases, these events may lead to a debt crisis, followed by a usually long and painful process of debt deleveraging and restructuring. This process, in turn, might have adverse effects on foreign investors' confidence, reducing the capacity of an economy to access external funding at reasonable prices.

While large and increasing *gross* external debt positions only provide an indication of accumulating imbalances in, and the potential vulnerabilities of, an economy, significant *net* external debt levels provide a clearer picture on the existence of such problems. Large imbalances in the *net* external debt and large net interest payments are a credible early warning signal of rising risks concerning the ability of the economy to successfully meet its external financial obligations, particularly in periods of economic distress or when hit by an external shock.

A closer look is taken here at external debt indicators other than solely gross external debt, in an attempt to extract an early warning "rule of thumb" for possible short- to medium-term external debt distress. The question asked was whether there is a common pattern in the recent country debt crises. Do the data contain any early warning sign for such events?

Statistical analysis of the data suggests a few very striking features that are worth commenting on:

- The gross external debt provides a first indication about the probability of future debt distress. After all, there is no external debt crisis without external debt. However, there is no single gross external debt-to-GDP threshold that really signals imminent debt problems. The likelihood of such an event occurring varies considerably across countries and depends to a critical extent on, among other things, the stage of development of the country's financial system, as well as on the currency composition and the remaining maturity spectrum of the debt.
- Large-scale external debt of the general government in terms of GDP increases the country's dependence on external financing, and so the risk of an external debt crisis. In the case of Argentina (2001) and Hungary (2008), the fact that the ratio of such debt to GDP was in excess of 50% clearly contributed to the occurrence of such events.
- The net external debt provides a more direct causal link to an external debt crisis. The ratio of net external debt to GDP was larger than 50% in the majority of external debt crises.

- The ratio of net interest payments to GDP points further to countries with financial difficulties related to their external debt. Countries where that ratio is higher than 3% often end up with external debt solvency issues. This was the case in Argentina (2001), Hungary (2008), Ukraine (2008), Iceland (2008) and Greece (2010).

In summary, a net external debt ratio above 50% combined with a ratio of net interest payments to GDP larger than 3% seems to be a very powerful indicator for potential external debt difficulties in the short to medium term.

5. Conclusions and challenges

In summary, the last decade was associated with an increase in gross external debt in most of the world's economic areas, including the euro area. This increase was partly driven by higher financing needs of governments in response to the crisis and by heightened global risk aversion on the part of investors. In the years immediately prior to the financial crisis, global financial innovation in debt instruments and the further deepening of global financial integration contributed strongly to the growth of external debt.

Although the euro area has a growing gross external debt, it remains, on balance, an economic union with solid fundamentals as regards its net external debt and net interest payments. However, some countries of the euro area need to make sure that the ongoing budgetary consolidation process is effective, and must take measures to curb the historical growth pattern of their net external debt. As long as interest rates remain low, which also stimulates GDP growth, the net interest payments are not an immediate concern when compared with the historical growth rates of external debt in some euro area countries.

The indicators related to external debt statistics proposed in this paper provide some guidance for anticipating possible financial distress. Policy-makers could therefore derive some benefit from incorporating this information when monitoring macroeconomic developments, in order to help identify possible future financial distress resulting from external debt.

References

ECB (2009), "Review of the international role of the euro", European Central Bank, 8 July 2009.

IMF (2003), "External Debt Statistics: Guide for Compilers and Users", International Monetary Fund, June 2003.

Reinhart, Carmen M. (2010), "This Time is Different Chartbook: Country Histories on Debt, Default, and Financial Crises", *NBER Working Paper*, No 15815, National Bureau of Economic Research, March 2010.

Reinhart, Carmen M. and Rogoff, Kenneth S. (2008), "This Time is Different: A Panoramic View of Eight Centuries of Financial Crises", University of Maryland and National Bureau of Economic Research, April 2008.

Session 6 A

Improving financial account data

Chair: Michael Andreasch, Central Bank of the Republic of Austria

Papers:

Toward further improvement of the Flow of Funds Accounts
Sayako Konno, Bank of Japan

Financial statistics on corporations – existing gaps and future possibilities
Lizette Appelberg, Kristina Holmberg and Jon Smedsaas, Statistics Sweden

Data on the balance sheet positions of households and financial and non-financial corporations in Slovenia
Nina Bostner, Bank of Slovenia

Compilation and analysis of Taiwan's household debt statistics
Huei-Jung Fang, Central Bank of the Republic of China (Taiwan)

ECB statistics on insurance corporations and pension funds
Ana Cláudia Gouveia and Rafael Quevedo, European Central Bank

Toward further improvement of the Flow of Funds Accounts

Sayako Konno[1]

1. Introduction

The Flow of Funds Accounts (hereafter the FFA) is a statistical record of financial transactions and of the financial assets and liabilities held by various sectors, such as households, corporations and governments. It is universally regarded as one of the most detailed and comprehensive financial statistics. As for the FFA in Japan, domestic sectors are classified into 45 sectors and financial transactions are classified into 53 items.

The FFA is compiled by using numerous source data, such as financial statements and market statistics. These source data are selected carefully by examining their definitions and attributes. They are also reviewed periodically to improve the accuracy of the FFA. Estimation methods are also reviewed periodically. Against the background of rapid changes in financial structures and the accounting standards, those review operations have become increasingly important.

This paper introduces the BOJ's measures to improve the accuracy of the FFA further and also presents some recent examples. The examples include data improvements in the field of so-called "shadow banking" including financial derivatives and securitized products transactions, which attracted attention in the recent financial crisis.

The contents of Sections 2 through 4 are as follows. Section 2 explains the BOJ's basic framework for improving the accuracy of the FFA. Section 3 illustrates recent examples of improvements in the FFA. Section 3.1 describes the revisions of the following as examples of improvement in accuracy of the FFA through reviews of source data: 1) data on the outstanding amount of structured-financing instruments; and 2) data on the outstanding amount of local government securities held by the household sector. Section 3.2 discusses examples of improvement in accuracy by adopting both new source data and new estimation methods. The examples include: 1) the data on the assets and liabilities of the central government sector; and 2) the revision of the treatment of lease transactions. Section 4 concludes.

2. The Basic Framework for Improving the Accuracy of Statistics

The accuracy of the FFA depends greatly on the accuracy of source data and estimation methods. The BOJ takes into account the availability of source data and possible improvements to the estimation methods when conducting periodic reviews. That process can be summarized as the BOJ's basic framework.

The FFA is presented in a matrix of sectors (column) and transaction items (row), and comprises approximately 6,000 data series. Each data series in the FFA is not always

---

[1] Research and Statistics Department, Bank of Japan. The views expressed here are those of the author and do not necessarily represent the views of the Bank of Japan. The author is responsible for any errors or omissions.

compiled from a single item of source data but from a multiple number of source data. More than 600 source data are used to compile the FFA. For example, “structured-financing instruments” comprises a multiple number of financial instruments, including asset-backed securities (ABS) and asset-backed commercial papers (ABCP). Data for each of these instruments are compiled from aggregated source data or through any kind of estimations, and then they are aggregated further to make up a data series in the FFA for release. One of the outstanding features of the BOJ’s compilation procedure is that careful examination of every single item of source data and the aggregation of sectors as well as transaction items is never neglected. The BOJ applies the framework to examine and improve the quality of individual source data and estimation methods efficiently.

2.1 Classification of Data Accuracy

The BOJ classifies the accuracy level of individual data in the FFA into four large categories, depending on the availability of source data and the accuracy of estimation.

The definitions of the four categories are as follows. The data in category [A] do not have problems in the availability of source data or in the accuracy of estimation methods. For example, the data for current deposits, ordinary deposits, etc., which make up the transaction item “transferable deposits,” are compiled using the data directly reported by banks and other deposit-taking financial institutions and data from financial statements as source data. These data appropriately cover the economic entities and financial instruments which are the objects of the “transferable deposits.” These types of data do not have any problems in terms of accuracy or coverage, and are classified as category [A].

The data in category [B] maintain a certain level of accuracy by estimation but their source data have room for improvement. For example, data for asset-backed commercial papers (ABCP) used to be classified as this category. Before the recent improvement, the data for the outstanding amounts of ABCP were not available, and estimation complemented the lack of data to maintain a certain level of accuracy.

The data classified under category [C] maintain satisfactory levels of accuracy by using available source data but still have room for improvement in the accuracy of estimation. For example, unlike data in category [A], financial statements of all enterprises are unavailable in some sectors to compile the outstanding amount of all items in financial assets and liabilities. In such cases, when data on a major item in financial assets and liabilities are available for the sector as a whole, the ratio of major enterprises to the whole sector is taken for the item, and is used to estimate the outstanding amount of other items in financial assets and liabilities of the sector as a whole. This type of estimation method is based on an implicit assumption, and in cases where the composition of assets and liabilities varies by the size or the business format of enterprises in the sector, compilers are required to:

1) divide the sector into strata by the size of outstanding amounts or by business format;

2) estimate the aggregate amount of each stratum; and

3) aggregate the outstanding amounts of assets and liabilities of these strata to obtain the amounts for the sector as a whole.

The data in category [D] have room for improvement both in source data and estimation methods. Data on hedge funds, for example, are neither available nor estimated and fall into this category.

2.2 Three Approaches toward Improving Data Accuracy

Data accuracy of the FFA can be improved through one of the following three approaches (see Chart 1).

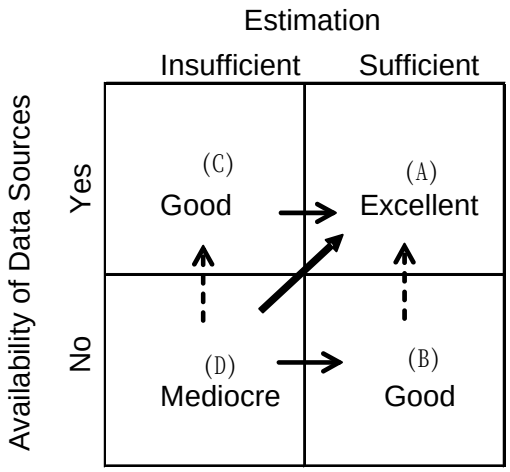
1) Replace the source data with more accurate data. (A vertical shift which can be represented by [D] → [C] or [B] → [A].) Switching source data to those with a broader coverage and a higher degree of accuracy, for example, falls into this category.

2) Improve the accuracy of estimation. (A horizontal shift which can be represented by [C] → [A] or [D] → [B].)

3) Improve the accuracy of statistics by combining (1) and (2). (A shift from [D] → [A].)

Chart 1:

The Flow of the Improvement in the FFA



Improving data accuracy under the framework is a continuous effort. Even data which have already been shifted to category [A] are liable to fall to category [D] due to changes in the financial environment, the introduction of new financial instruments, and other developments. When data actually fall from category [A], they are reclassified as [B], [C] or [D], and a new approach is adopted to pull them back to category [A].

2.3 Revisions Conducted in 2009

Table 1 shows six major improvements achieved from the revisions conducted in 2009. In terms of the basic framework of improvement stated above, two cases involved the improvement of source data ([B] → [A]) and four cases involved the improvement of both source data and the estimation methods ([D] → [A].)

Table 1:

Improvements in Statistical Accuracy in 2009

Order	Type of the Revision	Revision Method	Direction of Improvement
1	With the increase in foreign exchange margin transactions by individual investors, etc., the margin deposited and appraisal loss and profit from these transactions have been newly included.	Improved the estimation method because of new source data	D → A
2	Adopted the outstanding amount of Residential Local Gov't Bonds to improve the accuracy of estimation of the outstanding amount of local gov't securities held by the Household sector.	Switched from estimation to highly accurate source data	B → A
3	Included appraisal profit and loss from interest rate swap transactions, which the government began in 2006	Reflected new financial transactions to match actual financial activities	D → A
4	Revised source data for the outstanding amount of ABCP, a securitization product, to more accurately reflect the actual condition of the market	Switched from estimation to highly accurate source data	B → A
5	Data on the loans, which are initially provided and then securitized by the Fiscal Loan Fund, were relocated between transactions items in order to reflect actual transaction status.	Improved the estimation method due to the adoption of new source data	D → A
6	As the revised Accounting Standard for Lease Transactions stipulates that all finance lease transactions, including those which do not transfer ownership, be, in principle, treated as financial assets and liabilities in the statements of non-financial corporations, the FFA was revised to reflect their financial assets and liabilities more accurately.	Reflected new financial transactions to match the actual status of corporate accountng	D → A

3. Cases of Improvements

3.1 Cases of Improvement in Statistical Accuracy through Revisions of Source Data

In these cases, compiling the statistics through estimation with a low degree of accuracy has been replaced by the use of new source data; this is an example of a shift from category [B] to [A] in Chart 1.

3.1.1 Revision of "Structured-Financing Instruments" Data

a) Definition of "Structured-Financing Instruments"

"Structured-financing instruments" refers to financial instruments issued by structured-financing SPCs and trusts. These instruments are also part of the so-called "shadow banking." They involve various risks, including credit risk, and it is important that they are reflected properly in the FFA. However, it is difficult to identify their transactions or holders completely because these instruments are largely issued through private placements and their market size was unknown.

In the Japanese FFA, "structured-financing instruments" comprises asset-backed securities (ABS) and monetary claim trust beneficiary rights. Asset-backed securities, in turn, comprise asset-backed domestic corporate bonds, asset-backed *samurai* bonds or yen denominated

bonds issued by non-residents in the Japanese market and domestically-issued asset-backed commercial paper (ABCP).

The outstanding amounts of publicly-issued asset-backed domestic corporate bonds and asset-backed *samurai* bonds are available from the market data released by the Japan Securities Dealers Association. Figures for monetary claim trust beneficiary rights are also available through direct reporting. Source data on the outstanding amounts of privately-placed bonds and ABCP were unavailable and their outstanding amounts were estimated.

b) Features of the Revision

In the recent revision, the BOJ adopted "Outstanding Amounts of CP by Issuer's Category" released by the Japan Securities Depository Center, Inc.[2] as source data to obtain the outstanding amounts of ABCP in the "structured-financing instruments" category.

Previously, data on the outstanding amount of ABCP were estimated based on the assumption that ABCP accounted for a certain percentage of other structured-financing instruments.

In March 2003, the Book-Entry Transfer System for CP was launched in Japan. By using this system, which is operated by the Japan Securities Depository Center, Inc., rights can be transferred by recording CP transactions in the Transfer Account Books electronically. Since the launching of the Book-Entry Transfer System for CP, the issuing amount of CP recorded electronically on the system, i.e. dematerialized CP, has risen. Since 2006, dematerialized CP has accounted for more than 99 percent of the total amount of new CP issued, and now accounts for the greater part of CP.

The BOJ examined the category of the "Special Purpose Company" in the "Outstanding Amounts of CP by Issuer's Category" statistics. It turned out that this category comprises various types of SPC that were established to carry out securitization and that data for this category reflect the outstanding amount of ABCP that matches the definition of the FFA. The BOJ decided to replace the estimation with the data available from the statistics.

c) Impact of the Revision

The data on ABCP were revised retroactively from the end of June 2007, when the new source data became available. A comparison between the previous and revised data revealed that the gap between the two sets of data was approximately 1–5 percent of the outstanding amount of ABCP (after revision) and that previous figures had been overestimated; the difference was approximately 0.3–1.7 trillion yen (equivalent to 3.3–18.9 billion US dollars). As a result, the liabilities of the issuing sectors, i.e. "structured-financing special purpose companies and trusts," and the assets of the sectors holding the ABCP, were revised downward by the amount of difference accordingly.

d) Remaining Tasks Related to Data on the Outstanding Amounts of "Structured-Financing Instruments"

The outstanding amount of ABCP held by various sectors is estimated based on some assumptions whose validity may change over time. If the information about a holder's category of ABCP becomes available as source data for the FFA, it should help to identify the locations where risks are accumulating in the financial markets.

---

[2] The Japan Securities Depository Center, Inc. has the custody of securities, including shares, and makes delivery through changes in records on the books rather than physical delivery of certificates. In March 2003, it introduced the Book-Entry Transfer System for Short-Term Corporate Bonds (CP) designed to handle the processing of short-term corporate bonds completely in dematerialized form (paperless) using the Transfer Account Books. The system is explained in detail by JASDEC (2009).

The outstanding amount of some other financial instruments such as asset-backed securities is also estimated based on some assumptions. One of the areas on which the BOJ focuses is the outstanding amount of privately-placed asset-backed securities. At present, the amount is estimated by using the growth rate of publicly-issued asset-backed securities, but the present assumption may not be appropriate.

The BOJ has started discussions with a central securities depository in Japan to explore the possibilities of obtaining more appropriate source data.[3]

3.1.2 Revision of "Local Government Securities" Data held by the Household Sector

a) Definition of "Local Government Securities"

The transaction item "local government securities" comprises local government bonds and local public corporate bonds. Local government bonds are issued by the ordinary account, which is classified under "local governments" in the FFA, and by the local public enterprises accounts of local governments, which are classified under "public non-financial corporations." Local public corporate bonds are issued by local public corporations, and are classified under "public non-financial corporations." Both local government bonds and local public corporate bonds comprise three types of bonds: registered bonds,[4] book-entry bonds and bearer bonds.

b) Features of the Revision

Before the revision, the outstanding amount of "local government securities" held by the household sector was estimated assuming that all bearer bonds were held by the household sector and that the bearer bonds were the only bonds held by the household sector.

In the recent revision, the BOJ adopted the outstanding amount of publicly-issued Residential Local Government Bonds as source data for the outstanding amount of "local government securities" held by the household sector.

Residential Local Government Bonds are a type of publicly-issued municipal bond that local governments issue to local residents to finance their activities. They have been issued since fiscal 2001. The annual amount of issue of these bonds has stood at approximately 200–300 billion yen, and their outstanding amount now exceeds 1 trillion yen.

c) Impact of the Revision

As a result of the above-mentioned revision, the outstanding amount of "local government securities" held by the household sector has been revised upward. As its secondary impact, the amounts of "local government securities" held by the "private non-financial corporations," "local governments" and "private non-profit institutions serving households" have also been revised. The secondary impact is caused when the holding amount of residual sectors is calculated. The holding amount of those sectors is obtained by subtracting the holding

---

[3] Sato (2010) describes further efforts to identify holders of securities.

[4] Registered bonds are bonds the holders of which are registered with registering organizations or registering financial institutions. Since January 2007, new issuance of registered bonds has not been allowed due to a change in the settlement system, and book-entry bonds have been issued in their place. The Japan Securities Depository Center, Inc. serves as the central securities depository for book-entry bonds, transactions of which are settled electronically.

amount of the household sector, which reflects the primary impact, and other sectors from the total outstanding amount.[5]

d) Remaining Tasks Related to Data on the Outstanding Amount of "Local Government Securities"

As in the case for ABCP, improving the availability of data by holder's category is a priority for the outstanding amount of "local government securities."[6] At present, data on the holding amount are not available from financial statements of "private non-financial corporations," "local governments" and "private non-profit institutions serving households." The BOJ has started discussions with a central securities depository in Japan to obtain more appropriate source data.

3.2 Cases of Improvements in the Accuracy of Statistics through the Adoption of New Source Data and Improvement in the Accuracy of Estimation Methods

3.2.1 Improvement in the Accuracy of Outstanding Amounts of Assets and Liabilities of the Central Government Sector

(Chart 1: Example of improvement via [D] → [A])

a) Definition of "Financial Derivatives"

"Financial derivatives" in the FFA refers to a financial instrument that derives from a specific financial instrument (the "underlying asset") but does not involve transfers of funds in connection with the principal (notional principal) of the underlying assets. In the FFA, the figures posted under financial derivatives are the market prices (unrealized gains and losses) of forward-type financial derivatives and the market prices (current prices of option premiums) of option-type financial derivatives. The former includes such transactions as forward rate agreements, interest rate swaps, currency swaps and exchange forward contracts.

b) Features of the Revision

In 2006, the central government (the Ministry of Finance) began interest rate swap transactions in order to manage risk that may arise from the change in interest rates when it refinances the government securities of short duration. The outstanding amount of such transactions has increased and, as of the end of March 2010, reached 430 billion yen for the

---

[5] The following is a brief explanation of the concept of "residual sectors" for the FFA. The FFA is compiled in such a way that in the end the assets and liabilities of all sectors and all transaction items are balanced in order to make the matrix consistent. However, since not all figures for assets and liabilities of all sectors are always available, figures for some transaction items in some sectors are estimated by subtracting figures for other sectors from the total outstanding amount of the transaction item concerned. For "local government securities," the source data on the holding amount of "private non-financial corporations," "local governments" and "private non-profit institutions serving households" are not available. Accordingly, the outstanding amount of "local government securities" held by these sectors is obtained by subtracting the amounts held by the household and other sectors for which the figures are available from financial statements, etc., and then by allocating the amount to each of these sectors. To the extent to which the recent revision has improved the accuracy of data for the household sector, the accuracy of statistics for "private non-financial corporations," "local governments" and "private non-profit institutions serving households" has also improved.

[6] Evidence in late 2008 suggests that, in the U.S., yield spreads of local government securities widened against the government securities, and that their market cannot remain immune from financial market instability. It is inferred from this evidence, that the information on holders of local government securities should be reflected in the FFA appropriately.

receiving side and 2,050 billion yen for the payment side of fixed interest rate transactions (in terms of notional amounts). The FFA did not include those transactions.

In the recent revision, the BOJ decided to record the value gains and losses of the interest rate swap transactions conducted by the central government on the "financial derivatives" (forward-type instruments) of the "central government" sector. Its source data is based on the "General Account Financial Statements" released by the Ministry of Finance.

c) Impact of the Revision

The value gains and losses have been posted as assets and liabilities, respectively, on "financial derivatives" (forward-type instruments) in the "central government" sector from the first quarter of 2006, when interest rate swap transactions by the central government began. Since the source data for interest rate swap transactions are shown on a net basis, the net value is recorded on the outstanding amount of either assets or liabilities. At present, the net value (loss) is relatively small at approximately 38.0 billion yen (recorded on the liabilities side of the FFA). Nevertheless, the new source data will allow the BOJ to record data on financial derivatives transactions by the central government and to trace the development of the transactions in the FFA.

d) Remaining Tasks Related to the Outstanding Amount of "Financial Derivatives"

In addition to those included in the FFA, there are other types of financial derivatives. One of them is credit default swaps (hereafter CDS).[7] The System of National Accounts 2008 (2008 SNA) stipulates that standardized guarantees should be recognized as assets or liabilities, and it classifies CDS in the category of the first class of guarantees (2008 SNA, Paragraph 17.210). As is shown in the "Regular Derivatives Market Statistics in Japan" released by the Bank of Japan, as of the end of December 2009, their gross positive market value amounted to 2.8 trillion yen while the gross negative market value amounted to 2.4 trillion yen.[8] Their transactions have increased sharply since the latter half of 2008. Based on the development of the CDS market, the BOJ plans to consider including CDS in the "financial derivatives" category to capture the status of financial derivatives more accurately in the FFA.

3.2.2 Revision of the Treatment of Lease Transactions

(Chart 1: Example of improvement via [D] → [A])

Lease transactions that can be regarded as loans ought to be recognized as "installment credit" in the FFA. Some of such lease transactions have not been included in the "installment credit" category of the FFA due to the lack of source data. The relevant data have become available recently, with the introduction of a new accounting standard for lease transactions ("Accounting Standard for Lease Transactions") since April 2008. The BOJ has started to use these data and has revised the estimation method.

a) Classification of Lease Transactions and Principles under the 1993 SNA

Lease transactions comprise finance lease transactions and operating lease transactions. The former are leasing contracts under which: 1) the users use up the leased assets in effect; and 2) users cannot cancel the contracts during the contract period. All other lease transactions are categorized as operating lease transactions. Finance lease transactions, in

---

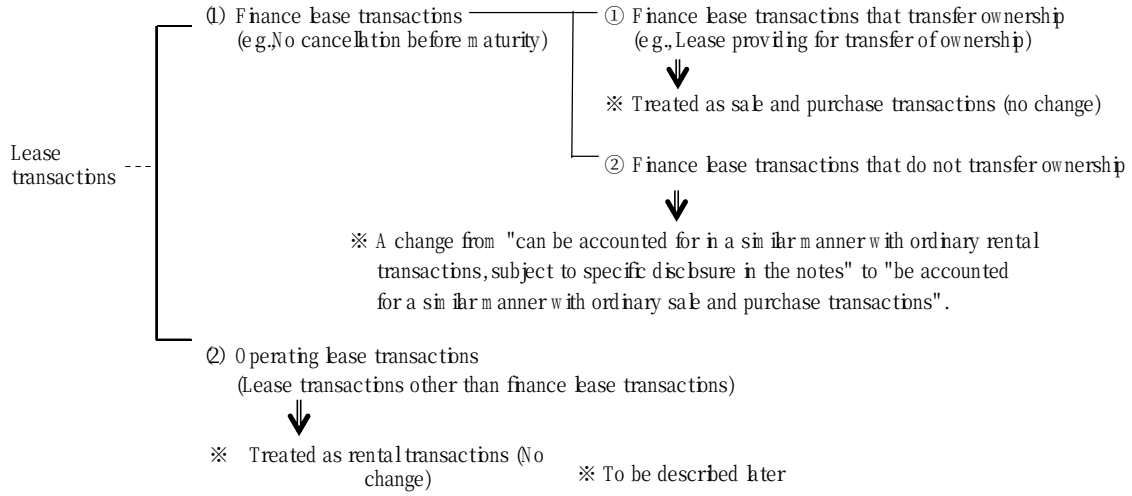
[7] CDS are a type of credit derivative. CDS transactions transfer only credit risks without transferring claims themselves.

[8] Calculated on the basis of the exchange rate of the yen at the end of December 2009 (93.61¥/$.)

turn, comprise transactions that transfer ownership and those that do not, which depends on the terms of the contracts shown in Chart 2 below.

Chart 2:

Classification of Lease Transactions



The treatment of lease transactions in statistics depends on their classification. Operating lease transactions are treated as ordinary rental transactions, while finance lease transactions can be treated as either ordinary rental transactions or financial transactions (i.e. “loans”). Depending on whether emphasis is placed on the legal owner (ownership principle) or the actual user (user principle) a different outlook can be created. From the standpoint of the legal owner of the leased item (the ownership principle), they are treated as ordinary rental transactions. From the standpoint of the actual user (the user principle), on the other hand, they are treated as financial transactions.

The System of National Accounts 1993 (1993 SNA) recommends that lease transactions are recorded according to their economic characteristics, regardless of their legal status. When a lease transaction can be viewed as an extension of credit by the lessor to the lessee to finance the purchase of the leased item, it is treated as a “loan.”

b) New Accounting Standard for Lease Transactions

The pre-revision standard stipulated that the assets and liabilities pertaining to finance lease transactions are to be treated as financial assets and liabilities in their accounting treatment. However, it also permitted exceptions. In case certain information is disclosed in the footnotes to financial statements, finance lease transactions that do not transfer ownership could be accounted for in a manner similar to the accounting treatment for ordinary rental transactions. In this accounting treatment, such lease transactions are not recorded as financial assets and liabilities (i.e. not to be included in the balance sheets). For this reason, data on the outstanding amount of finance leases that do not transfer ownership could not be collected from financial statements, although they should basically be included in the FFA under the provisions of the 1993 SNA. The new Accounting Standard for Lease Transactions[9] that came into effect in April 2008 repealed the exception. As a result, finance

[9] ASBJ (2007) explains the new standard in detail.

lease transactions that do not transfer ownership are no longer treated off the balance sheets but are treated as financial assets and liabilities.

c) Features of the Revision

Under the pre-revision accounting standard, data on finance lease transactions that do not transfer ownership could not be reflected in the FFA due to source data constraints. The change in the accounting standard enabled the BOJ to obtain data on finance lease transactions that do not transfer ownership and to record them in the "installment credit" category from the second quarter of 2008. At the same time, the BOJ also revised the estimation method for the outstanding liabilities of lessees in accordance with the change in source data.

d) Impact of the Revision

The outstanding amount of the assets in the "installment credit" category of the "finance companies" sector, which includes leasing companies, was revised upward. On the side of liabilities (lessees of finance lease transactions that do not transfer ownership), the outstanding amounts of "installment credit" (liabilities) of the relevant sectors were also revised upward.

e) Remaining Tasks Related to the Outstanding Amount of "Installment Credit"

At present, the holding amount of each sector is estimated assuming that the relative amount held by each sector does not change among types of lease transactions. Accordingly, the same ratio is applied to allocate the total outstanding amount to each holding sector for the lease transactions that do not transfer ownership and for "installment credit," which is the upper category of the lease transactions. In case the assumption does not hold true, and the ratio applied to calculate the holding amount of each sector varies by the type of lease transactions included in the "installment credit" category, then it would be necessary to examine the possibility of further improvement to the accuracy.

Moreover, reliable statistics on the whole industry, compiled by the government or industrial organizations, are not available for the "finance companies" sector, which holds "installment credit" as assets. Therefore, the BOJ conducts independent surveys of major finance companies, leasing companies, credit companies, etc. with their cooperation, and estimates the figures for "finance companies" based on the survey data.

4. Concluding Remarks

This paper presented the Bank of Japan's framework and its efforts to improve the accuracy of the FFA. The FFA comprises approximately 6,000 data series. Each of the data series is compiled by aggregating some individual source data or by estimation. The BOJ pays careful attention to both every single item of source data and aggregated data series. It follows the framework described in this paper to examine and improve the accuracy of the FFA efficiently. Under the framework those individual data are classified into four large categories depending on the availability of source data and the accuracy of estimation, by which the direction of improvement is clarified for individual data. It helps the BOJ to prioritize the focus of work on the FFA. Among the revisions conducted in 2009, this paper showed some examples of major improvements.

The rapid evolution of new financial markets and instruments is a challenging issue for the FFA. It requires the BOJ to identify and collect missing data promptly and also to improve the accuracy of existing data. Tasks for further improvement remain. The BOJ will continue improving the FFA under the framework to capture new developments of financial

transactions and outstanding amounts more accurately, and to make the FFA more useful for its users.

References

Accounting Standards Board of Japan (2007), Accounting Standard for Lease Transactions, ASBJ Statement No. 13, March 2007.

Bank of Japan (2006), Guide to Japan's Flow of Funds Accounts, August 2006.

Bank of Japan (2006), Compilation Method of Japan's Flow of Funds Accounts, August 2006.

Eurostat, IMF, OECD, UN and World Bank (1993), System of National Accounts 1993 (1993 SNA).

Eurostat, IMF, OECD, UN and World Bank (2009), System of National Accounts 2008 (2008 SNA).

JASDEC (2009), Annual Report 2009, June 2009.

Sato, Yoshiko (2010), Developing Database on Securities Holders Information: The Case of Japan, paper presented for the OECD Working Party on Financial Statistics Workshop on Securitization, May 27–28, 2010.

Financial statistics on corporations – existing gaps and future possibilities

Lizette Appelberg, Kristina Holmberg and Jon Smedsaas[1]

Introduction

The financial crisis started in the United States in 2007 and peaked in autumn 2008 after the bankruptcy of Lehman Brothers. The collapse of Lehman Brothers caused a global meltdown in the financial market. Some of the market functions stopped working during this period. To prevent a financial disaster, governments and central banks responded with unprecedented fiscal stimulus and monetary policy expansion. One sector that was substantially affected was the non-financial corporate sector. According to the Sveriges Riksbank Survey from December 2008 – January 2009,[2] more than half of the companies stated that access to credit had become significantly tighter. Other surveys, made by among others NIER[3] and ALMI Företagspartner,[4] demonstrated the same situation. Contradicting this are statistics from Statistics Sweden that illustrate a somewhat different picture. An example of this is the value of the non-financial corporate sector's outstanding amount of debt securities, which actually increased throughout the year of 2008. Another inconsistency is commercial banks' lending to the sector, which also grew during the period.

Contributing to the rather ambiguous picture of the financing situation of the Swedish non-financial corporate sector were the media and the political establishment. There were numerous articles, and comments in newspapers and other media, during the financial crises citing the difficulties that the corporate sector had in accessing finance. Even the Swedish Parliament's Committee on Finance had viewpoints on the official statistics on bank lending. In June 2009 the Committee pointed out to the Sveriges Riksbank that there was a lack of statistics on bank lending broken down by firm size.

In this paper we bring together all major surveys that were made during this period, trying to illustrate an adequate picture of the Swedish corporate sector's financial situation. This compilation will then be compared with the existing statistics on this area, collected from Statistics Sweden. Based on the results, we try to explain existing contradictions in the statistics and demonstrate further assignments that can be made to get a better statistical overview of the non-financial corporate sector.

Non-financial corporations' funding situation, qualitative approach

In January 2009 Sveriges Riksbank observed in the publication "The Riksbank's company interviews December 2008 – January 2009" that the Swedish companies' funding situation

---

1 The views expressed in this paper are solely the responsibility of the authors and should not to be interpreted as reflecting the views of Statistics Sweden. The paper is to be regarded as a report on ongoing studies, and the authors would welcome comments.

2 *The Riksbank's Company Interviews December 2008 – January 2009,* www.riksbank.se.

3 National Institute of Economic Research, www.konj.se, 2010-06-30.

4 Almi Företagspartner, www.almi.se, 2010-06-30.

had become more difficult during the autumn. Since September 2008 more than half of the companies participating in the survey had problems with funding and stated that access to credit had become significantly tighter.

Borrowing on the international capital market became considerably more expensive and difficult at the end of 2008. None of the companies in the report issued any bonds or commercial paper, as the interest rate was too high.[5] The willingness of major international banks to lend to Swedish companies also declined drastically. According to the companies, the international banks reverted to their domestic markets. Most of the larger companies seemed to find various ways to meet their borrowing requirements. Several companies in the survey had to withdraw to their domestic market. This meant that the companies were getting credits from Swedish banks to a greater extent than previously.

The larger companies' increased demand for Swedish bank credits raised concerns that it could prevent smaller companies from getting loans. Add the fact that the banks had severe problems with their own funding, and we had a classical crowding-out situation.

The Riksbank's company interviews normally focus on larger companies.[6] However, in March 2009, interviews with medium-sized companies were also represented in the report. Compared to the larger companies, the medium-sized companies seemed to be meeting their borrowing requirements more effectively. Small and medium-sized enterprises (SMEs) do not have access to the international capital markets. Thus, they were not affected directly by the increased turbulence on the money and fixed income markets.

This view is also supported to a certain extent by the Swedish National Institute of Economic Research (NIER). The survey from NIER provides the widest existing coverage of how Swedish companies perceived their funding situation during the financial crisis. In order to contribute to the picture of the possible effects of the financial turbulence on companies' financing opportunities, NIER expanded its monthly Economic Tendency survey.[7] This survey covers a larger sample than the Riksbank's company interviews. About 1800 companies were asked whether it was currently more difficult or easier than normal to finance their activities. Approximately 31% of the companies in the non-financial corporate sector stated in November 2008 that it was currently more difficult to finance the company's activities. Companies with more than 500 employees and firms with less than 50 employees perceived the financing problems as worse than did the medium-sized companies. The main obstacle to financing activities was reported to be the lack of opportunities to obtain bank loans.

This was also the case for the larger companies. Less than 10% of the companies with more than 500 employees claimed that they were concerned by the increased cost of obtaining financing through the issuing of bonds and commercial paper. The Economic Tendency survey was expanded to August 2009. Through that period, the smaller companies became gradually more satisfied than the larger companies with the current funding situation.

The information revealed by the Riksbank's company interviews and by The Economic Tendency survey is somewhat mixed. The Riksbank's company interviews are mainly from the larger companies' perspective. Most of these companies seemed to be meeting their funding needs during the financial crisis, even though they had to revert to domestic banks and more expensive forms of funding, such as credit lines. Because of the scope of the

---

5 *The Riksbank's Company Interviews December 2008 – January 2009.*

6 It should be noted that the Riksbank's company interviews are adapted to the issues that are important to monetary policy at specific times. The sample comprises about 60 companies and does not need to represent the business sector as a whole.

7 http://www.konj.se, 2010-06-30.

sample, The Economic Tendency survey provides a wider view of the funding situation for the business sector during the financial crisis. As in the Riksbank's report, the medium-sized companies seemed less concerned about financing problems than did the smaller and larger companies. However it is not possible to draw clear-cut conclusions from the data provided by The Economic Tendency survey.

The evidence provided by The Riksbank and by the NIER cover the demand side of funding – how the companies perceive their possibilities of financing their activities. For further understanding of the funding situation, one can also study the supply side of funding. The public financing company, ALMI Företagspartner, which mainly aims to support SMEs, conducts a quarterly loan indicator survey in which they ask the banks how they perceive companies' financing situation. From October 2008 throughout the entirety of 2009, the banks in the survey stated that their lending to companies had decreased.[8] According to the banks, this could be explained by companies' unwillingness to invest. Moreover, the banks were less inclined to lend to companies, due to increased risk and a reluctance to tie up capital.

Perhaps as a result of the latter explanation, the demand for credits from ALMI increased during that period.

Also useful is information from the Swedish Export Credit Corporation (SEK) and the Swedish Export Credits Guarantee Board (EKN), which met a surge in the demand for export credits during 2009. The demand for guarantees from EKN increased nine-fold during the first half of 2009 compared to the corresponding period in 2008.[9] It was primarily SMEs that were behind the increased demand, as they had more problems obtaining guarantees from the private market. In addition, SEK significantly increased its lending to Swedish export companies. According to SEK, it filled the gap that emerged when the banks couldn't provide long-term lending.[10]

What do the statistics say?

At Statistics Sweden, there are several units collecting data concerning the financial situation of the non-financial corporate sector: the balance statistics, the financial market statistics and the balance of payments statistics. While the balance of payments covers only the foreign aspect of the non-financial corporate sector's financial situation, we will limit our focus here to a discussion of the first two statistics.

The balance statistics show financial assets and liabilities for non-financial corporations, positions and transactions. This includes, among other things, debt securities issued on the capital markets, loans within the group, and loans from Swedish and foreign banks, thus providing sufficient coverage to give an overall view of the financial situation of the corporate sector. While the balance statistics cover all of the larger corporations, they sample the smaller strata, which are adjusted upwards.

The financial market statistics provide an overall picture of Swedish monetary and financial institution (MFI) assets and liabilities, and are collected primarily on a monthly basis. The

---

8 www.almi.se, 2010-06-30.

9 The total amount of offers during the first half of 2009 was just over SEK 200 billion, compared to SEK 22 billion for the corresponding period in 2008. www.ekn.se, 2010-06-30.

10 The volume of new customer financing during the year totalled SEK 122.5 billion, compared to SEK 64,9 billion for 2008. www.sek.se, 2010-06-30.

financial market statistics also cover MFIs' lending to the corporate sector. The survey is a census and should fully cover Swedish MFIs' lending to the non-financial corporate sector.

To investigate the corporate sector's financial situation from a statistical point of view we will start by studying the sector's possibility of borrowing currency on the international capital markets. Thereafter we will examine banks' lending to the sector, and further on we will demonstrate the Swedish corporate sector's consolidated debt burden.

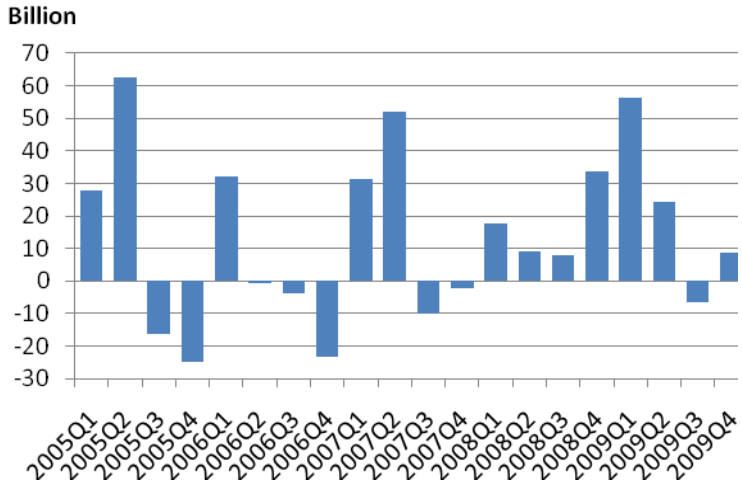
Borrowing in debt securities

Issuing corporate bonds and commercial paper on the international capital markets is an important source of financing for large international Swedish corporations. But according to the Riksbank's interviews in December 2008 – January 2009, none of the companies in the report managed to issue bonds or commercial paper on the international capital market during that period.

However, this is not borne out by the statistics. A survey conducted by Statistics Sweden, compiling balance statistics on corporations' financial assets and liabilities on a quarterly basis, illustrates a somewhat different picture. From the beginning of 2008 and for the following eighteen months, the outstanding amount of debt securities actually increased, implying that issues of debt securities were indeed possible.

One important explanation of this contradiction is that Sweden is a rather small country, with just a few companies that are active on the international market for debt securities. Yet the domestic market contains both medium and large corporations. Smaller companies hardly ever use debt securities as a form of borrowing. The small number of players issuing debt securities results in statistics that are highly dependent on single actors' movements in the market. This was obvious during late 2008 and the beginning of 2009, when a few large companies successfully issued large amounts of bonds on the international market, affecting the statistics significantly.

Figure 1. Non-financial corporations' borrowing in debt securities, bonds and certificates, quarterly change in outstanding amount



Source: Statistics Sweden

Macro-level figures, therefore, show an increase in bonds and certificates, but this could all be based on a very few large companies.

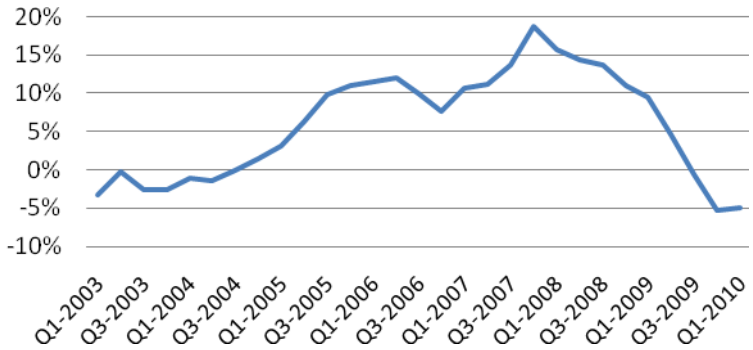
Another factor that has affected the picture a great deal is the national currency and its development during this period. The largest share of debt securities issued abroad is denominated in foreign currency, and since the Swedish krona depreciated 14% during the period from August to December 2008 alone, this is a factor in the rising debt.

Diminishing growth rates in lending, and falling interest rates

During the financial crisis in 2008 and 2009, the non-financial corporate sector was not only struggling in efforts to obtain currency via the securities market, but there was also a decrease in banks' willingness to lend to the sector. According to the banks that participated in ALMI Företagspartner surveys,[11] the reduction in banks' lending was not only due to their constraints but was also caused by the fact that the companies' demand for credit actually fell during the crisis.

Even though the Swedish banks were more restricted in giving credits during the autumn of 2008, their lending to the corporate sector actually continued to grow during the period. In the two last quarters of 2008, the rate of growth in the stock of outstanding loans and in corporate stock grew by 14% and 11%, respectively, compared to stock levels at the same period the year before (Figure 2). The credit supply on a quarterly basis also continued to grow during the last part of 2008. A reasonable explanation of this could be what was mentioned in the Riksbank's company interview report: larger Swedish companies financed their activities by borrowing from Swedish banks, since the international capital market was no longer an alternative. Whether this circumstance prevented smaller companies from getting loans or not cannot be shown by the statistics.

Figure 2. MFIs' lending to non-financial corporations, yearly change



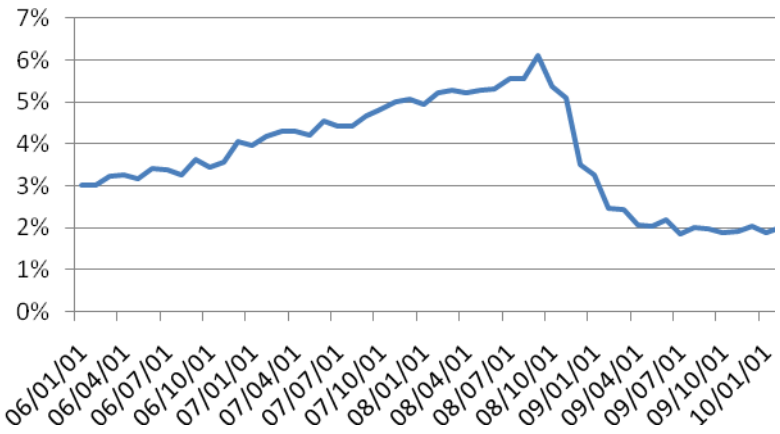
Source: Statistics Sweden

Although the corporate sector continued to borrow in 2008, there was a trend break, since the annual growth rate actually started to decline in the first quarter of 2008. In the third quarter of 2009, the growth rate was negative for the first time since 2004. This coincides

[11] www.almi.se, 2010-06-30.

with the sharp economic downturn that Sweden faced in 2009. The gross national product fell by 4.9% in 2009 – the deepest drop in Swedish history since World War II.[12] The decline in borrowing is probably mainly attributable to the recession and not to the fact that corporations were rejected by the banks. This is further emphasized by the decline in the interest rates during the current period. One of several measures used by the Swedish Riksbank to prevent a financial collapse was to quickly reduce the Swedish repo rate to a very low level. In September 2008, the repo rate was at 4.75%; half a year later it was as low as 1.0%, and in July 2009 the Swedish Riksbank lowered the repo rate to 0.25%. Naturally, the decline in the repo rate affected the MFIs' lending rates, which fell from 6% to 2% in six months (Figure 3). Although the Riksbank's drastic cuts in the repo rate had a very positive effect on non-financial corporations' borrowing costs, this evidently has not encouraged the sector to increase its borrowing.

Figure 3. MFIs' lending rate on new agreements



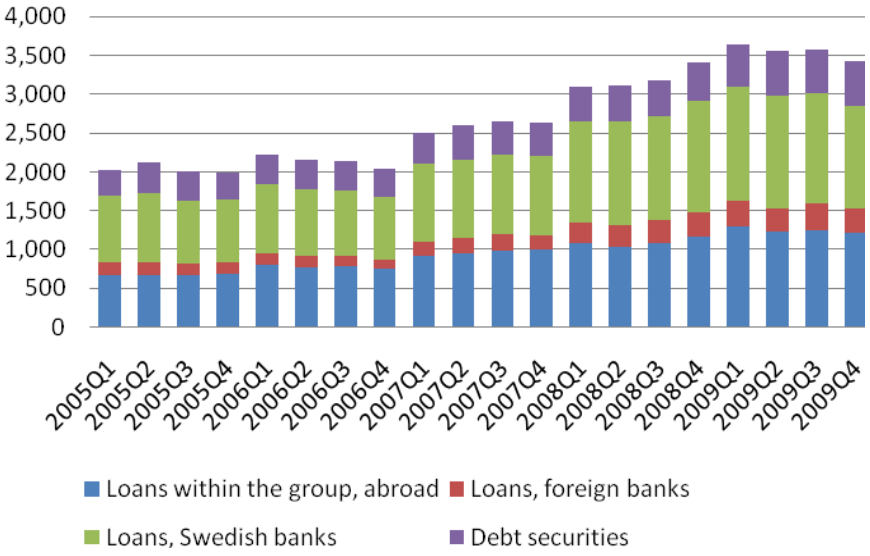
Source: Statistics Sweden

Consolidated liabilities

To get an overview of the complete financial situation of the non-financial corporate sector, several statistical measures from the balance statistics have to be used: *debt securities issued on the market, loans within the group,* and *loans from Swedish and foreign banks*. In line with the earlier discussion, the general expectation would be that the companies' consolidated liability burden should have declined during the crisis in 2008 and 2009. The overall picture of the difficulties of issuing securities, banks' tightening of credits and the steep economic downturn implied a decline of debt in the corporate sector. Still, statistics shown earlier proved the contrary for the year 2008. Yet for the year of 2009, the statistics seem to stay closer to the assumption.

[12] www.scb.se 2010-06-30.

Figure 4. Non-financial corporations' consolidated liabilities, billions SEK



Source: Statistics Sweden

Figure 4, above, shows, to a great extent, what has already been illustrated in statistics presented earlier in this paper.[13] During the last two quarters of 2008, enterprises' balance sheets expanded, especially in the last quarter of the year. In accordance with earlier evidence, the sector's balance sheet shrunk in 2009. During the last two quarters of 2008, increasing debt could be seen in all instruments and among the different sources. In 2009, it was the sector's loans from foreign banks, in particular, that seemed to decline. Worth mentioning is the influence of the Swedish krona, which affected all loans made in foreign currency during 2008 and 2009.

Proposal on further improvements

The existing statistics picture the companies' funding situation on an aggregate level. However, they are not sufficient for studying how a financial crisis affects companies of different sizes. For a deeper understanding, there is a need for new measures, as well as for developing the existing ones. Along with statistical measures, qualitative measures are also of great importance.

Qualitative measures

The temporary expansion of The Economic Tendency survey and the bank survey performed by ALMI highlight other important aspects of the companies' funding situation. Firstly, this gives a more detailed understanding of the financing difficulties facing the companies, from the companies' perspective. Making the expansion of the survey permanent would usefully

[13] The data used in Figure 4 derive from a random sample consisting of all non-financial corporations. While it covers all of the larger corporations, it samples the smaller strata, which are adjusted upwards. The sample is drawn once a year.

complement the Riksbank's company interviews and would provide a better understanding of SMEs' funding situation. Secondly, it provides some understanding of banks' lending to companies, which the existing statistics do not capture.

The companies' consolidated liabilities do not reflect their funding requirements – the need for credits was probably higher during the crisis than the supply. ALMI's survey provides some evidence on loan application denials, and banks' risk assessments of the companies differ over time.

Breakdown of the existing statistics by enterprise size

A deeper and more detailed analysis concerning non-financial corporations' financial situation would be obtained by breaking down the existing statistics by enterprise size.

As the balance statistics are already based on a collection of different-sized strata, they could be used to analyze whether or not there are idiosyncrasies. Changes in the different components of the consolidated liabilities for each stratum would also be useful for further examining enterprises' financial situations. Since the smaller strata in the balance statistics derive from a random sample, which is adjusted upwards, this might require that the sample for each of the smaller strata be enlarged. Enlarging the sample does not only require more resources, it would also increase the companies' total reporting burden, which goes against the Swedish government's mandate to reduce the reporting burden.

Breaking down the parts of the Financial Market Statistics by enterprise size would also be beneficial in a deeper analysis of the non-financial corporate sector's funding situation. This should mirror the balance statistics, but is nevertheless very useful since the financial market statistics are a census and thus cover Swedish MFIs' lending to the corporate sector. The financial market statistics are not currently collected according to enterprise size. Changes in the data collection of the financial market statistics normally involves a long process. Nevertheless, it is probably a more realistic way forward, since changes in the financial market statistics affect fewer respondents than do changes in the balance statistics.

Central Credit Register

Similar to a breakdown by company size for MFIs' lending to the non-financial corporate sector would be a central credit register. Many European central banks have an integrated central credit register whose primary objective is to provide a service for institutions that need to assess risk when granting credit. To fulfil this aim, these institutions have access to the total liabilities of each customer in the financial system. The major part of the central credit register is also set up to provide policy-makers with all of the credit-related information that could be useful to their decision-making. In France, for example, the threshold for reporting exposures (as of January 2006) is EUR 25,000.[14] Given this threshold, it is possible to collect information on a large number of companies, in particular small-sized ones. The data contained in the French credit register may be associated or combined with other descriptive accounting or financial information from the French database "FIBEN". This makes it possible to obtain aggregated data on areas such as: *economic sectors, geographical areas, loan categories*, etc.

In Sweden, no such data is collected for companies and organizations. There is a credit register for private individuals, managed by UC.[15] While UC covers most of the credits of

[14] The economic impact of business failures in 2008 and 2009, Banque de France, Quarterly Selection of Articles, No. 17, Spring 2010. p 36.

[15] Uppgiftslämnar Centralen, a business and credit information agency owned by seven major Swedish banks.

private individuals, its company register is limited to companies' financial statements. Creating a Swedish credit register for companies is certainly not an easy task. Nevertheless, for the monetary and financial authorities, it would constitute a mine of information on the current economic condition in general and, more specifically, would shed much light on companies' borrowing and banks' lending.

Conclusion

This paper presented a compilation of what has been stated about the funding situation of non-financial corporations during autumn 2008 and the beginning of 2009. This qualitative information was then compared to available statistics from Statistics Sweden. At the end of the paper, we have suggested measures that could be taken to improve the statistical description of the corporate sector's financial situation.

Surveys made by the Swedish Riksbank and NIER give the same picture – one of a financial situation that became significantly tighter during the financial crisis and in the following real economic downturn. According to the reviews, the companies' funding situation tightened with respect to securities issues and bank loans. The latter constraint was also confirmed in the survey made by ALMI, as well as by the enormous surge in the demand for export credits during the period.

In contrast to the more qualitative information from the surveys, the statistical data illustrate a somewhat different picture. Despite the common picture of an international capital market that was more or less nonfunctional during autumn 2008, the sector's outstanding amount of debt securities was actually increasing during the period. Another contradiction to the surveys is the bank sector's statistics, as well as the statistics of corporations' consolidated debt burden. These sources also indicate that funding was indeed obtainable during 2008 and 2009.

An explanation of the first contradiction mentioned above has already been given in the article – the depreciation of the Swedish Krona. Another, more important, explanation is the fact that there are only a few very large corporations that use the international capital market. A few of those, with high credit worthiness, were able to come out with new issues.

Concerning increased stocks of bank lending during 2008 and the beginning of 2009, the reason for the contradiction is probably the same as above: large companies dominate the statistics.

Given the above facts, the main conclusion of this article is that there is indeed a gap in the statistics. Data concerning the non-financial sector do not manage to capture SMEs' financial situation.

The last part of the article therefore suggests some further steps to be taken in order to develop the statistics on financial conditions for the non-financial corporate sector.

The first proposal is to maintain the enlargements of the surveys that were made during the crisis, since they gave important qualitative insights of SMEs' funding situation. The second proposal is to split the sample into groups sorted by size – this would make it possible to study SMEs. Unfortunately this method would not only be expensive for both authorities and corporations, but would also go against the requirements to reduce the reporting burden.

The third and most essential point raised in this part of the paper is the lack of a Swedish central credit register for non-financial corporations. A central credit register would make it possible to easily compile data from SMEs that could illustrate quick changes in their funding possibilities. Nevertheless, creating such a vast register would require a deep and careful investigation, which is beyond the scope of this paper.

References

The Riksbank's Company Interviews December 2008 – January 2009, www.riksbank.se, 2010-06-30.

The Economic Tendency survey, The Swedish National Institute of Economic Research, www.konj.se, 2010-06-30.

ALMI Loan Indicator December 2008, Almi Företagspartner, www.almi.se, 2010-06-30.

Committee on Finance 2008/09:FiU24, "Evaluation of monetary policy in 2006 - 2008 and a description of the Riksbank Action taken by the financial crisis".

2008 Annual report, Exportkreditnämnden, www.ekn.se, 2010-06-30.

Swedish National Accounts, www.scb.se 2010-06-30.

The economic impact of buisness failures in 2008 and 2009, Banque de France, Quarterly Selection of Articles, No. 17, Spring 2010.

Data on the balance sheet positions of households and financial and non-financial corporations in Slovenia

Nina Bostner

1. Introduction

Financial accounts statistics represent an important analytic tool for analysing financial transactions between institutional sectors within the economy and financial interactions between the domestic sectors and the rest of the world.

The methodological basis for the compilation of the financial accounts is the ESA 95 (the European System of Accounts). The financial accounts disclose the stocks and flows that individual institutional sectors hold in individual financial instruments as claims and as liabilities. The financial accounts disclose how a surplus is distributed or a deficit is covered by transactions in financial assets (claims) and liabilities.

The subjects of financial accounts statistics are financial transactions, valuation and other changes and the financial balance sheet. The financial balance sheet of a sector shows financial assets and liabilities at the end of a specified date.

In the first part of the paper the financial accounts will be presented in theory, followed by a description of the institutional sectors, in which the individual institutional units are merged, and of financial instruments, through which financial transactions take place between units. In the second part I will focus only on the financial balance sheet of the Slovenian non-financial corporations, financial companies (for the banking sector) and households. The financial balance sheet of a sector shows financial assets and liabilities at the end of a specified date. Thus, for the period from 2004 to 2009, a detailed analysis for each sector will be made to present what happened during that period and what was the impact of the current crisis on these sectors.

2. European System of Accounts 1995 (ESA 95)

2.1. ESA 95 methodology

The methodological basis for the compilation of the financial accounts is the European System of Accounts 1995 (ESA 95).

The financial accounts disclose the stocks and flows that individual institutional sectors hold in individual financial instruments as claims and as liabilities. The financial accounts disclose how a surplus is distributed or a deficit is covered by transactions in financial assets (claims) and liabilities.

The net item of a financial account, which represents transactions in financial assets minus transactions in liabilities, should as a rule be equal to the net item of the non-financial (capital) account (net borrowing or net lending B.9).

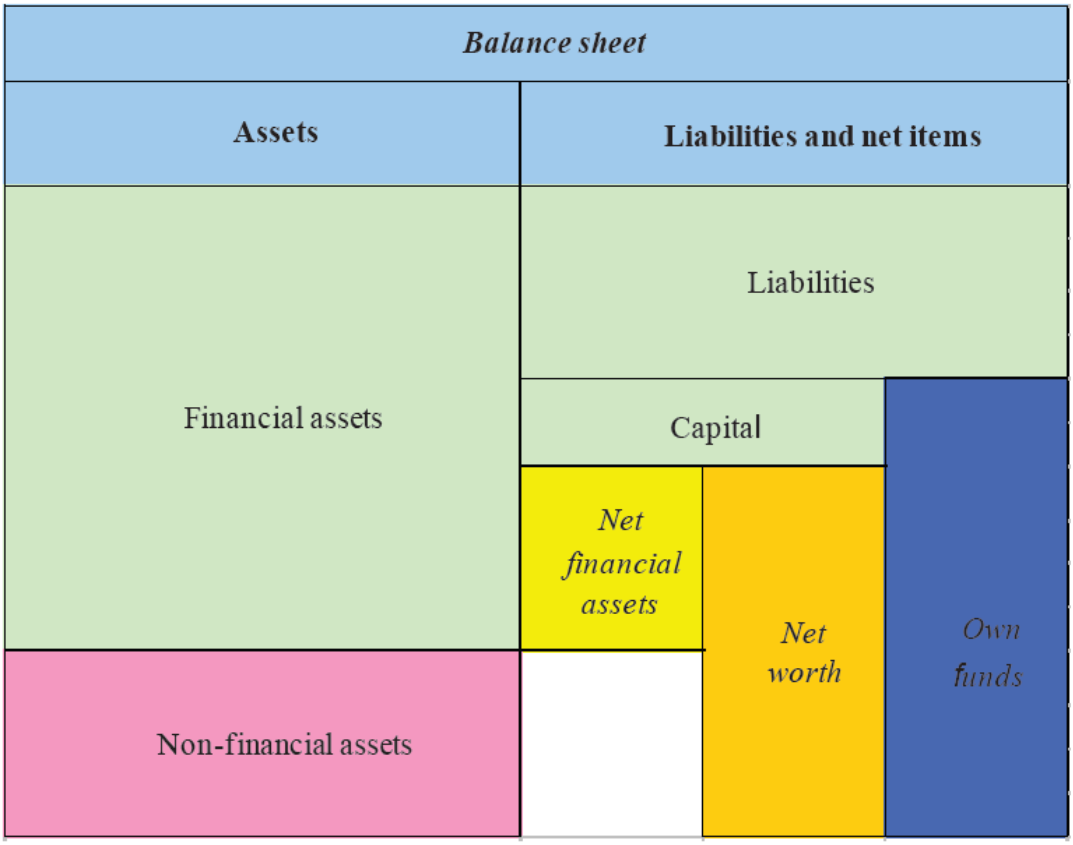
The basic principles of the ESA 95 are:

- all assets and liabilities are valued at current market value;
- the difference between financial assets and liabilities represents the net financial assets;

- the difference between total assets (financial and non-financial) and liabilities represents net worth;
- net worth plus shares and other equity represents own funds.

Picture 1

Balance sheet and net items



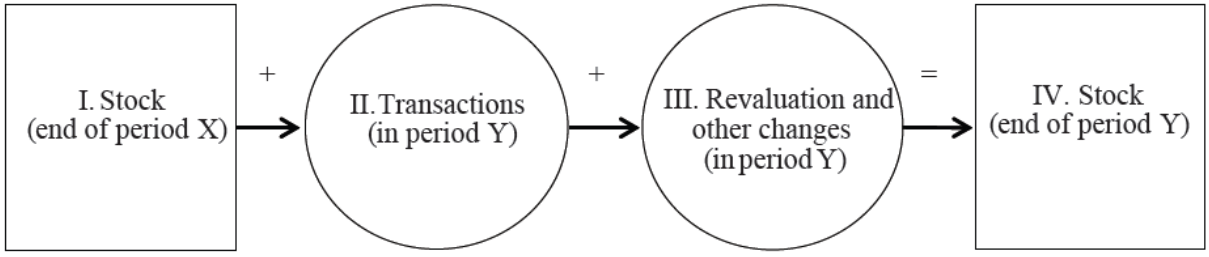
Source: ESA 95.

The items in the financial accounts and the items in the balance sheet are not equal in value because of the aforementioned ESA 95 principles.

Financial accounts may be non-consolidated or consolidated. In a consolidated account claims and liabilities between institutional units within a particular sector are eliminated.

Picture 2

Financial Accounts Model



Source: Financial Accounts of Slovenia 2003-2008, p. 35.

2.2. Institutional sectors

Institutional units are economic entities that are capable of owning goods and assets, incurring liabilities and engaging in economic activities and transactions with other units in their own right (ESA 95, p. 8).

For the purposes of the system, the institutional units are grouped together into five mutually exclusive institutional sectors composed of the following types of units:

- non-financial corporations;
- financial corporations;
- general government;
- households;
- non-profit institutions serving households.

The five sectors together make up the total economy. Each sector is also divided into subsectors.

Table 1

Classification of sectors

Code	Title of financial instrument
S.1	Slovenian economy
S.11	Non-financial corporations
S.12	Financial corporations
S.121	Central bank
S.122	Other monetary financial institutions
S.123	Other financial intermediaries, except insurance corporations and pension funds
S.124	Financial auxiliaries
S.125	Insurance corporations and pension funds
S.13	General government
S.1311	Central government
S.1313	Local government
S.1314	Social security funds
S.14	Households
S.15	Non-profit institutions serving households
S.2	Rest of the world
S.21	European Union (EU)
S.2111	Economic Monetary Union (EMU)
S.2112	Other EU members outside the EMU, and EU institutions
S.22	Third countries and international organisations (Others outside the EU)

Source: Financial Accounts of Slovenia 2003-2008; see p. 254.

The financial accounts of Slovenia disclose the stock of and flows in financial assets and liabilities in terms of different sectors or subsectors under the Standard Classification of Institutional Sectors (Official Gazette of the Republic of Slovenia, No. 13/06).

2.3. Financial instruments

The stock of and changes in financial assets and liabilities under the ESA 95 methodology are disclosed by individual financial instrument, and are equal on both the asset and the liability sides.

Financial instruments are divided into seven groups: monetary gold and Special Drawing Rights (SDRs) (F.1), currency and deposits (F.2), securities other than shares (F.3), loans (F.4), shares and other equity (F.5), insurance technical reserves (F.6) and other accounts receivable/payable (F.7) (ESA 95, p. 93).

Each individual financial instrument that a particular unit holds as a financial asset has a counterpart item in the liabilities of another unit, and vice versa. The only financial asset that does not have a counterpart in liabilities is F.1 (Monetary gold and SDRs).

Table 2

Classification of financial instruments

Code	Title of financial instrument
F.1	Monetary gold and SDRs (Special Drawing Rights)
F.2	Currency and deposits
F.21	Currency
F.22	Transferable deposits
F.29	Other deposits
F.3	Securities other than shares
F.33	Securities other than shares, excluding financial derivatives
F.331	Short-term debt securities
F.332	Long-term debt securities
F.34	Financial derivatives
F.4	Loans
F.41	Short-term loans
F.42	Long-term loans
F.5	Shares and other equity
F.51	Shares and other equity, excluding mutual fund shares
F.511	Quoted shares
F.512	Unquoted shares
F.513	Other equity
F.52	Mutual fund shares
F.6	Insurance technical reserves
F.61	Net equity of households in life insurance reserves and pension funds reserves
F.611	Net equity of households in life insurance reserves (Life insurance reserves)
F.612	Net equity of households in pension funds reserves (Pension funds reserves)
F.62	Prepayments of insurance premiums and reserves for outstanding claims (Other technical reserves)
F.7	Other accounts receivable/payable
F.71	Trade credits and advances
F.79	Other accounts receivable/payable, excluding trade credits and advances

Source: Financial Accounts of Slovenia 2003-2008; see p. 255.

2.4. Data sources of Slovenian financial accounts

Primary and secondary sources are used for the compilation of the financial accounts.

Primary sources:

- quarterly data (stocks and transactions) based on direct reporting by individual institutional units:
  - non-financial corporations (S.11): reporting threshold: balance sheet total of EUR 1 million;
  - financial corporations (S.12): reporting threshold: balance sheet total of EUR 1 million;
  - general government units (S.13): reporting threshold: balance sheet total of EUR 8 million.
- quarterly IIP (International Investment Position) and BOP (Balance of Payments) data;
- securities statistics.

Secondary sources:

- monetary and banking statistics;
- other financial institution statistics;
- public finance statistics.

Annual financial accounts have been compiled from 2001, and quarterly financial accounts from the first quarter of 2004.

3. The analysis of the financial accounts of Slovenia by institutional sectors

The analysis of the financial accounts of Slovenia is focused on the following sectors: non-financial corporations (S.11), financial corporations (S.12) and households (S.14) in the period from 2004 to 2009. In this studied period, Slovenia has joined the European Union, has successfully accepted the euro, has experienced financial and economic prosperity, and has engaged with financial and economic crisis. The purpose of the analysis is to show the analytical value of financial accounts statistics.

3.1. The international financial crisis and its impact on Slovenia

3.1.1. Background and causes

The present financial crisis is a crisis caused by an insolvent United States banking system. It is considered to be the worst financial crisis since the Great Depression of the 1930s. It has resulted in the collapse of large financial institutions, the bailout of banks by national governments and downturns in stock markets around the world (Wikipedia, 2010).

Before August 2007 no one thought that the financial system could collapse. Central banks were able to lend when needed, deposit insurance and investor protections made it possible to free individuals from worrying about the security of their wealth, regulators and supervisors watched over individual institutions and kept their managers and owners from taking on too much risk. Prosperity and stability were evidence that the system worked, inflation was low and growth was high (BIS 79th Annual Report, 2009, p. 3).

The financial system is based on trust, and in the wake of the Lehman Brothers failure in September 2008, that trust was lost. The lenders started to doubt the quality of loans, their insurance and the chance of repayment, and the investors started to doubt the long-term safety of their investments. The loss of trust in the financial system has caused a global financial crisis (BIS 79th Annual Report, 2009, p. 4). The crisis rapidly developed and spread into a global economic shock, resulting in a number of European bank failures, declines in various stock indices, and large reductions in the market value of equities and commodities (Wikipedia, 2010).

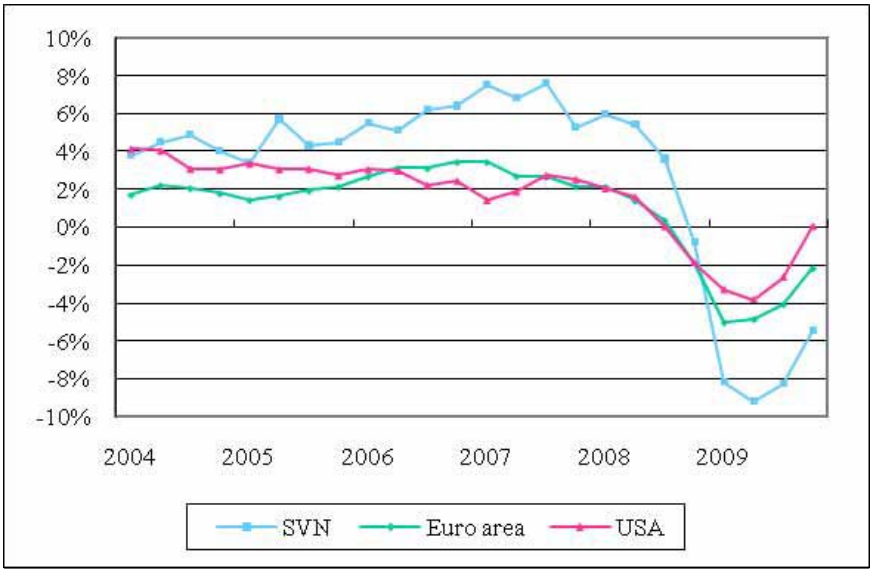
The impact of the financial crisis on the (real) economy was already noticeable in 2008, when the rapid stopping of economic growth was evident, followed by the crossing into negative territory (see Picture 3).

The annual GDP real growth rate has decreased from 2% in the middle of 2008 to over -4% in the middle of 2009 in the euro area, and a similar development has happened in the US. The turnabout was even greater in Slovenia, where, in the second quarter of 2009, GDP decreased by 9.3% compared to the second quarter of 2008. This was the third GDP volume decrease in a row and the deepest in the current economic crisis. In the first half of 2009, GDP decreased by 8.8% compared to the same period of 2008.

Picture 3

GDP growth rate in Slovenia, in the euro area and in the US from the first quarter of 2004 to the final quarter of 2009

(quarterly data, annual real growth rate in %)



Sources: SURS, ECB, BEA.

3.2. Reflection of the financial crisis on financial accounts in Slovenia

3.2.1. Non-financial corporations

Non-financial corporations had 20% of the total financial assets and 38% of the total liabilities in the financial accounts of Slovenia at the end of 2009. The financial assets of non-financial companies accounted for 131% of GDP, and liabilities for 250% of GDP.

Non-financial companies in the euro area had 15% of the total financial assets and 24% of the total liabilities in the financial accounts at the end of 2009. The financial assets of non-financial companies accounted for 179% of GDP, and liabilities for 276% of GDP in the euro area.

Table 3

Stock of financial assets and liabilities of non-financial corporations from 2004 to 2009

(EUR million)

S.11 *(EUR million)*	Code	2004	2005	2006	2007	2008	2009
I. FINANCIAL ASSETS		29,766	34,186	37,610	45,564	46,059	45,679
Currency and deposits	F.2	2,771	3,219	3,484	3,914	3,907	4,020
Loans	F.4	2,682	3,132	3,180	4,525	5,443	5,916
Shares and other equity	F.5	12,612	14,406	15,784	19,776	18,542	18,664
Other accounts receivable	F.7	10,776	12,594	14,258	16,473	17,387	16,271
II. LIABILITIES		56,551	62,984	71,305	87,946	86,959	87,320
Loans	F.4	15,611	18,465	20,920	27,398	33,348	33,431
Shares and other equity	F.5	30,079	31,345	35,543	43,292	35,705	36,385
Other accounts payable	F.7	10,511	12,651	14,332	16,664	17,201	16,527
III. NET FINANCIAL ASSETS		-26,785	-28,798	-33,696	-42,382	-40,900	-41,641

Source: Bank of Slovenia, Financial Accounts Statistics.

The financial assets of non-financial corporations amounted to EUR 45,679 million at the end of 2009, up 53% or EUR 15,913 million over the observation period of 2004 to 2009, the largest increase of EUR 7,954 million coming in 2007.

Investments in ***shares and other equity*** accounted for the largest proportion of non-financial corporations' assets at the end of 2009 (EUR 18,664 million or 41% of the total). This was up 48% over the observation period, the largest increase being recorded in 2007 (EUR 2,150 million of net purchases and EUR 1,842 million of positive revaluation changes), but there was actually a decline of EUR 1,233 million in 2008, with negative revaluation changes contributing EUR 2,671 million towards the decline. At the end of 2009 non-financial corporations' largest investments were in their own sector (73%, compared with 81% at the end of 2004) and in the rest of the world (19%, compared with 10% at the end of 2004). Investments in shares accounted for 42% of the total at the end of 2009, other equity for 57%, and mutual fund shares for 1%.

Other accounts receivable stood at EUR 16,271 million at the end of 2009 (36% of financial assets), and were up 51% over the observation period. Receivables from trade credits and advances accounted for the majority (83%) of other accounts receivable, of which 55% were intrasectoral (compared with 54% at the end of 2004), and 34% were from the rest of the world (the same as at the end of 2004). The favourable economic climate saw non-financial corporations increase their intrasectoral receivables (by EUR 1,322 million) and receivables from the rest of the world (EUR 530 million) in 2007, but in 2008 and 2009 the financial turmoil meant there was a decline of EUR 326 million.

Non-financial corporations' ***loans*** granted amounted to EUR 5,916 million (13% of financial assets) at the end of 2009. The largest proportion was made within the sector, the rest of the world and households accounting for the remainder. The amount of intercorporate lending increased in 2009 (to EUR 330 million, of which the majority was in the form of long-term

loans), while lending to non-resident corporations increased to EUR 209 million. There was an increase over the observation period in the proportions accounted for by borrowing by the rest of the world (from 15% at the end of 2004 to 27% at the end of 2009), while the proportion accounted for by non-financial corporations declined from 65% to 61%, and by households from 13% to 7%.

Non-financial corporations' ***currency and deposits*** stood at EUR 4,020 million at the end of 2009 (9% of financial assets); domestic banks accounted for almost all of this (94%). Currency and deposits increased by 45% over the observation period.

Non-financial corporations in the euro area had most financial assets in the form of shares and other equity (46%), other accounts receivable (21%), loans (18%) and currency and deposits (11%). In comparison with the euro area, a greater proportion of other accounts receivable (+15 pp) and smaller proportions of loans (-5 pp), shares and other equity (-5 pp), and currency and deposits (-2 pp) have been observed in the financial assets of non-financial companies in Slovenia.

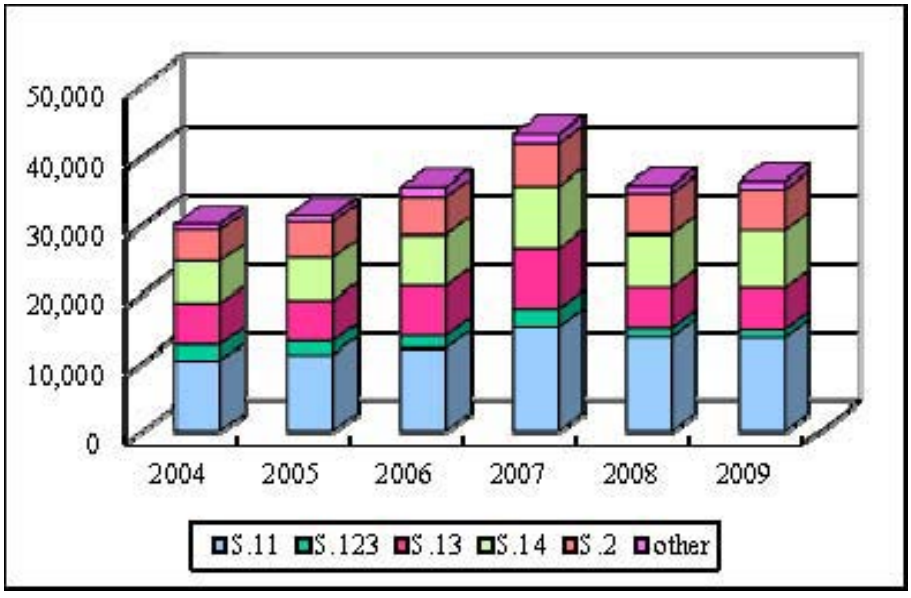
Non-financial corporations' total ***liabilities*** stood at EUR 87,320 million at the end of 2009, up EUR 30,769 million or 54% over the observation period, the largest increase of EUR 16,641 million coming in 2007.

Liabilities from ***shares and other equity*** amounted to EUR 36,385 million at the end of 2009 (42% of liabilities), up 21% (EUR 6,306 million) over the observation period, mostly as a result of positive revaluation changes (EUR 3,792 million). There was a decline of 18% or EUR 7,587 million in 2008 (as a result of negative revaluation changes). Public limited companies accounted for 45% of the total, with other forms of equity accounting for the remaining 55%. The largest holders of equity in non-financial corporations were non-financial corporations (37%), households (23%), the rest of the world (17%), general government (16%) and other financial intermediaries (3%).

Picture 4

Holders of equity in non-financial corporations by sectors from 2004 to 2009

(stock at year-end, EUR million)



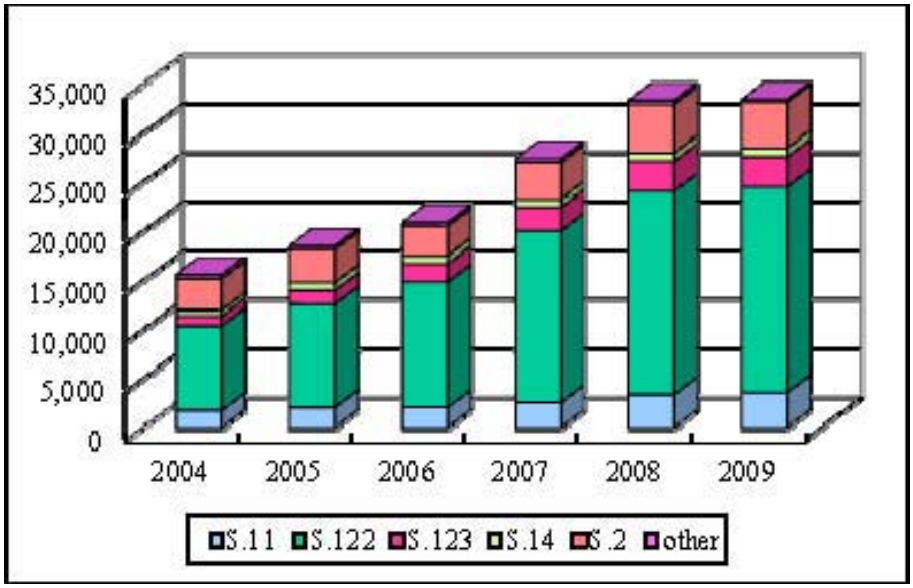
Source: Bank of Slovenia, Financial Accounts Statistics.

The stock of ***loans*** totalled EUR 33,431 million at the end of 2009 (38% of liabilities), up 114% or EUR 17,820 million over the observation period, the largest increase of EUR 6,479 million coming in 2007, primarily as a result of high economic growth, favourable interest rates and mergers and acquisitions activity. Liabilities from loans remained almost unchanged in 2009 relative to 2008, as a result of the financial turmoil and the resulting crisis in the real sector. Banks accounted for the largest proportion of non-financial corporations' liabilities from loans at the end of 2009 (63% of the total), followed by the rest of the world (14%), non-financial corporations (11%) and other financial intermediaries (9%).

Picture 5

Liabilities of non-financial corporations from loans by sectors from 2004 to 2009

(stock at year-end, EUR million)



Source: Bank of Slovenia, Financial Accounts Statistics.

The amount of intercorporate borrowing increased in 2009 (by EUR 330 million), followed by borrowing from banks (by EUR 211 million) and from other financial intermediaries (by EUR 151 million EUR), while borrowing from the rest of the world decreased (by EUR 404 million) (see Picture 6).

Issues of ***debt securities*** accounted for a negligible proportion of non-financial corporations' financing (1% of total liabilities at the end of 2009).

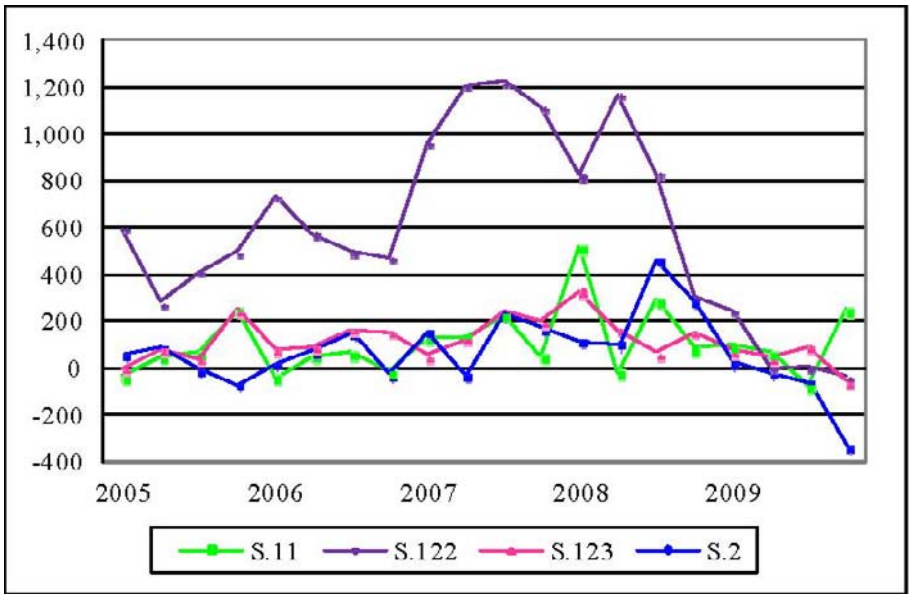
Other accounts payable totalled EUR 16,527 million at the end of 2009 (19% of total liabilities), and consisted primarily of trade credits and advances (75%), mostly to non-financial corporations (60%). Other accounts payable saw their largest increase, of EUR 2,332 million, in 2007, but declined by EUR 675 million in 2009 (for the first time in the observation period).

Non-financial corporations in the euro area had most of their liabilities in the form of shares and other equity (49%), loans (34%) and other accounts payable (12%). In comparison with the euro area, greater proportions of other accounts payable (+7 pp) and loans (+4 pp) and a smaller proportion of shares and other equity (-7 pp) have been observed in the liabilities of non-financial companies in Slovenia.

Picture 6

Liabilities of non-financial corporations from loans by sectors from 2005 to 2009

(quarterly transactions, EUR million)



Source: Bank of Slovenia, Financial Accounts Statistics.

The non-financial corporations sector recorded a deficit in financial assets relative to liabilities over the observation period, as a significant proportion of non-financial corporations' assets is in the form of non-financial assets. The deficit stood at EUR 41,641 million at the end of 2009 (EUR 26,785 million at the end of 2004), having declined in 2008 for the first time by EUR 1,482 million, primarily as a result of the effect of positive net revaluation changes in shares and other equity (EUR 5,806 million), but it again increased in 2009 (by EUR 741 million).

Non-financial corporations' intrasectoral financial claims and liabilities totalled EUR 25,764 million at the end of 2009, equivalent to 56% of their total financial assets, and 30% of their total liabilities.

The deficit in financial assets relative to liabilities of non-financial companies in Slovenia accounted for 119% of GDP at the end of 2009 (up 20 pp over the observation period), and in the euro area accounted for 97% of GDP (up 8 pp). Leverage in Slovenia, calculated as the ratio of debt[1] and capital, stood at 94% (+41 pp) and in the euro area at 75% (+9 pp). The debt of non-financial corporations relative to GDP in Slovenia accounted for 98% (+39 pp), and in the euro area for 102% (+20 pp). Debt relative to financial assets of non-financial companies in Slovenia amounted to 75% (+21 pp), and in the euro area to 57% (+3 pp). The data show that the financial situation of non-financial corporations in Slovenia deteriorated over the observation period as a result of increased borrowing and that their indebtedness was already higher than in the euro area at the end of 2009.

[1] Debt consists of debt securities (F.33) and loans (F.4).

3.2.2. Financial corporations

The financial corporations sector is subdivided into five subsectors (ESA 95, p. 25):

- the central bank (S.121);
- other monetary financial institutions (S.122);
- other financial intermediaries, except insurance corporations and pension funds (S.123);
- financial auxiliaries (S.124);
- insurance corporations and pension funds (S.125).

Table 4

Stock of financial assets and liabilities of financial corporations from 2004 to 2009

(EUR million)

S.12 *(EUR million)*	Code	2004	2005	2006	2007	2008	2009
I. FINANCIAL ASSETS		41,191	48,157	54,128	67,265	71,144	76,816
Currency and deposits	F.2	4,685	5,742	6,103	7,234	7,595	8,621
Securities other than shares	F.3	14,709	16,347	14,952	14,433	14,416	16,412
Loans	F.4	15,717	19,803	25,054	34,507	41,456	43,244
Shares and other equity	F.5	4,710	4,867	6,499	9,391	6,187	6,694
Insurance technical reserves	F.6	1,060	1,092	1,178	1,430	1,164	1,290
II. LIABILITIES		39,629	46,644	53,063	65,866	70,294	75,788
Currency and deposits	F.2	18,854	21,359	24,080	30,645	34,317	37,122
Securities other than shares	F.3	4,732	5,207	3,554	1,841	2,198	4,337
Loans	F.4	6,537	9,597	12,394	16,343	19,476	18,509
Shares and other equity	F.5	6,411	6,837	8,680	12,130	9,335	10,289
Insurance technical reserves	F.6	2,391	2,805	3,333	3,726	3,997	4,605
III. NET FINANCIAL ASSETS		1,562	1,513	1,064	1,398	850	1,028

Source: Bank of Slovenia, Financial Accounts Statistics.

Considering that other monetary financial institutions are the largest and most important subsector within financial corporations, and that the financial crisis has had a very important impact on banks, a detailed analysis only of this subsector will be presented.

3.2.2.1. Other monetary financial institutions

The subsector "other monetary financial institutions[2]" comprises commercial banks, savings banks and money market funds. There were 22 banks, three savings banks and two money market funds in Slovenia at the end of 2009.

Banks had 23% of the total financial assets and 22% of the total liabilities in the financial accounts of Slovenia at the end of 2009. Financial assets of banks accounted for 152% of GDP, and liabilities for 148% of GDP.

[2] The term "banks" is used in the material for the subsector "Other monetary financial institutions (S.122)".

Table 5

Stock of financial assets and liabilities of banks from 2004 to 2009

(EUR million)

S.122 *(EUR million)*	Code	2004	2005	2006	2007	2008	2009
I. FINANCIAL ASSETS		24,417	29,972	34,620	43,381	48,711	53,063
Currency and deposits	F.2	2,852	3,487	4,104	4,131	4,015	4,884
Securities other than shares	F.3	6,570	7,930	7,259	7,011	6,732	8,091
Loans	F.4	13,537	16,890	21,352	30,192	36,179	37,914
Shares and other equity	F.5	976	1,175	1,579	1,781	1,574	1,868
II. LIABILITIES		23,531	28,808	33,409	42,349	47,284	51,534
Currency and deposits	F.2	16,096	18,777	21,154	25,630	28,468	30,903
Securities other than shares	F.3	1,437	1,604	1,667	1,788	2,113	4,253
Loans	F.4	3,504	5,833	7,520	10,651	12,468	11,714
Shares and other equity	F.5	2,270	2,360	2,714	3,911	3,906	4,336
III. NET FINANCIAL ASSETS		886	1,164	1,212	1,032	1,427	1,530

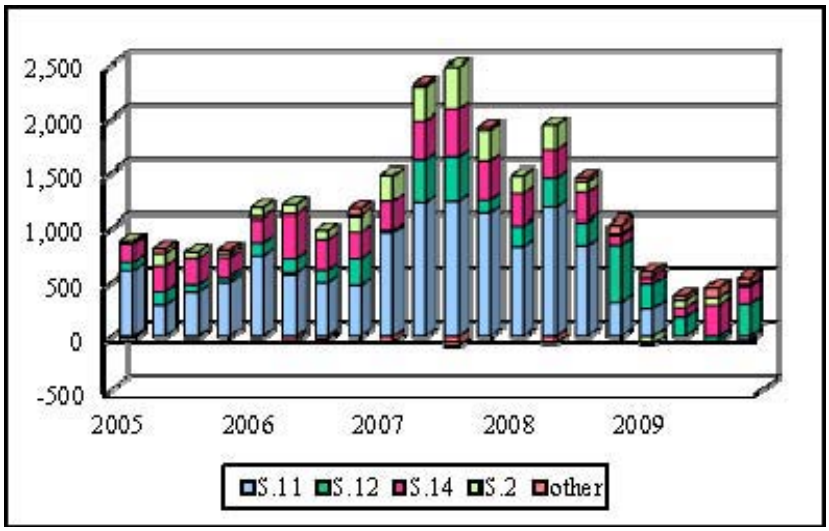
Source: Bank of Slovenia, Financial Accounts Statistics.

The ***financial assets*** of banks stood at EUR 53,063 million at the end of 2009, up 117% or EUR 28,646 million over the observation period, the largest increase of EUR 8,761 million coming in 2007.

Picture 7

Claims of banks from loans by sectors from 2005 to 2009

(quarterly transactions, EUR million)



Source: Bank of Slovenia, Financial Accounts Statistics.

Bank ***loans*** stood at EUR 37,914 million at the end of 2009, up 180% over the observation period, the largest increase of EUR 8,840 million coming in 2007 (the largest increases were recorded by loans to non-financial corporations (EUR 4,699 million or 37%), loans to

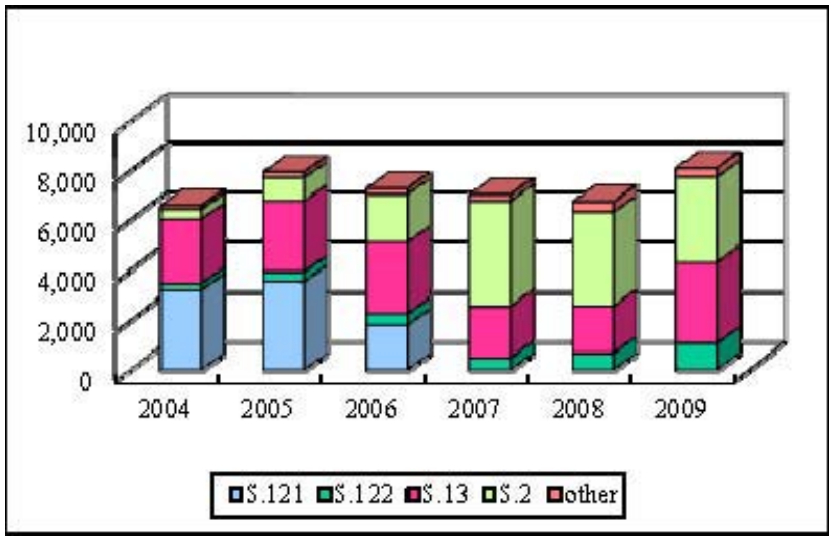
households (EUR 1,413 million of 26%) and loans to the rest of the world (EUR 1,304 million), while the increase in 2008 compared to 2007 reached 68%, but was still higher than in 2006. Loans granted increased only EUR 1,735 million in 2009, which indicates decreasing lending activity (as a result of higher uncertainty in financial markets and reduced demand for savings transmission between loss-making sectors and excess supply sectors). At the end of 2009 banks held their largest stocks of loans with non-financial corporations (55%) and households (22%).

Banks held investments in ***debt securities*** in the amount of EUR 8,091 million at the end of 2009, primarily foreign securities (42%, compared with 6% at the end of 2004) and government securities (40%, compared with 39% at the end of 2004). Investments in debt securities increased by 20% in 2009, and by 23% over the observation period. Banks held EUR 1,815 million of claims from central bank bills at the end of 2006, but the introduction of the euro in 2007 meant that they were replaced by investments in foreign debt securities. Investments in government debt securities and in intrasectoral securities increased in 2009 (by EUR 1,320 million and EUR 393 million, respectively), while investments in foreign debt securities declined (by EUR 310 million).

Picture 8

Claims of banks from securities other than shares by sectors from 2004 to 2009

(stock at year-end, EUR million)



Source: Bank of Slovenia, Financial Accounts Statistics.

Banks held EUR 4,884 million of ***currency and deposits*** at the end of 2009, of which 59% was with the rest of the world (compared with 43% at the end of 2004), 30% was with the central bank (43% at the end of 2004), and 10% with domestic banks (14% at the end of 2004). Banks' currency and deposits increased by 71% over the observation period, declined for the first time by 3% during 2008 (a decline in deposits in the rest of the world, and an increase in deposits at the central bank), but again increased by 22% during 2009 (an increase in deposits in the rest of the world, at the central bank, and intrasectoral deposits).

Banks' ***liabilities*** stood at EUR 51,534 million at the end of 2009, up 9% at the end of 2008, and up EUR 28,003 million or 119% over the observation period, the largest increase of EUR 8,940 million coming in 2007.

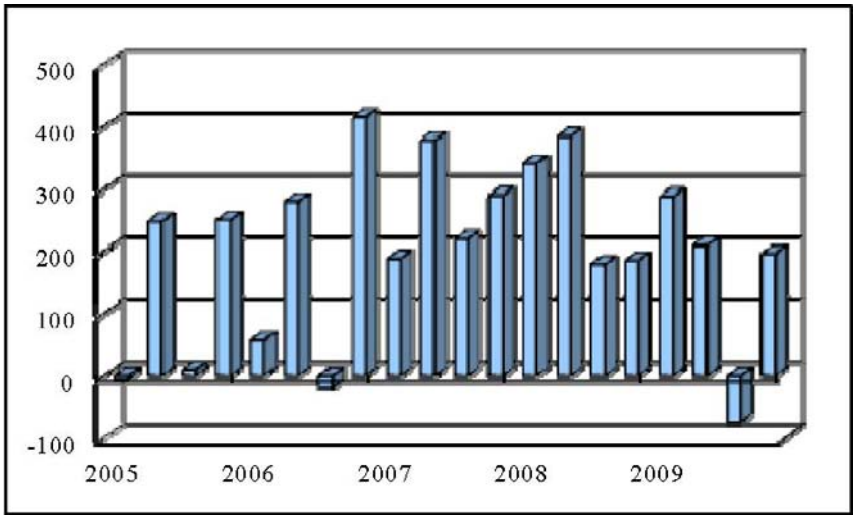
The stock of ***deposits*** in banks stood at EUR 30,903 million at the end of 2009, up 9% or EUR 2,435 million during 2009, and up EUR 14,807 million or 92% over the observation

period, the largest increase of EUR 4,476 million coming in 2007. The largest deposits in banks at the end of 2009 were held by households (45% of the total, compared with 61% at the end of 2004), followed by the rest of the world (17%, compared with 9% at the end of 2004) and non-financial corporations (12%, compared with 16% at the end of 2004). The largest increases in 2009 were recorded by general government deposits (EUR 2,058 million; an increase in non-transferable deposits), central bank deposits (EUR 885 million; increased liquidity injection into the banking system), and household deposits (EUR 642 million), and the largest decline was recorded by the rest of the world (EUR 1,448 million).

Picture 9

Liabilities of banks to households from deposits from 2005 to 2009

(quarterly transactions, EUR million)



Source: Bank of Slovenia, Financial Accounts Statistics.

Banks' liabilities from ***loans*** totalled EUR 11,714 million at the end of 2009, down 6% or EUR 754 million for the first time during 2009, and EUR 8,210 million or 234% over the observation period. Loans raised in the rest of the world accounted for the largest proportion of banks' loans at the end of 2009 (79% of the total, of which 81% was from members of the EMU), while the proportion of intersectoral borrowing also increased in 2009 (to 21% at the end of the year, compared with 1% at the end of 2004).

Funding from the rest of the world via deposits and loans in 2008 (EUR 1,434 million) was just 32% of that recorded in 2007, an indication that this source of funding was being closed, and in 2009, the rest of the world stopped funding domestic banks.

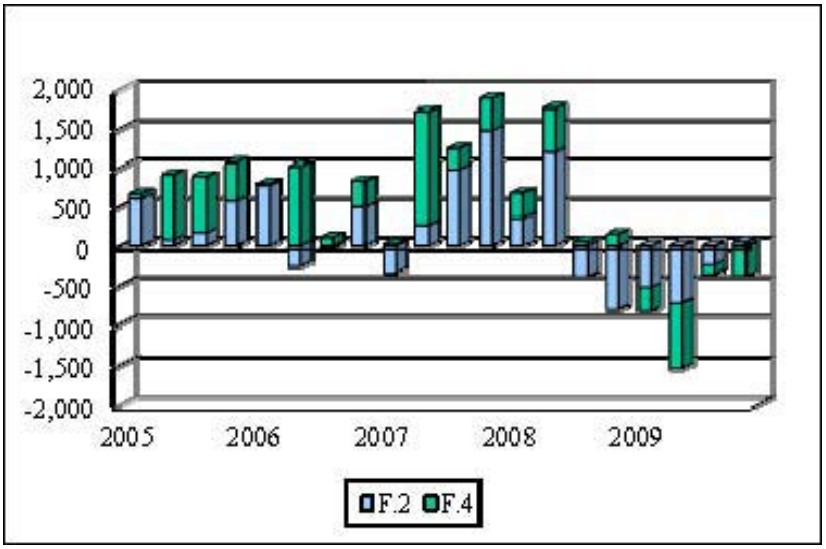
Banks had EUR 4,336 million of liabilities from ***shares and other equity*** at the end of 2009. Liabilities from unquoted shares were up EUR 434 million in 2009, while liabilities from quoted shares remained almost unchanged during 2009. The largest holder of equity in banks at the end of 2009 was the rest of the world, which accounted for 35% of the total (compared with 28% at the end of 2004), followed by the general government sector (27%, compared with 32% at the end of 2004) and non-financial corporations (20%).

Banks' liabilities from issued debt securities totalled EUR 4,253 million at the end of 2009, up 101% during 2009, and up EUR 2,816 million or 196% over the observation period. The investors in debt securities as at the end of 2009 were the rest of the world (53%, compared with 16% at the end of 2004), banks (25%, compared with 18% at the end of 2004) and insurance corporations and pension funds (12%, compared with 22% at the end of 2004).

Picture 10

Liabilities of banks to the rest of the world from deposits and loans from 2005 to 2009

(quarterly transactions, EUR million)



Source: Bank of Slovenia, Financial Accounts Statistics.

Banks had a surplus of financial assets over liabilities of EUR 1,530 million at the end of 2009. The largest surplus was vis-à-vis non-financial corporations (EUR 17,293 million), while the largest deficits were vis-à-vis the rest of the world (EUR 8,283 million) and households (EUR 5,785 million).

Banks' intrasectoral financial claims and liabilities totalled EUR 4,239 million at the end of 2009, equivalent to 8% of their total financial assets/liabilities.

As in the euro area, financial accounts data for the central bank and other monetary financial institutions are not separate. Slovenia will be compared with the euro area at the level of monetary financial institutions (S.121 and S.122).

The financial assets of monetary financial institutions in Slovenia stood at EUR 60,506 million and their liabilities stood at EUR 58,570 million at the end of 2009, which represented 26% of the total financial assets and 25% of the total liabilities in the financial accounts of Slovenia. In the euro area, monetary financial institutions had 31% of the total financial assets and 30% of the total liabilities in the euro area financial accounts at the end of 2009.

The financial assets of monetary financial institutions in Slovenia accounted for 173% of GDP (361% in the euro area), and liabilities stood at 168% of GDP (352% in the euro area), which indicates a lesser deepness of financial intermediation in Slovenia.

In Slovenia, the share of financial assets of monetary financial institutions in the financial assets of all financial corporations stood at 79%; in the euro area the figure was 63%, which shows the relatively greater importance of monetary financial institutions in Slovenia.

Monetary financial institutions in Slovenia had most investments in loans (63%), debt securities (21%) and currency and deposits (12%), and the largest liabilities from currency and deposits (63%), loans (20%) and shares and other equity (9%). Monetary financial

institutions in the euro area had the largest proportion of their financial assets in loans (39%), currency and deposits (29%), debt securities (21%) and shares and other equity (6%), and the largest proportion of their liabilities from currency and deposits (70%)[3], debt securities (17%), shares and other equity (9%) and other accounts payable (4%).

A comparison with the euro area shows that monetary financial institutions in Slovenia had on the financial assets side a higher proportion of loans (+24 pp) and smaller proportions of currency and deposits (-17 pp) and shares and other equity (-3 pp), and on the liabilities side a higher proportion of loans (+20 pp) and lower proportions of debt securities (-10 pp) and currency and deposits (-7 pp).

3.2.3 Households

Households had 17% of the total financial assets and 5% of the total liabilities in the financial accounts of Slovenia at the end of 2009. The financial assets of households accounted for 113% of GDP, and liabilities for 33% of GDP.

Households in the euro area had 17% of the total financial assets and 6% of the total liabilities in the financial accounts at the end of 2009. Financial assets of households accounted for 202% of GDP, and liabilities for 72% of GDP in the euro area.

Table 6

Stock of financial assets and liabilities of households from 2004 to 2009

(million EUR)

S.14 *(EUR million)*	Code	2004	2005	2006	2007	2008	2009
I. FINANCIAL ASSETS		25,673	27,824	31,508	36,877	36,347	39,274
Currency and deposits	F.2	12,807	14,011	15,228	16,887	19,229	20,528
Securities other than shares	F.3	741	468	459	444	436	445
Shares and other equity	F.5	8,234	8,645	10,497	13,621	10,298	11,335
Insurance technical reserves	F.6	1,867	2,280	2,746	3,167	3,390	3,912
Other accounts receivable	F.7	1,407	1,547	1,751	1,914	2,094	2,121
II. LIABILITIES		5,666	6,772	8,004	9,940	11,070	11,662
Loans	F.4	4,432	5,417	6,714	8,537	9,609	10,208
Other accounts payable	F.7	1,233	1,355	1,290	1,403	1,461	1,454
III. NET FINANCIAL ASSETS		20,007	21,052	23,504	26,938	25,277	27,612

Source: Bank of Slovenia, Financial Accounts Statistics.

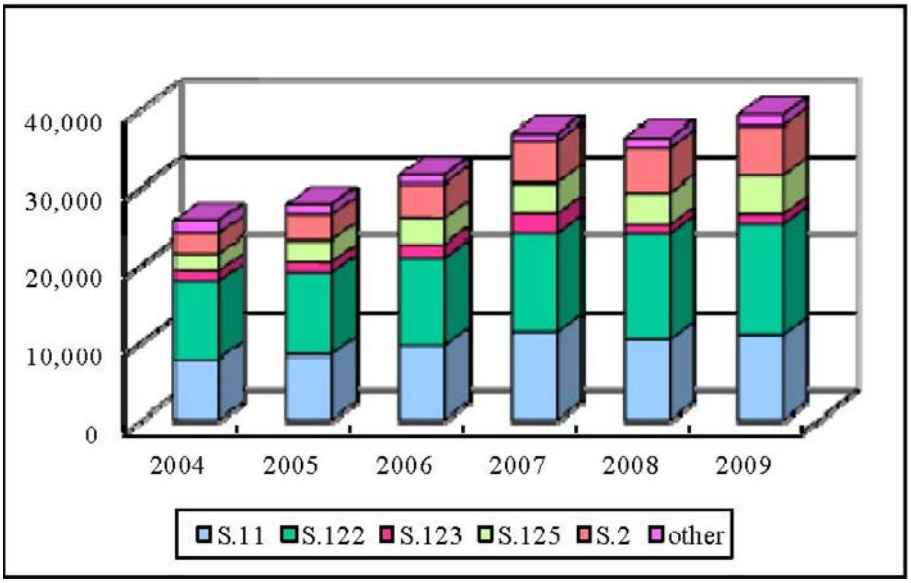
The ***financial assets*** of households amounted to EUR 39,274 million at the end of 2009, up EUR 13,601 million or 53% over the observation period, the largest increase of EUR 5,369 million coming in 2007.

[3] In the euro area, the financial accounts liabilities of monetary financial institutions from loans are recorded among deposits.

Picture 11

Financial assets of households by sectors from 2004 to 2009

(stock at year-end, EUR million)



Source: Bank of Slovenia, Financial Accounts Statistics.

Households held EUR 20,528 million of ***currency and deposits*** at the end of 2009, 52% of their total financial assets, of which currency accounted for 29% (compared with 19% at the end of 2004), and deposits for 71% (compared with 81% at the end of 2004).

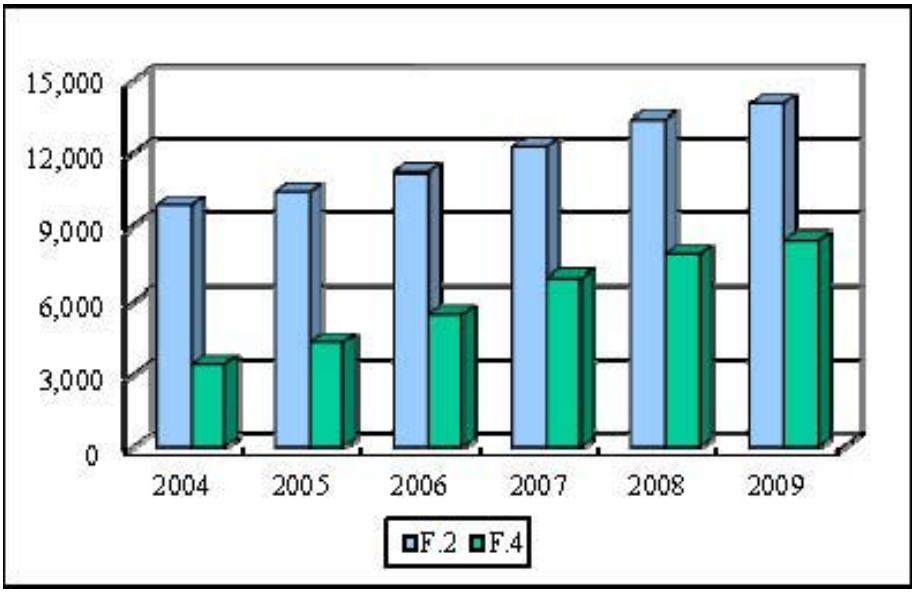
Claims from currency amounted to EUR 5,875 million at the end of 2009, up 140% or EUR 3,423 million over the entire period, an average increase of 23% each year, the largest increase coming in 2008 (EUR 1,121 million). The proportion of households' financial assets accounted for by currency increased from 10% at the end of 2004 to 15% at the end of 2009. The rest of the world accounted for 88% or EUR 5,181 million of households' claims from currency at the end of 2009 (compared with 73% or EUR 1,779 million at the end of 2004), this figure consisting of estimated holdings of currency at home. It is estimated that a portion of the currency has been converted into other instruments, mostly investments in real estate, particularly in Croatia, transfers to relatives in the rest of the world, and investments in foreign securities bypassing domestic brokers. Claims from currency from the central bank amounted to EUR 655 million at the end of 2009 (11% of the total claims from currency). The figure increased by EUR 188 million in 2009, households' demand for currency rising because of the uncertain conditions on the financial markets.

Claims from deposits stood at EUR 14,653 million at the end of 2009, 37% of households' total financial assets, up 42% or EUR 4,298 million over the entire period, an average increase of 7% each year. The largest increases in deposits were recorded in 2007 (EUR 1,142 million) and 2008 (EUR 1,221 million). The proportion of financial assets accounted for by deposits ranged from 35% to 40% over the observation period. The majority of households' deposits were held by domestic banks (93%).

Picture 12

Claims of households from currency and deposits and liabilities from loans to the banks from 2004 to 2009

(stock at year-end, EUR million)



Source: Bank of Slovenia, Financial Accounts Statistics.

At the end of 2009 households held EUR 11,335 million in ***shares and other equity***, 29% of their total financial assets. These investments increased by EUR 3,101 million over the entire period, the largest increase being recorded in 2007 (EUR 560 million of net purchases and EUR 2,564 million of positive revaluation changes), but the largest decline being recorded in 2008 (EUR 245 million of net sales and EUR 3,078 million of negative revaluation changes). Households realised EUR 1,303 million of net purchases over the observation period, comprising increases in investments in other equity (of EUR 445 million), domestic and foreign mutual funds (of EUR 259 million) and mutual pension funds (of EUR 589 million), and an increase in investments in shares (of EUR 9 million). Non-financial corporations accounted for 74% of households' investments at the end of 2009 (compared with 66% at the end of 2007), investment funds for 11% (19% at the end of 2007), mutual pension funds for 9% and the rest of the world for 4%.

Insurance technical reserves accounted for 10% of households' total financial assets and stood at EUR 3,912 million at the end of 2009, up EUR 522 million on 2009, and up 110% or EUR 2,045 million over the observation period. Life insurance reserves accounted for 53% of the total insurance technical reserves at the end of 2009, pension funds reserves for 28% and other technical reserves for 19%. Households' claims were primarily from domestic insurance corporations and pension companies (98%).

Other accounts receivable stood at EUR 2,121 million at the end of 2009, or 5% of households' total financial assets, up EUR 714 million over the observation period. The majority of other accounts receivable were from non-financial corporations (78%) and the general government sector (14%).

Households in the euro area had most of their financial assets in the form of currency and deposits (36%), insurance technical reserves (30%), shares and other equity (23%) and debt securities (8%) at the end of 2009. Compared with the euro area, households in Slovenia had a greater proportion of investments in currency and deposits (+16 pp) and shares and

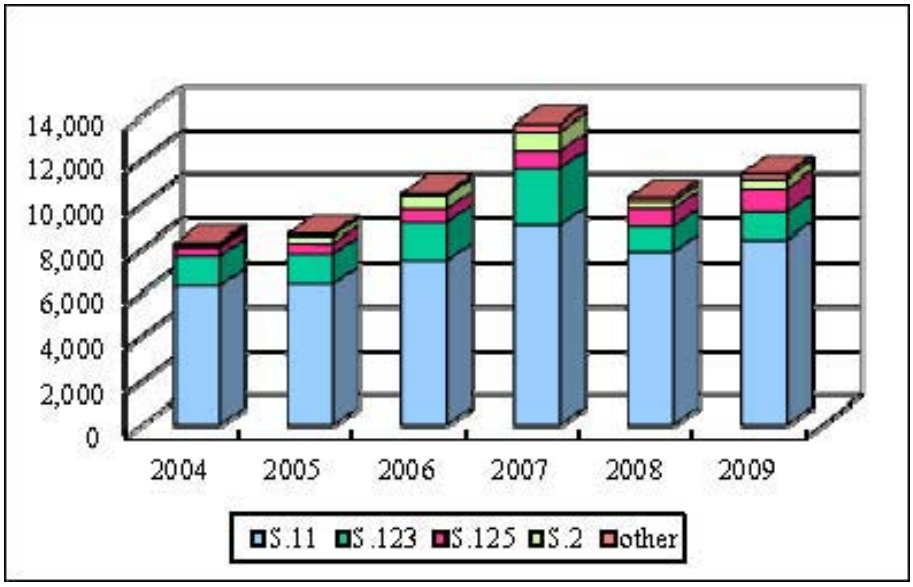
other equity (+6 pp), at the expense of smaller shares of investment in insurance technical reserves (-20 pp) and debt securities (-7 pp).

Households' ***liabilities*** totalled EUR 11,662 million at the end of 2009, up 5% or EUR 593 million on the end of 2008, and up 106% or EUR 5,997 million over the observation period, the largest increase coming in 2007 (24% or EUR 1,936 million). At the end of 2009 banks accounted for 72% of households' liabilities, other financial intermediaries for 12% and non-financial corporations for 11%.

Picture 13

Investments by households in shares and other equity from 2004 to 2009

(stock at year-end, EUR million)



Source: Bank of Slovenia, Financial Accounts Statistics.

Loans taken amounted to EUR 10,208 million at the end of 2009, accounting for 88% of all household liabilities (compared with 78% at the end of 2004). This figure was up 130% or EUR 5,776 million over the observation period, an average increase of 17% each year, the largest increase coming in 2007 (EUR 1,823 million or 27%). The increase in 2008 was EUR 1,072 million, and in 2009 EUR 599 million (evident slowdown in borrowing). Domestic banks (83%, compared with 77% at the end of 2004) and other financial intermediaries (12%) accounted for the majority of household loans taken at the end of 2009, of which 86% was in the form of long-term loans.

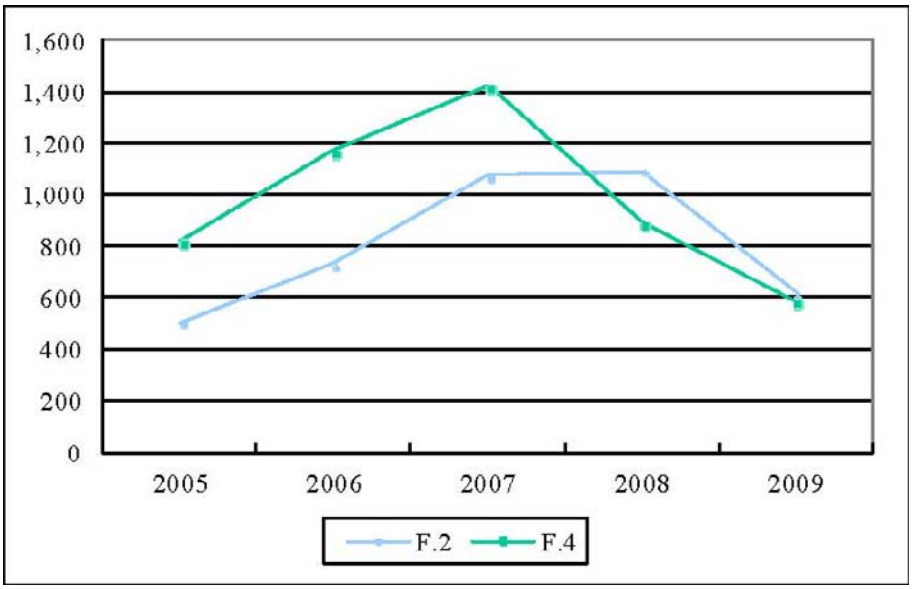
Loans taken from banks increased by EUR 2,591 million between the end of 2005 and the end of 2007, but deposits at banks by just EUR 1,804 million. The loans taken increased by EUR 891 million in 2008, just 63% of the increase in 2007, while the increase in deposits at banks was at the level seen in 2007 (for EUR 1,090 million). The loans taken increased by EUR 584 million in 2009 (41% of the increase in 2007), while the increase in deposits at banks was at the level of the loans taken (for EUR 619 million).

Households' ***other accounts payable*** stood at EUR 1,454 million at the end of 2009, or 12% of the total liabilities, up EUR 221 million over the entire period. Non-financial corporations accounted for the majority (63%) of households' other accounts payable, and the general government sector for 14%.

Picture 14

Claims of households from currency and deposits and liabilities from loans to banks from 2005 to 2009

(transactions, EUR million)



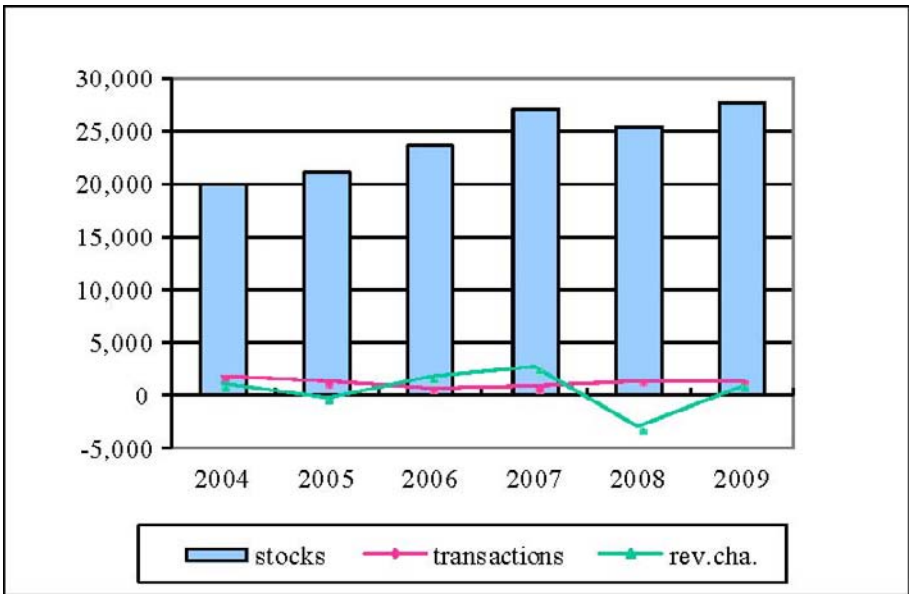
Source: Bank of Slovenia, Financial Accounts Statistics.

Households in the euro area had most of their liabilities in the form of loans (89%) at the end of 2009, which is similar to that of Slovenia.

Picture 15

Net financial assets of S.14

(stocks, transactions and revaluation changes, EUR million)



Source: Bank of Slovenia, Financial Accounts Statistics.

Households recorded a surplus of financial assets over liabilities during the observation period. The surplus increased by EUR 7,605 million or 38% over the observation period to stand at EUR 27,612 million at the end of 2009. The largest increase was recorded in 2007 (EUR 3,433 million), but there was a decline of EUR 1,661 million in 2008 (EUR 1,403 million of positive net transactions, and EUR 3,064 million of negative revaluation changes), followed by an increase of EUR 2,335 million in 2009 (EUR 1,396 million of positive net transactions, and EUR 939 million of positive revaluation changes). At the end of 2009 households held the largest surpluses vis-à-vis non-financial corporations (EUR 9,633 million, primarily from shares and other equity), the rest of the world (EUR 6,410 million, primarily from estimated holdings of currency) and banks (EUR 5,785 million).

The surplus of financial assets relative to liabilities of households in Slovenia accounted for 79% of GDP at the end of 2009 (up 5 pp over the observation period), and in the euro area accounted for 129% of GDP (down 2 pp). The debt of households in Slovenia stood at 29%, and in the euro area at 65% of GDP. Debt relative to financial assets of households in Slovenia accounted for 26% and in the euro area for 32%. The data show that the worse financial situation of households in Slovenia was a result of lower disposable financial assets; however, households' indebtedness in Slovenia was lower than in the euro area.

4. Conclusion

Financial accounts statistics in Slovenia have developed only in recent years, so knowledge of them is rather limited. The purpose of this paper is to contribute to a better understanding of financial accounts statistics and encourage the use of financial accounts for analytical purposes. Financial accounts give us a comprehensive picture of the financial linkages within the economy and with the rest of the world and can help us analyse the past, monitor the present and foresee the future.

With this paper I wanted to demonstrate, using an example from the latest economic crisis, the usefulness of the financial accounts of Slovenia for financial analysis and the management of economic policy. As is evident from the paper, the economic crisis is visible in all presented sectors.

The financial assets of non-financial corporations stood at EUR 45,679 million (56% to non-financial companies and 23% to the rest of the world) and liabilities accounted for EUR 87,320 million (30% to non-financial companies, 25% to banks and 17% to the rest of the world) at the end of 2009. Over the observation period non-financial companies invested within sectors (50%) and in the rest of the world (33%), but were financed by banks (47%), by their own sector (28%) and by the rest of the world (16%). The deficit of non-financial corporations increased by EUR 14,856 million over the observation period, to EUR 41,641 million at the end of 2009. The analysis showed that the financial situation of non-financial corporations deteriorated because of the increased borrowing and lower financial assets.

The financial assets of banks stood at EUR 53,063 million (42% to non-financial companies, 19% to the rest of the world and 16% to households) and liabilities accounted for EUR 51,534 million (35% to the rest of the world and 28% to households) at the end of 2009. Over the observation period banks invested in non-financial corporations (44%), in the rest of the world (27%) and in households (17%) and reduced their investments in the central bank, but were financed by the rest of the world (43%) and by households (16%). The rest of the world represented a major source of financing for banks in the period from 2004 to 2009 (an increase of EUR 9,708 million), but in 2008 the impact of the financial crisis was already evident, as funding from abroad reached only 32% of funding in 2007. The share of external liabilities in all liabilities of banks declined from 41% at the end of 2007 to 35% at the end of

2009. Banks began to deleverage in the rest of the world in the third quarter of 2008. The deleveraging of banks in the rest of the world has been partly replaced by government, central bank and intrasectoral funding.

The financial assets of non-financial corporations stood at EUR 39,274 million (36% to banks and 28% to non-financial companies) and liabilities accounted for EUR 11,662 million (72% to banks) at the end of 2009. Over the observation period households invested in the rest of the world (36%) and in banks (36%), but were financed by banks (80%). Households recorded a surplus of financial assets over liabilities during the observation period, which means that households continue to fund other sectors. The largest increase in the surplus was recorded in 2007 (by EUR 3,433 million), but there was a decline in 2008 for the first time (by EUR 1,661 million, mainly as a result of lower financial assets due to a fall in the prices of securities), followed by an increase (by EUR 2,335 million) in 2009. Analysis showed that the worse financial situation of households in Slovenia was a result of lower disposable financial assets; however, households' indebtedness in Slovenia was lower than in the euro area.

Appendix

Classification of sectors and subsectors

The Slovenian economy (S.1) consists of resident institutional units.

Non-financial corporations (S.11) are market producers whose principal activity is the production of goods and non-financial services.

The central bank (S.121) is the Bank of Slovenia.

Other monetary financial institutions (S.122) comprise commercial banks, savings banks and money market funds.

Other financial intermediaries except insurance corporations and pension funds (S.123) comprise:

- mutual funds;
- investment companies (ICs);
- management companies;
- corporations engaged in financial leasing;
- corporations engaged in factoring (trading in claims).

Financial auxiliaries (S.124) include:

- brokerage houses;
- exchange offices;
- institutions providing financial market infrastructure services (e.g. KDD – the Central Securities Clearing Corporation);
- stock exchanges (Ljubljana Stock Exchange).

Insurance corporations and pension funds (S.125) comprise:

- insurance and reinsurance corporations;
- mutual pension funds;
- pension companies.

Central government (S.1311) includes:

- direct state budget spending units (non-governmental, governmental and judicial spending units);
- indirect budget spending units (public institutes and agencies) at state level;
- public funds at state level;
- the Slovene Compensation Fund (SOD).

Local government (S.1313) comprises:

- municipalities;
- regional authorities;
- public funds at municipal level;
- indirect budget spending units at local level.

Social security funds (S.1314) comprise:

- the Health Insurance Institute (ZZZS);
- the Pension and Disability Insurance Institute (ZPIZ);
- Kapitalska Družba (pension fund manager; KAD).

The household sector (S.14) consists of private individuals and sole traders.

Non-profit institutions serving households (S.15) include societies, political parties, trade unions, clubs, associations, religious communities and humanitarian organisations.

The rest of the world (S.2) consists of non-resident units, and comprises S.21 (EU) and S.22 (Others outside the EU). The EU comprises EU Member States, divided into the countries of the EMU (S.2111) and other EU members (S.2112).

Classification of financial instruments

Category F.1 Monetary gold and SDRs comprises:

- Monetary gold, which is gold held as a component of international reserves by monetary authorities or by others subject to the effective control of the authorities;
- SDRs (Special Drawing Rights), which are international reserve assets created by the International Monetary Fund and allocated to its members to supplement existing reserve assets.

As a rule F.1 is a financial asset of the central bank (S.121). A feature of F.1 is that no institutional unit or sector discloses a liability deriving from the instrument. Only in transactions is the counterpart item disclosed on the side of financial assets of the rest of the world (S.2) in the same amount as it is disclosed by the central bank (S.121), but with a negative sign.

Category F.2 Currency and deposits consists of three subcategories of financial instruments:

- Subcategory F.21 Currency consists of notes and coins that are commonly used to make payments, and comprises notes and coins in circulation issued by resident monetary authorities and notes and coins in circulation issued by non-resident monetary authorities held by residents. All sectors may hold F.21 as a financial asset. F.21 represents a liability of the unit that issued it (generally the central bank).
- Subcategory F.22 Transferable deposits consists of sight deposits in domestic or foreign currency. Transferable deposits can be converted into currency or transferred by cheque, banker's order, debit entry or the like, without any kind of significant restriction or penalty. F.22 also includes deposits between monetary financial institutions (such as deposits that other monetary financial institutions hold with the central bank to satisfy compulsory reserve requirements). All sectors may hold F.22 as a financial asset. Liabilities deriving from F.22 are disclosed as a rule by monetary financial institutions (S.121 and S.122) and by the rest of the world (S.2).
- Subcategory F.29 Other deposits consists of deposits that cannot be used to make payments at any time and are not convertible into currency or transferable deposits without any kind of significant restriction or penalty. Other deposits comprise:
  - fixed-term deposits;
  - savings deposits;
  - certificates of deposit that are non-negotiable, or whose negotiability, while theoretically possible, is very limited;

- repo transactions (repurchase agreements) that are liabilities of monetary financial institutions;
- repayable margin payments related to financial derivatives that are liabilities of monetary financial institutions;
- deposits resulting from a savings scheme or contract;
- evidence of deposits issued by savings and loan associations, building societies, credit unions and the like;
- claims against and liabilities to the International Monetary Fund;
- other deposits not included in subcategory F.22.

All sectors may hold F.29 as a financial asset. Liabilities deriving from F.29 are disclosed as a rule by monetary financial institutions (S.121 and S.122) and by the rest of the world (S.2).

Category F.3 Securities other than shares consists of:

- F.33 Securities other than shares (debt securities), excluding financial derivatives, and is further subdivided into:
  - F.331 Short-term debt securities, which are securities with an original maturity of one year or less, and comprise:
    - treasury bills and other short-term securities issued by the general government;
    - short-term bills of exchange (own bills, commodity bills, drawn bills, drafts);
    - bills;
    - commercial paper;
    - negotiable certificates of deposit;
    - bankers' acceptances.
  - F.332 Long-term debt securities, which are securities with an original maturity of more than one year, and comprise:
    - bonds;
    - floating rate notes (FRNs);
    - other debt securities with an original maturity of more than one year.
- F.34 Financial derivatives comprises:
  - options, tradable and over-the-counter (OTC);
  - standardised futures, provided that they have a market value because they are tradable or can be offset;
  - swaps, provided that they have a market value because they are tradable or can be offset;
  - forward rate agreements, provided that they have a market value because they are tradable or can be offset;
  - warrants. Warrants are a special form of tradable option.

All sectors may hold F.3 as a financial asset. F.3 is generally liabilities of non-financial corporations (S.11), financial corporations (S.12), general government (S.13) and the rest of the world (S.2).

Category F.4 is divided into two subcategories:

- F.41 Short-term loans consists of loans with an original maturity of one year or less;
- F.42 Long-term loans consist of loans with an original maturity of more than one year.

Category F.4 Loans consists of all types of loans created when creditors lend funds to debtors, either directly or through brokers, that are either evidenced by non-negotiable documents or not evidenced by documents. The initiative concerning a loan normally lies with the borrower. F.4 also includes loans to finance trade credits, leasing, repurchase agreements, and repayable margin payments related to financial derivatives when these agreements and payments are liabilities of corporations that are not monetary financial institutions. F.4 does not include trade credits or advances. All sectors may hold F.4 as a financial asset and liability.

Category F.5 Shares and other equity comprises:

- F.51 Shares and other equity, excluding mutual fund shares, which comprise:
  - F.511 Quoted shares, namely equity securities quoted on the domestic market or a foreign market;
  - F.512 Unquoted shares, namely equity securities not quoted on the domestic market or a foreign market;
  - F.513 Other equity, namely equity that is not in the form of shares.
- F.52 Mutual fund shares, which comprise:
  - shares in investment companies;
  - investment coupons registered to one or more units of a mutual fund;
  - mutual pension fund units.

All sectors may hold F.51 as a financial asset. F.51 is generally liabilities of non-financial corporations (S.11), financial corporations (S.12) and the rest of the world (S.2). Exceptionally, individual units of general government (S.13) may hold a liability in F.51.

All sectors may hold F.52 as a financial asset. Money market funds (S.122), investment companies and mutual funds (S.123), mutual pension funds (S.125) and the rest of the world (S.2) may hold liabilities in F.52.

Category F.6 Insurance technical reserves comprises the insurance technical reserves of insurance corporations and pension funds against policyholders and beneficiaries, and is divided into two basic subcategories of financial instruments:

- F.61 Net equity of households in life insurance reserves and in pension funds reserves, which is further subdivided into:
  - F.611 Net equity of households in life insurance reserves, comprising:
    - net life insurance provisions;
    - net provisions for life insurance policies where the investment risk is borne by the policyholder;
  - F.612 Net equity of households in pension funds reserves, which consists of provisions deriving from pensions.
- F.62 Prepayments of insurance premiums and reserves for outstanding claims, which consists of:
  - net prepayments of insurance premiums;
  - net provisions for bonuses, rebates and cancellations;

– net reserves for outstanding claims;

– equalisation reserves;

– other net insurance technical reserves.

F.611 may be financial assets of households (S.14) as policyholders, and liabilities of insurance corporations (S.125).

F.612 may be financial assets of households (S.14) as policyholders, and is generally a liability of pension funds (S.125).

F.62 may be financial assets of all sectors as policyholders (prepayments of insurance premiums) or beneficiaries (reserves for outstanding claims), and is generally a liability of insurance corporations and pension funds (S.125).

Those who are obliged to report and who create insurance technical reserves report the net technical reserves for the instrument of insurance technical reserves as a liability of the reporter, and allocate them as liabilities to individual sectors/subsectors as policyholders or beneficiaries (e.g. liabilities to households, liabilities to non-financial corporations).

Category F.7 Other accounts receivable/payable consists of:

- F.71 Trade credits and advances, which consists of financial claims or liabilities arising from the direct extension of credit by suppliers and buyers for goods and services transactions, and advance payments for work that is in progress or to be undertaken and associated with such transactions. F.71 includes all as-yet-unpaid claims and liabilities deriving from goods and services. F.71 may be financial assets or liabilities for all sectors;
- F.79 Other accounts receivable/payable, excluding trade credits and advances consists of all other claims and liabilities arising from timing differences between transactions and payments made in respect of taxes, social contributions, wages, rents, dividends, interest and transactions in financial assets on the secondary market. F.79 may be financial assets or liabilities for all sectors.

As a rule accrued interest is included in the instrument to which the interest relates (e.g. interest on deposits is included in F.2, interest on loans is included in F.4, and interest on securities is included in F.3). However, should it be impossible to include the interest in the relevant instrument, it is disclosed in F.79.

References and sources

1. BIS 79th Annual Report (April 2008 – March 2009). (2009). Basel: BIS.
2. Euro area accounts. ECB Statistical Data Warehouse. (http://sdw.ecb.europa.eu/quickview.do?SERIES_KEY=119.ESA.Q.I5.S.0000.B1QG00.1000.TT TT.L.U.R)
3. European System of Accounts 1995 (ESA 95). (1996). Luxembourg: Eurostat.
4. Financial Accounts of Slovenia 2003-2008. (2009). Ljubljana: Bank of Slovenia.
5. Financial Accounts. Bank of Slovenia. (http://www.bsi.si/en/publications.asp?MapaId=923)
6. Gross Domestic Product. Statistical office of the Republic of Slovenia (http://www.stat.si/eng/indikatorji.asp?ID=12)
7. Gross Domestic Product. U.S. Department of Commerce. (http://www.bea.gov/national/index.htm#gdp)

Compilation and analysis of Taiwan's household debt statistics

Huei-Jung Fang[1]

1. Introduction

As clearly illustrated in the U.S. subprime mortgage crisis, where the problems of a relatively small portion of the home mortgage market triggered the most severe financial crisis in the United States since the Great Depression, the financial system is adversely affected by the weakness in the household sector's debt repayment ability. Given the significant implications of household indebtedness for financial stability, proper understanding and assessment of household indebtedness are crucial.

In the past decades, the household sector has played an increasingly important role in the financial system in Taiwan. Household loans extended by all banks as a percentage of total loans of the banking system have significantly risen, to 46.0% as of March 2010 from 40.2% at end-2000. At the same time, loans to private enterprises as a percentage of total loans have stagnated at around 40%, and loans to government agencies have decreased by 6.5%.

For policymakers, the concern is whether financial stability is affected by greater household indebtedness. By observing the recent development of household debt and the early warning indicators, we probe into the core issues behind the increase in household borrowing. This paper looks at Taiwan's household debt situation and analyzes the potential threats likely to have an adverse impact on its credit quality. Finally, we present the government's recently adopted policies, designed to take preemptive actions against these problems in order to maintain financial stability.

This paper is organized as follows. Section Two introduces the compilation of Taiwan's household debt statistics. Section Three describes household debt quality and its implications for financial stability. Section Four discusses the potential threats of household debt. Section Five presents the government's policy measures. Section Six concludes the paper.

2. Compilation of Taiwan's household debt statistics

Household debt[2] is composed of loans extended by financial institutions and loans by non-financial institutions. In Taiwan, loans by financial institutions account for more than 95% of household debt, as depicted in Figure 1. The financial institutions that are allowed to extend loans to households include commercial banks, community financial institutions, postal savings institutions, insurance companies, securities companies, and investment and trust

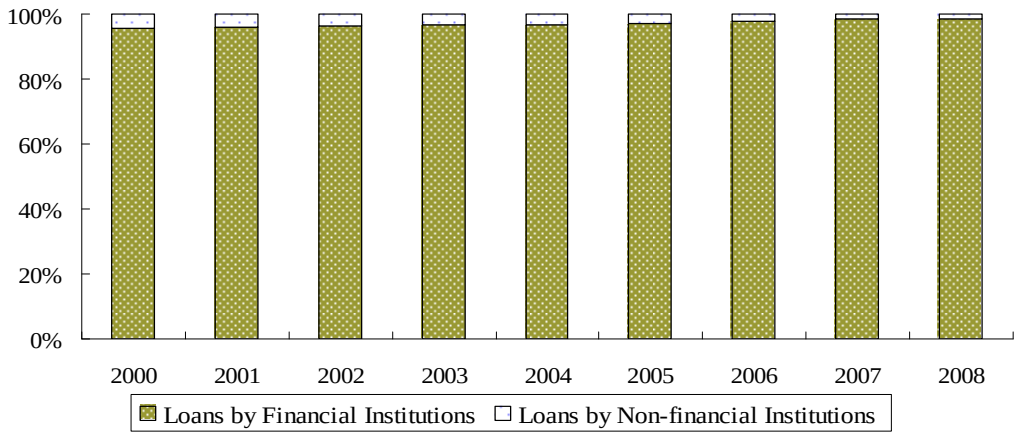
---

[1] Department of Economic Research, Central Bank of the Republic of China (Taiwan) (CBC). The views expressed in this paper are those of the author and not necessarily those of the Central Bank of the Republic of China (Taiwan).

[2] Household debt includes loans to households and non-profit institutions. Households consist of individuals in general, including self-employed individuals, as well as individuals engaged in farming, forestry, fishing, animal husbandry and other sideline occupations. The term non-profit institutions refers to those engaged in social welfare and cultural activities, such as charitable institutions, trade unions, private schools, and welfare institutions annexed to various organizations.

companies. Among these, commercial banks account for the majority of the financial sources of household debt. The statistical information comes from the financial statistics, which are compiled on a monthly basis by the CBC after receiving the financial data prepared and submitted by the various financial institutions.

Figure 1: Sources of Household Debt

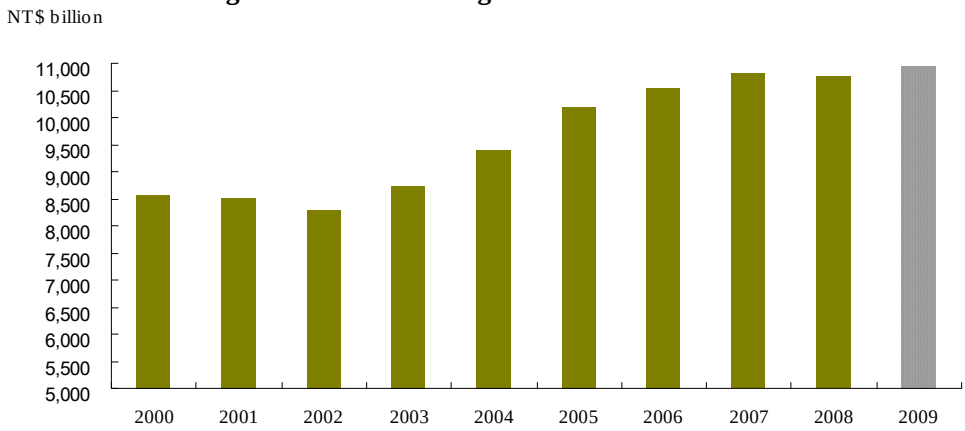


Source: Flow of Funds Statistics, CBC.

Loans by non-financial institutions refer to loans extended by the government and by public and private enterprises. The data sources for loans by non-financial institutions are from annual surveys on financial conditions of the government and of public and private enterprises, which are conducted by the Economic Research Department of the CBC.

Figure 2 shows the outstanding household debt between 2000 and 2009. Since 2000, the piling up of household debt in Taiwan slowed as the housing market turned into a recession and banks' lending attitude became conservative due to a build-up of non-performing loans. Total household debt began a steady rise in 2003, due to falling interest rates, the extension of the government's preferential mortgage programs, and active expansion of consumer finance activities by banks. As of end-2009, outstanding household debt had reached NT$10.95 trillion.

Figure 2: Outstanding Household Debt



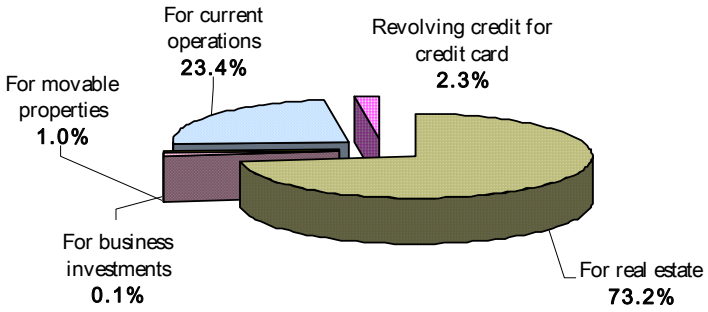
Note: Household debt in 2009 is the author's estimate.
Source: Flow of Funds Statistics, CBC.

Taiwan's household debt is presented in the Flow of Funds Report on a yearly basis. Since most of the total household debt is extended by all banks, whose statistical information is

compiled on a monthly basis, we can look at the loans by all banks to gain an instant understanding of the development of total household debt.

For households, housing investment has been the major motive for borrowing. According to the monthly financial statistics for the first quarter of 2010, the biggest share of household loans extended by all banks went to the purchase of real estate[3] (73.2%), followed by working capital loans[4] (23.4%) and revolving balances of credit cards (2.3%) (Figure 3).

Figure 3: The Purpose of Household Loans by All Banks in Q1 2010

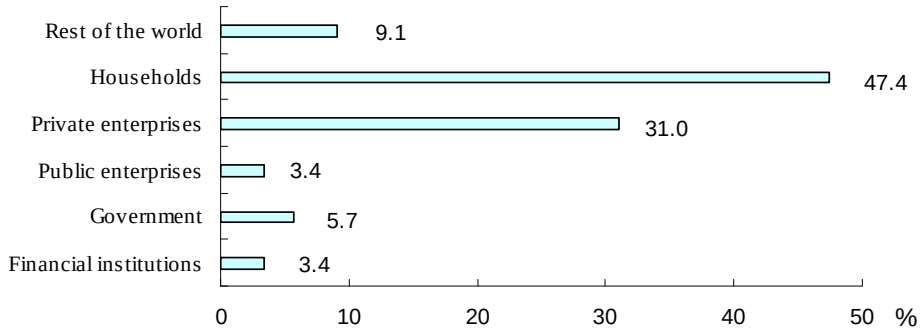


Source: Financial Statistics Monthly, CBC.

3. Household debt quality and its implications for financial stability

Household loans make up the largest portion of loans extended by financial institutions, representing 47.4% of the total as of end-2008 (Figure 4). Therefore, the quality of household debt is crucial to banks' performance and financial stability. For this reason, policymakers should pay greater attention to the growing household debt.

Figure 4: Loans by Financial Institutions in 2008, by Sector



Source: Financial Statistics Monthly, CBC.

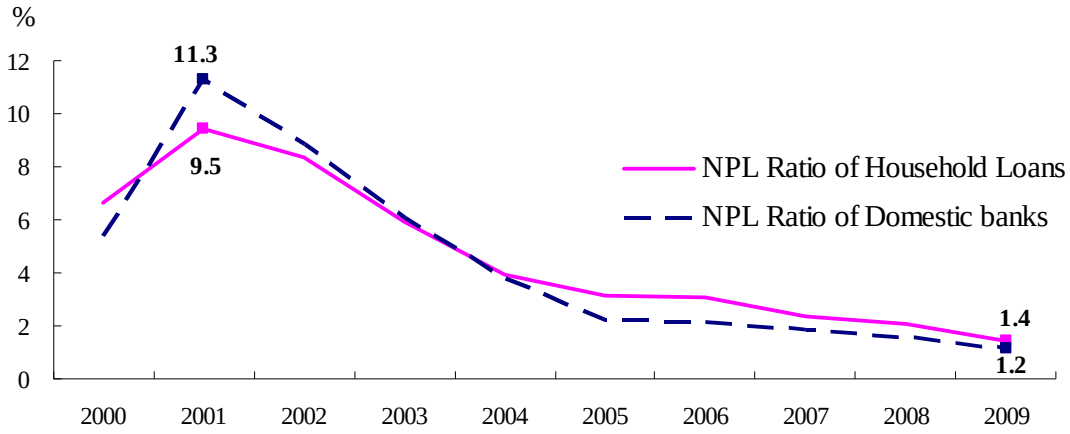
[3] Includes loans for purchasing premises and fixed assets. Loans for construction and house repair and improvement are also included.

[4] Includes loans for purchasing material and paying overhead costs. Other small loans and loans to individuals for financing their own business are also included.

Figure 5 shows the non-performing loan (NPL) ratio of household loans, which is defined as non-performing loans of households divided by total household loans. The ratio reflects the quality of household debt. The burst of the global IT bubble in 2001 adversely impacted Taiwan's export sector, weakened domestic demand and created more cyclical unemployment.[5] The rising unemployment rate and the poor state of the economy imposed strains on the housing markets, causing housing prices to remain at their lowest levels during 2001, as depicted in Figure 6.

Since more than 70% of household debt goes to the purchase of real estate, a serious slump in the housing market resulted in a rising NPL ratio of household loans, peaking at 9.5% at end-2001. To prevent falling house prices from hampering economic and financial stability, the government actively adopted measures to restrain supply and stimulate demand in the housing market.[6] Since these measures gradually began to take effect, the housing market has been on an upturn since the second half of 2003. At the same time, the global economy also continued its recovery. Therefore, the NPL ratio of household loans has declined, reaching its lowest level, 1.4%, at end-2009.

Figure 5: NPL Ratio of Household Loans and Domestic Banks



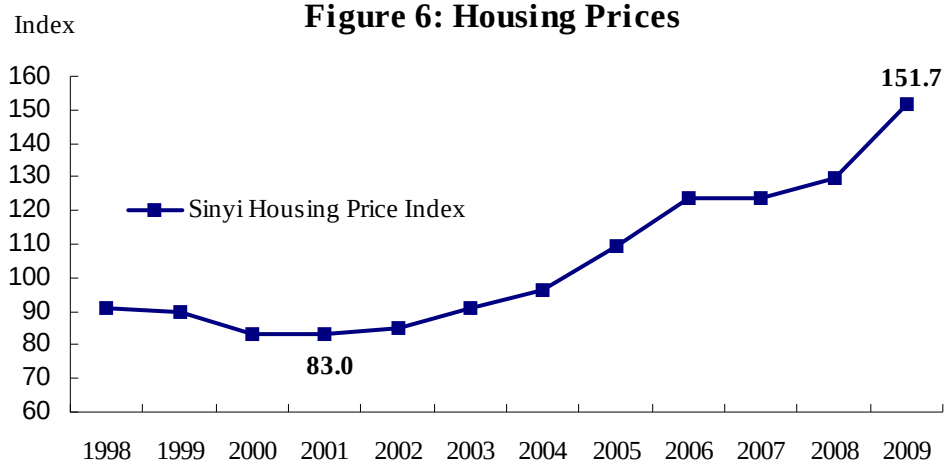
Sources: 1. Calculated by the author based on the Monthly Credit Statistics from the Joint Credit Information Center.
2. Financial Statistics Monthly, CBC.

1. NPL ratio of household loans= non-performing household loans/household loans×100.
2. Beginning Jan. 1993, the figures include the data of DBUs, OBUs and overseas branches of domestic banks and medium business banks, but exclude the data of Agricultural Bank of Taiwan. Beginning Dec. 2001, the figures represent the broadly defined NPL ratios released by Financial Suervisory Commission, which include loans under surveillance.

[5] Due to the shift of production base overseas, especially to low-cost China, by Taiwanese businesses, structural unemployment has risen since 1996.

[6] For example, the government provided interest subsidies for home buyers to encourage financial institutions to make preferential housing loans.

Figure 6: Housing Prices



Source: Sinyi Realty Inc.
Sinyi Housing Price Index is released by Sinyi Realty Inc., showing the housing prices in the secondary market.

4. The potential threats of household debt

A previous study[7] (2010) by the author uses the error correction model to analyze the influence of leading factors on the quality of Taiwan's household debt under the life-cycle model, with a default option developed by Lawrence (1995). The leading factors include housing price, unemployment rate, interest rate, and household debt to GDP ratio.

That study found that housing price has a negative effect on the NPL ratio of household loans, while the remaining factors have a positive effect. In what follows, we will take a closer look at the leading factors and see whether the potential threats to the credit quality of household borrowing can be mitigated at an early stage.

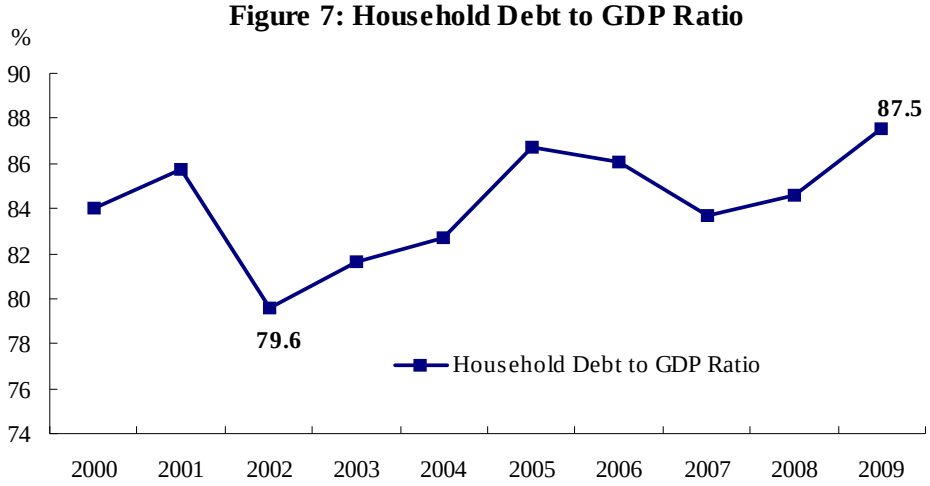
A. The rise in the household debt to GDP ratio indicates a warning of over-expansion in banks' lending to households.

The ratio of household debt to GDP, which is one of the financial soundness indicators published by the IMF, is a measure of the relative development of the financial and real sides of the economy. A higher ratio indicates that the financial side is expanding faster than the real side of the economic system. Overly rapid expansion of household debt tends to impair asset quality and thus worsen the credit quality of household borrowing.

As depicted in Figure 7, the household debt to GDP ratio went up dramatically, to 86.7% at end-2005 from 79.6% at end-2002, then slowed to 83.7% at end-2007. After the global financial crisis, the housing market regained its growth momentum; thus the household debt to GDP ratio rose again, reaching a high of 87.5% at end-2009. Figure 8 shows that the growth in household debt has been driven mainly by the purchase of real estate since 2003. Given the alarming surge in the household debt to GDP ratio, it might be time for policymakers to pay more attention to banks' household lending policies.

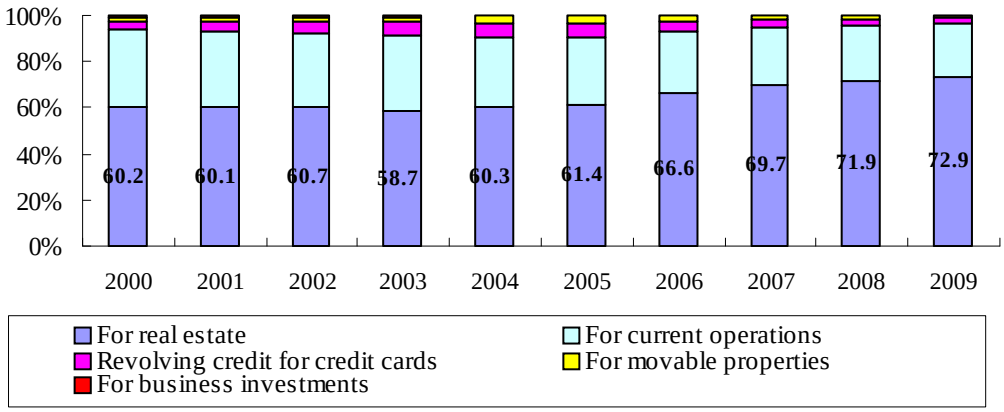
[7] "Household Indebtedness and Its Implications to Financial Stability in Taiwan," January 2010. This paper is part of the SEACEN research project.

Figure 7: Household Debt to GDP Ratio



Sources: Flow of Funds Statistics, CBC; National Income in Taiwan, Directorate-General of Budget, Accounting and Statistics (DGBAS).
Household debt to GDP ratio in 2009 is the author's estimate.

Figure 8: Household Loans Extended by All Banks, by Purpose



Source: Financial Statistics Monthly, CBC.

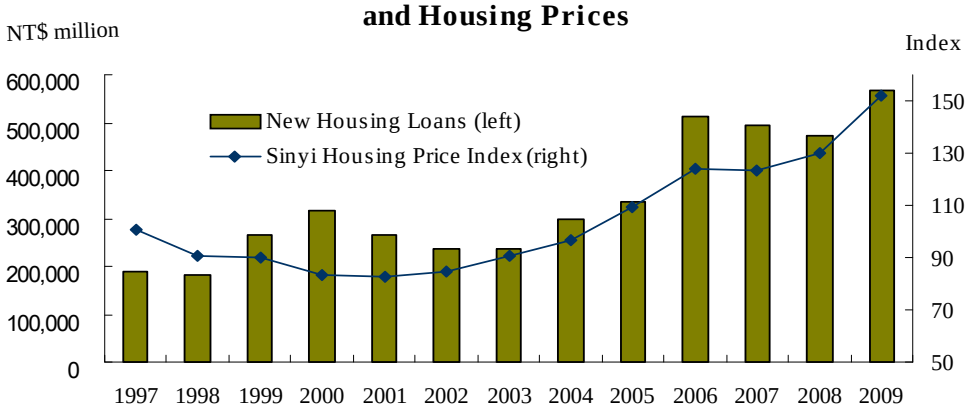
B. A gradually forming housing bubble in some metropolitan areas is a potential threat.

As mentioned earlier, residential mortgage loans account for the largest share of household borrowing. In addition, the main growth momentum of household debt in the past few years came from the purchase of real estate. Therefore, the performance of the housing market in Taiwan has a great impact on the quality of household debt.

As depicted in Figure 9, beginning in 2003 new housing loans increased and housing prices went up, mainly due to government measures aiming to boost the housing market. However, impacted by the financial crisis in the second half of 2008, the housing market cooled down.

After a series of interest rate cuts and stimulus measures[8] adopted by the government to bolster the real estate market, the housing market began to rebound.

Figure 9: New Housing Loans by Five Leading Banks and Housing Prices



Source: Financial Statistics Monthly, CBC; Sinyi Realty Inc.

The potential problem for the housing market in Taiwan is that housing prices in some metropolitan areas, such as Taipei City, are too high to be affordable for the general public. Some metropolitan areas might be experiencing a housing bubble, fueled by the repatriation of funds by overseas Taiwanese businesspeople and rampant property speculation on expectations of further trade liberalization across the Taiwan Strait.

Property speculators usually take advantage of the 2- to 3-year grace period, during which the borrowers pay the interest, but not the principal, to increase their leverage. For example, for a monthly repayment of NT$25,000 (around one-third of households' disposable income per month) during the grace period, one could afford a house priced at over NT$20 million, instead of a house priced at around NT$6.3 million through installment payments of both principle and interest, assuming 80% loan-to-value ratio, 20-year maturity and a 1.67% mortgage interest rate. Therefore, even though the growth in the salaries of a majority of the public has failed to keep pace with the surge in property prices, housing prices still continue rising.

Rising housing prices added to the cost burden on home buyers. The average mortgage burden[9] and the housing price to annual income ratio hit highs of 28.2% and 7.1, respectively, in the second half of 2009. The cost burden was heaviest in Taipei City, where the mortgage burden and the housing price to annual income ratio stood at 36.1% and 9.1, respectively.

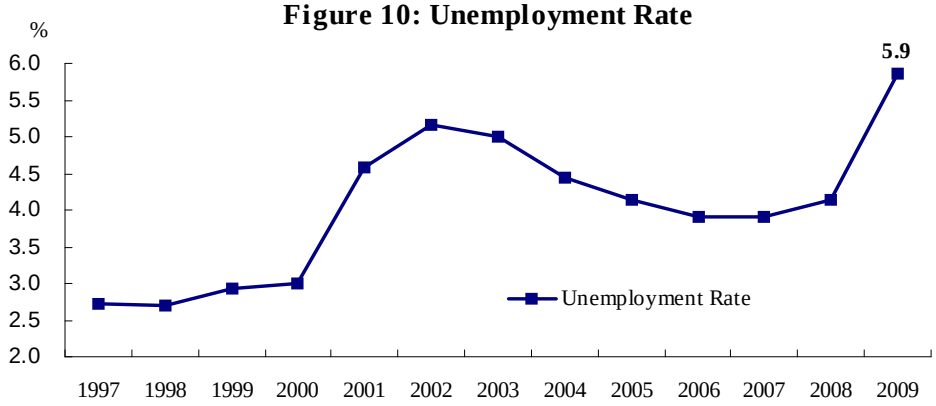
[8] These stimulus measures included extending the expiration date of construction license permits, offering additional preferential mortgage loans for home buyers, and opening the local real estate market to investors from China.

[9] Mortgage burden = monthly mortgage repayment / household monthly income.

C. High unemployment rates and future interest rate hikes may cause additional pressure on the credit quality of household borrowing.

Taiwan's unemployment rate has gradually risen since the second half of 2008 due to the global financial crisis. The average unemployment rate reached a record 5.9% at end-2009 (Figure 10). Higher unemployment rates would weaken households' ability to repay debt.

Figure 10: Unemployment Rate



Source: DGBAS.

On the other hand, starting in September 2008, the CBC continuously lowered the discount rate, to 1.25% from 3.625%, in order to help boost domestic demand. However, as the economy gradually recovered, the CBC raised the discount rate by 12.5 basis points, to 1.375% in June 2010, the first interest rate hike since February of last year. Rising interest rates would increase the interest payment pressures on borrowers and thus the probability of defaults.

5. Government policies

Since October 2009, the government has made a series of efforts to rein in the overheated property market by tightening credit for property speculators. The increase in real estate speculation has boosted the housing prices in some major metropolitan areas like Taipei City and in some specific regions, constituting a major threat to the credit quality of household borrowing, with the added potential of increasing the credit risk faced by banks in the future. Because the surge in housing prices was limited to certain major metropolitan areas, the CBC decided to adopt selective credit control measures to curb property speculation.

In October 2009, the CBC actively urged banks to closely monitor mortgage-lending risks. In March 2010, the CBC asked banks to reduce loan-to-value ratios, raise interest rates, and remove grace periods related to loans for investment purposes. Furthermore, in April 2010, the central bank conducted a round of financial examinations of local banks, requesting that they submit reports on their loan packages for property speculators, including the amount of loans, the loan-to-value ratio and loan interest rates, in a bid to rein in skyrocketing housing prices. Home loan interest rates should reflect the cost and risk of capital, so the CBC is keeping an eye on local mortgage lenders to see if they offer unreasonably low interest rates to borrowers.

In June 2010, the CBC announced the Regulations Governing the Extension of Housing Loans in Specific Areas by Financial Institutions, to enhance risk management for real estate loans in order to ensure the sound development of the housing market. It stipulated that financial institutions extending new loans to borrowers who have taken out other outstanding housing loans against collateral located in the Specific Areas[10] shall:

1. Approve loans not exceeding 70% of the value of the collateral,
2. Remove grace periods, and
3. Grant no additional loans against the same collateral for home renovations, as working capital, or for other purposes.

Moreover, to create employment opportunities, the government adopted some expansionary fiscal policies to promote domestic demand, and introduced the 2008-2009 Short-Term Employment Promotion Program, which aimed to provide approximately 46,000 and 56,000 job openings in 2008 and 2009, respectively. Moreover, the 2009-2012 Employment Promotion Program is expected to add 50,000 employment opportunities per year from 2009 to 2012 and to effectively reduce the unemployment rate.

6. Conclusion

The quality of household debt is crucial to banks' performance and financial stability. Household loans in Taiwan make up the largest portion of loans extended by all banks, constituting 46.0% of the total as of March 2010. Hence, proper understanding and assessment of household indebtedness is crucial for financial stability.

The rise in the household debt to GDP ratio indicates a warning that banks' lending to households has expanded too much. The household debt to GDP ratio went up dramatically, to 86.7% at end-2005 from 79.6% at end-2002, then slowed to 83.7% at end-2007. After the global financial crisis, the housing market resumed its growth momentum, which contributed to a rise in Taiwan's household debt and, in turn, to a further rise in the household debt to GDP ratio, which reached 87.5% at end-2009.

The performance of the housing market in Taiwan has a great impact on the quality of household debt. More than 70% of household loans extended by all banks go to the purchase of real estate. Loans by all banks account for the majority of the sources of household debt.

A housing bubble formed gradually in some metropolitan areas, like Taipei City and some specific regions, posing a potential threat to the credit quality of household borrowing and thus increasing the credit risk faced by banks. Given the impact of the global financial crisis in the second half of 2008, the CBC cut the discount rate continuously to boost domestic demand. In addition, Taiwan's government also provided some stimulus measures aimed at underpinning the real estate market. Since the second quarter of 2009, the housing market has begun to rebound, and strong demand for real estate has boosted housing prices. Some metropolitan areas could currently be experiencing a housing bubble.

Since October 2009, the government has made a series of efforts to rein in the overheated property market by tightening credit for property speculators. Because the housing price surge seemed to occur mostly in major metropolitan areas, the CBC adopted selective credit control measures to curb property speculation. In addition, in order to create employment

[10] Specific Areas prescribed in the Regulations include Taipei City and 10 other cities in Taipei County, covering Banciao, Sanchong, Jhonghe, Yonghe, Sinjhuang, Xindian, Tucheng, Lujhou, Shulin, and Sijhih.

opportunities, the government introduced the Short-Term Employment Promotion Program and adopted some expansionary fiscal policies to promote domestic demand.

References

Huei-Jung Fang (2010), “Household Indebtedness and Its Implications to Financial Stability in Taiwan,” unpublished paper, January.

James Bullard, Christopher J. Neely, and David C. Wheelock (2009). “Systemic Risk and the Financial Crisis: A Primer,” Federal Reserve Bank of ST. Louis Review, September/October, pp. 403-417.

Emily C. Lawrance (1995), “Consumer Default and the Life Cycle Model,” Journal of Money, Credit and Banking, Vol. 27/4, part 1, November, pp. 939-954.

Laura Rinaldi and Alicia Sanchis-Arellano (2006), “Household Debt Sustainability What Explains Household Non-Performing Loans?,” Working Paper Series, European Central Bank, No. 570, pp. 9-43.

Peter Ping-Yao Chang and Yeo-Ru Tsai (2003), Quarterly Bulletin, Central Bank of the Republic of China (Taiwan), Vol. 25/4, December, pp. 31-64.

Yen Chrystal Shih and Chu-Ming Tsao (2004), “Household Debt in Taiwan–Trend and Policy Responses,” Quarterly Bulletin, Central Bank of the Republic of China (Taiwan), Vol. 26/3, September, pp. 1-11.

ECB statistics on insurance corporations and pension funds

Ana Cláudia Gouveia and Rafael Quevedo[1]

Introduction

Non-bank financial intermediaries have rapidly increased in importance in the euro area over the past 15 years. Among these, two sub-sectors – investment funds, and insurance corporations and pension funds (ICPF) – play an important role, as reflected by the steady growth of their balance sheet totals. Both sectors are now covered by enhanced statistics. The former is described in an ECB Monthly Bulletin article (please refer to ECB, 2010a). This paper presents the statistics for the latter sub-sector, developed by the ECB in close cooperation with the euro area National Central Banks (NCBs). These statistics are being developed under a "short-term approach" based on available data sources, mostly supervisory authorities, ie without implementing new data collection from reporting agents, and with the main objective of setting up a framework for timely quarterly estimates of euro area statistics.

1. Importance of euro area insurance corporations and pension funds

Euro area insurance corporations and pension funds (ICPF) are important investors in the financial markets. They account for 12% of the financial assets of the euro area financial sector (end-2009 data) and have significant links and interconnections with the different sectors of the euro area economy. In particular, ICPF hold 18% of the debt securities issued by euro area general government and 28% of the mutual fund shares issued by euro area investment funds. In parallel to this active role as providers of financing, euro area ICPF liabilities are one of the main components of euro area households' financial wealth (accounting for 30% of the total), competing with deposits in attracting households' investments. In addition, their role as providers of insurance is essential for the smooth functioning of the euro area economy. ICPF balance sheet data are, moreover, used for different types of analysis, namely monetary and financial stability analysis.

Concerning monetary analysis, ICPF directly hold monetary assets, but these account for only a small portion of the sector's total financial assets and of monetary financial institution (MFI) liabilities composing monetary aggregates. ICPF play an important role as a counterpart to the flows into and out of MFI balance sheet positions and, as mentioned, compete with MFI in attracting savings originating from households. ICPF data are also relevant for analysing economic activity and the monetary transmission mechanism, for instance through ICPF investments in securities, their impact on the financing conditions of

[1] Directorate General Statistics, European Central Bank. European Central Bank (ECB), Kaiserstrasse 29, 60311 Frankfurt am Main, Germany; e-mail: ana_claudia.gouveia@ecb.europa.eu and rafael.quevedo@ecb.europa.eu. The authors would like to thank Na Luo, Daniele Frison, Henning Ahnert and Jean-Marc Israël for their valuable comments and contributions. The views expressed in this paper are those of the authors and not necessarily those of the ECB.

the non-financial private sector, and also as an important and increasing part of the wealth portfolio of the household sector.

From a financial stability perspective, the role of ICPF as investors in financial markets, their growing links and interconnections with the financial sector, and their importance as providers of insurance (for households and firms) make the new statistics relevant in assessing the stability of the financial system.[2] As long-term investors, ICPF, which have lower levels of liquidity risk than banks, are well placed to play a stabilising role. At the same time, possible under-funding by ICPF may affect the real economy in times of adverse asset price developments. The same is true in the event of low interest rates, which are used to discount future liabilities. Furthermore, the sector is also important for monitoring systemic risk, given their growing interaction with financial markets and financial intermediaries, and the special role of reinsurance. Finally, concentration in the insurance sector has grown over time, and financial conglomerates have emerged.

2. New insurance corporation and pension fund statistics

Given the scarcity of timely, harmonised and comprehensive data on euro area ICPF,[3] at the end of 2007 the ECB launched an initiative to improve the statistical coverage of the ICPF sector, as part of a broader strategy to enhance the statistical coverage of the non-bank financial intermediaries sectors. A task force was mandated to consider compilation issues, in particular to further define a reporting scheme for ICPF statistics from NCBs to the ECB relying on available national data. User requirements from monetary policy and financial stability analyses were taken into account. In parallel, ICPF statistics were also geared towards enhancing the input (as a 'building block' for the ICPF sector) to the compilation of euro area accounts. These accounts are an integrated statistical framework that provides a systematic description of the euro area economy for the financial and non-financial sectors.

For the enhanced statistics, NCBs transmit to the ECB quarterly data on ICPF assets and liabilities for the total sector and, if available, broken down into the two sub-sectors of insurance corporations and pension funds. The required data cover end-quarter stocks as well as quarterly transactions (change in stocks adjusted for reclassifications, exchange rate changes and price revaluations) and should be reported to the ECB within 85 calendar days after the reporting period.[4] There are some requirements that may be met on an annual basis if no quarterly data are available. NCBs may report available annual data or best estimates on splits of (i) the balance sheet by sub-sector; (ii) net equity of households in insurance technical reserves (ie unit-linked and non-unit-linked business); and (iii) net equity of households in pension reserves (ie defined contribution, defined benefit and hybrid schemes). The reporting scheme showing all of the series to be provided by the NCBs to the ECB is presented in Annex I.

National statistics are provided by the NCBs to the ECB on a best efforts basis and may include estimates. The main national data sources for outstanding amounts are supervisory data, complemented by information directly reported by ICPFs. Financial accounts estimates are also used to support the compilation of ICPF statistics. These main sources are complemented by other NCBs' statistics, including MFI balance sheets, securities issues

---

2 For further details please refer to ECB (2009) and ECB (2010b).

3 Data on ICPFs have been part of euro area accounts since their publication in June 2006 for annual accounts and in June 2007 for quarterly accounts (see ECB Monthly Bulletin, Statistics section, Table 3.5)

4 This timeliness will move to 80 calendar days by end-2010, to align with tighter deadlines for the compilation of euro area accounts.

statistics or balance of payments statistics, mostly for purposes of compiling net transactions. The ICPF statistics are based on a host approach[5], at market value (except for deposits and loans which are at nominal value) and on a non-consolidated (solo accounts) basis.

Since October 2008, the ESCB has worked on implementing the new ICPF statistics, and particular attention has been given to the promotion of a sound methodological framework. The treatment of reinsurance, for example, was discussed as a means of ensuring an effective and harmonised treatment across euro area countries. The derivation of transactions, one of the major difficulties of NCB compilers, was the main topic of a workshop held in October 2009. Another workshop is scheduled to take place in October 2010, and will follow up on the derivation of transactions and discuss data quality issues.

The quality of the data transmitted is regularly monitored through internal ECB consistency checks. In addition to this, a cross-checking with alternative sources was performed, in order to assess the consistency of the ICPF dataset and statistics on other financial sub-sectors (MFI, investment funds, money market funds, financial vehicle corporations), securities issues and euro area accounts. The results for outstanding amounts data were, in general, positive, and some of the detected discrepancies were solved by NCBs. A similar exercise is being conducted for transactions.

The quality of the euro area results depends on the coverage achieved at the national level. Concerning outstanding amounts, the coverage of the euro area instrument totals by national data is close to 100%. For the compilation of euro area aggregates, estimates by the ECB encompass missing breakdowns for residency, sector counterparts or maturity. Regarding missing residency or sector counterparts, the main data gaps are in holdings of securities, quoted shares and unquoted shares and other equity, where, respectively 36%, 33% and 84% of the counterpart allocation has to be estimated by the ECB. Concerning the missing maturity breakdown, the gaps relate to the longer-term maturities. Only the maturity breakdown of deposits is estimated by the ECB (the amounts missing account for 10% of the instrument total) since, for the other instruments, the gaps remain too large.

In respect of the data on transactions, the coverage is lower in comparison to reported stock data, while it has substantially improved since the workshop held in October 2009. NCBs rely more heavily on estimates for the compilation of transactions than for the compilation of stocks. Estimates are fine-tuned, and the resulting data are of an improved quality.

A regular publication of ICPF quarterly stock data is tentatively planned to start in mid 2011.

3. First results on the data[6]

Euro area ICPF invest mainly in securities other than shares, which account for 37% of their financial assets (see chart 1). The importance of mutual funds shares has increased through time as the investments in shares and other equity were reduced (the weight of each instrument in the ICPF balance sheet is, respectively, 24% and 12%). Deposits account for 12% of total financial assets. On the liabilities side, insurance technical reserves account, as expected, for a large share of the liabilities (85% of the total). These reserves may be further split by type of business: the shares of life insurance reserves, pension fund reserves and non-life insurance reserves are, respectively, 58%, 27% and 15%.

---

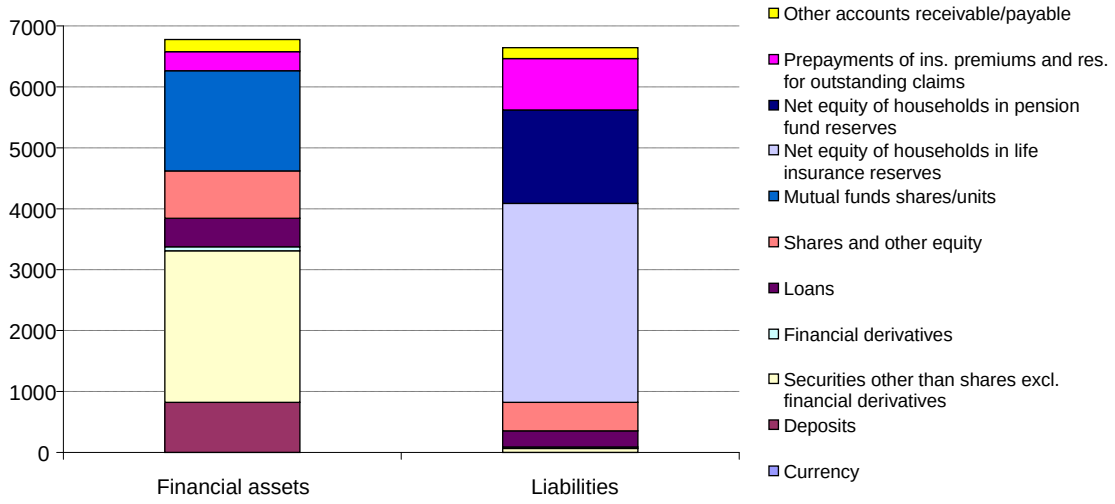
[5] Macroeconomic statistics following the System of National Accounts and the European System of Accounts concepts are based on the host approach (residency of individual institutional units, eg Citibank Germany is a German resident), while supervisory data are based on home approach (eg Citibank Germany is consolidated with its parent company).

[6] This section is based on the latest stock data available in August 2010, for reference period 2010Q1.

Chart 2 presents the euro area ICPF balance sheet by counterpart sectors. Euro area counterparts account for 86% of euro area ICPF financial assets. In particular, other financial intermediaries of the euro area (where investment funds are included) represent 28% of total financial assets, mainly as issuers of mutual funds shares. Euro area MFI and euro area general government are further important counterparts (22% and 18%, respectively, of total financial assets) as issuers of securities and, in the case of MFI, also with respect to deposits. On the liabilities side, euro area households have the largest share (78% of total liabilities) as a counterpart for life insurance and pension reserves.

Chart 1

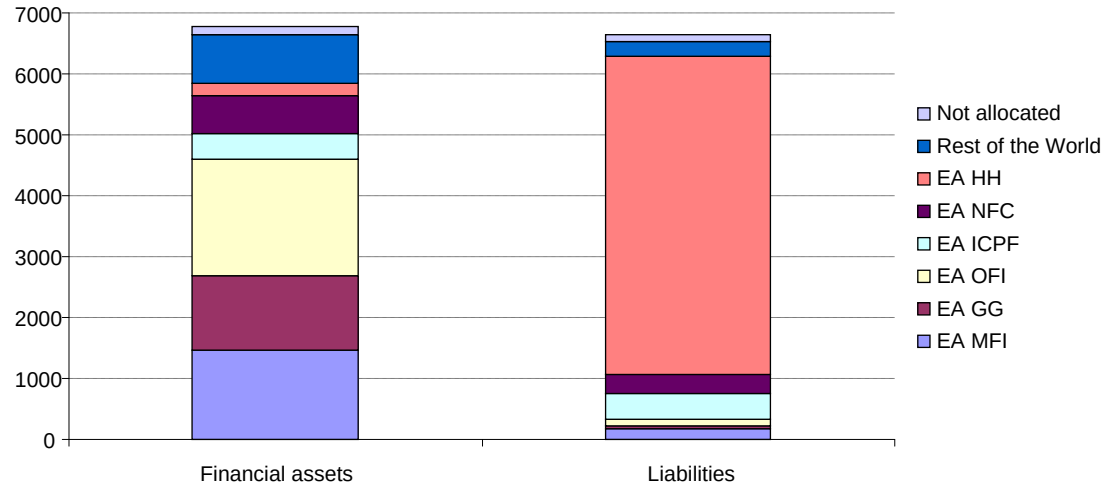
Euro area ICPF balance sheet structure – by instrument (2010Q1, EUR bn)



Source: ECB

Chart 2

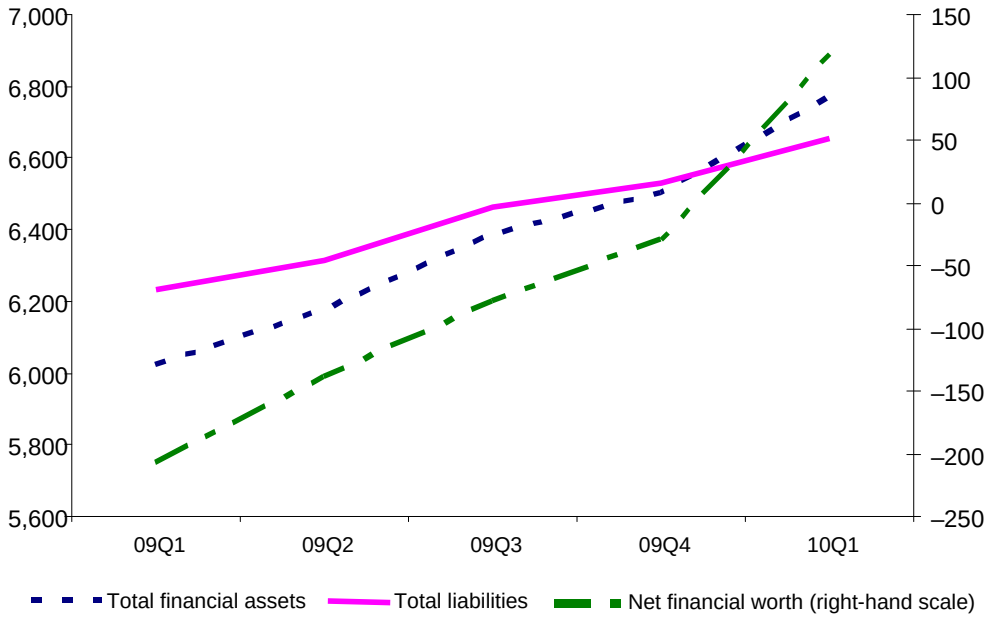
Euro area ICPF balance sheet structure – by counterpart sector (2010Q1, EUR bn)



Source: ECB

Chart 3

Euro area ICPF balance sheet developments (2009Q1–2010Q1, EUR bn)



Source: ECB

According to the available results, the financial position of euro area ICPF has been improving through 2009 (chart 3) and net financial worth (which measures the difference between financial assets and liabilities) reached a positive value of EUR 118 billion in 2010Q1. During the period 2009Q1 to 2010Q1, financial assets increased 12% (EUR 748 billion), mainly due to mutual funds shares/units[7] (which increased by EUR 501 billion, 45% of the initial stock) and, also, securities other than shares (EUR 218 billion, 10% of the initial stock) against euro area counterparts – in particular general government, MFI and other financial intermediaries (respectively, EUR 127, 42 and 55 billion). These positive developments were partially compensated by an increase of 7% in liabilities incurred (EUR 422 billion), in particular related to developments on life insurance products.

Regarding the sub-sector split, insurance corporations account for 80% of the total financial assets of the ICPF sector. The relative low weight of pension funds (which have shares in total ICPF that vary widely across countries) reflects institutional differences across countries. First, only autonomous pension funds[8] are included in the ICPF statistics; thus, countries where private pension schemes are mainly provided through non-autonomous pension funds, linked in particular to non-financial corporations and MFI, have a smaller pension fund sub-sector, according to the ICPF statistics. Furthermore, countries where social security is particularly developed tend to have a smaller pension fund sub-sector.

---

7 Partially related to the reorganization of the investment strategies of some large PF that replaced their investments in shares and securities by investments in mutual funds shares/units.

8 Apart from insurers (insurance and reinsurance), the statistics cover *autonomous* pension funds, ie funds that have autonomy of decision and keep a complete set of accounts. Non-autonomous pension funds set up by, for example, credit institutions or non-financial corporations are not covered since they are not separate institutional units.

Furthermore, despite similarities between insurers' activities (namely, life insurance) and pension funds' activities, their investment policies are different. Insurance corporations invest mainly in securities (40% out of total financial assets), followed by mutual funds shares (20% out of total financial assets). Conversely, for pension funds, mutual funds shares represent the main important investment class (40% of total financial assets), while securities other than shares account for 20% of total financial assets.

4. Challenges ahead

The ICPF stock data improve considerably the current situation on ICPF data availability for the euro area: the combination of timeliness, frequency, instrument detail and geographic and sector counterpart breakdown allows different users to enhance their analysis. Some further improvements for outstanding amounts – and, for selected transactions, data – are underway. Nevertheless, further improvements are needed, in particular due to the growing importance of the sector for financial stability analyses, in view of the European Systemic Risk Board's analysis and of ECB's own financial stability analysis (eg the Financial Stability Review).

The main new challenges facing ICPF statistics are:

i. Separate balance sheets for the insurance corporation (IC) and pension fund (PF) sub-sectors

Aggregate data for the ICPF sector can hide important differences across types of institutions. Sector-wide assessments need, therefore, to be complemented by, in particular, an analysis of sub-sectors, allowing for a more accurate and detailed analysis. Initially, in the context of the ICPF short-term approach, the split between insurance corporation and pension fund sub-sector data was only requested at annual frequency and with a longer time lag (9 months after the reporting period). Moreover, the analysis of data for euro area countries (the majority of countries already report these data on a quarterly basis) showed that the two sub-sectors have different investment behaviours and their respective countries' distribution is uneven. Following user requests, the ECB reviewed the available national data for the split of the insurance corporation and pension fund sub-sectors, and compiled euro area aggregates for stock data, covering, for the time being, the main balance sheet items (namely, instrument totals). Further improvements on national data will help enhance euro area aggregates for the two distinct sub-sectors.

ii. Statistics for all EU Member States and EU counterparts country breakdown

The ECB's future tasks in supporting the ESRB will be to help assess systemic risks for the entire European Union (EU27), as well as for individual EU countries. Hence, ICPF statistics for non-euro area EU countries will be needed.[9] In addition, the current geographical breakdown would also have to include non-euro area EU countries. The EU counterparts (euro area and non-euro area) may have to be split by country in the future.

[9] Some EU non-euro area countries have already developed (or are currently developing) these statistics.

iii. Balance sheets by type of business (non-life, life – unit-linked and non-unit-linked – reinsurance, defined benefit pensions and defined contribution pensions)

The different types of business (non-life, life – unit-linked and non-unit-linked – reinsurance, defined benefit pensions and defined contribution pensions) entail different investment policies, different risk profiles and different money holding behaviours and are, therefore, relevant for analysts. The requirement was not included in the ICPF short-term approach but will need to be reconsidered in a steady state approach.

iv. Further improvement in timeliness

For the timely use of the ICPF statistics as input to the euro area accounts, work is underway to provide regular NCB data transmission at 80 calendar days after the reference period. It is expected that this objective can be met from 2011 onwards. A demanding challenge for a steady-state approach would be to fulfil the users' request for monetary analysis. With a view to enhancing the value for analysis and related communication, different (and complementary) sets of statistics need to be analysed together and reported in the same briefing material. This implies that ICPF core aggregates would be expected to become available with a timeliness around 50 calendar days after the reference period. This option of a timely provision of ICPF data will be considered in the longer term.

Other relevant improvements would be the distinction of investments, between, for example, "*Available for sale*" and "*Held to maturity*", since the impact on the ICPF assets of valuation changes in investments held can differ substantially depending on how they are accounted for on their balance sheets. In addition, group level information and intra-group transactions (complementing the available solo data) and information on the residual maturity (in addition to the original maturity approach currently followed) would be needed to assess risks confronting groups as a whole and liquidity risks.

v. Integration of statistical and supervisory reporting

Following the agreement between the ECB and NCBs, a close cooperation with the European Level-3 Committees (and future European Supervisory Authorities) has been pursued and deepened, in particular for the ICPF sector with the Committee of European Insurance and Occupational Pensions Supervisors (CEIOPS). The CEIOPS is developing, under the Solvency II Directive adopted in 2009, new supervisory reporting templates for insurance undertakings.[10] The templates are seen as a key element in meeting user needs, ie both the expected ESRB and financial stability analysis requirements and those for monetary policy purposes, since the supervisory templates cover reporting of solo and consolidated accounts (and investments). In contrast to the low frequency, insufficient timeliness and lack of detail and harmonisation of the current supervisory data, ICPF statistics are expected to improve greatly with the new Solvency II requirements. For example, the current draft templates contain a security-by-security reporting, with a quarterly frequency and a timeliness of 4 to 6 weeks. Solvency II reporting may also provide a significant part of the statistical data needed for the requirements outlined above, in particular (a) the separate balance sheets for the insurance corporation and pension fund sub-sectors, (b) separate data for all EU countries, (c) separate data for EU country counterparts and (d) some distinctions by type of business (eg life insurance). Overall, many ECB requirements could be met on the basis of the draft Solvency II templates. The future EIOPA

[10] These are scheduled to be formally approved in 2011 for implementation in 2012, with the first reporting in 2013.

intends to also work on the Pension Funds Directive in a similar fashion. Therefore, in order to minimise the reporting burden for insurance corporations and, in the future, for pension funds, and to ensure the best possible consistency of data used by different institutions for analytical purposes, close cooperation between the ECB and CEIOPS (and its successor EIOPA) will continue.

Annex I:
ECB statistics on Insurance Corporations and Pension Funds – reporting scheme

		Total	Total	Domestic										Non-residents										Not allocated
						Non-MFIs									Other MUMS								Rest of the world	
					MFIs	Total non-MFIs	General government	Total	Other fin. interm.	Other residents				Total non residents	Total other MUMS	MFIs	Total non-MFIs	General government	Total	Non-MFIs				
										ICPF	Non-fin. corporations	Households								Other fin. interm.	Other residents			
		(1) (= 2 + 11 + 22)	(2) (= 3 + 4)	S.1	S.121+S.122	(4) (= 5 + 6)	S.13	(6) (= sum 7 to 10)	S.123+S.124	S.125	S.11	S.14+S.15	S.2	(12) (= 13 + 14)	S.121+S.122	(14) (= 15 + 16)	S.13	(16) (= sum 17 to 20)	S.123+S.124	S.125	S.11	S.14+S.15	(21)	(22)
1	**Total financial assets**																							
2	**Currency**																							
3	**Deposits**																							
4	Up to 1 year																							
5	Over 1 year and up to 2 years																							
6	Over 2 years																							
7	**Securities other than shares excl. financial derivatives**																							
8	Up to 1 year																							
9	Over 1 year and up to 2 years																							
10	Over 2 years																							
11	**Financial derivatives**																							
12	**Loans**																							
13	Up to 1 year																							
14	Over 1 year and up to 5 years																							
15	Over 5 years																							
16	**Shares and other equity**																							
17	Quoted shares																							
18	Unquoted shares and other equity																							
19	**Mutual funds shares/units**																							
20	of which: money market fund shares																							
21	**Prepayments of insurance premiums**																							
22	**Other accounts receivable/payable**																							
23	**Total non-financial assets**																							
24	**Total Assets**																							

		Total	Total	Domestic										Non-residents										Not allocated
						Non-MFIs									Other MUMS								Rest of the world	
					MFIs	Total non-MFIs	General government	Total	Other fin. interm.	Other residents				Total non residents	Total other MUMS	MFIs	Total non-MFIs	General government	Total	Non-MFIs				
										ICPF	Non-fin. corporations	Households								Other fin. interm.	Other residents			
		(1) (= 2 + 11 + 22)	(2) (= 3 + 4)	S.1	S.121+S.122	(4) (= 5 + 6)	S.13	(6) (= sum 7 to 10)	S.123+S.124	S.125	S.11	S.14+S.15	S.2	(12) (= 13 + 14)	S.121+S.122	(14) (= 15 + 16)	S.13	(16) (= sum 17 to 20)	S.123+S.124	S.125	S.11	S.14+S.15	(21)	(22)
1	**Total Liabilities**																							
2	**Securities other than shares excl. financial derivatives**																							
3	Up to 1 year																							
4	Over 1 year and up to 2 years																							
5	Over 2 years																							
6	**Financial derivatives**																							
7	**Loans received**																							
8	Up to 1 year																							
9	Over 1 and up to 5 years																							
10	Over 5 years																							
11	**Shares and other equity**																							
12	Quoted shares																							
13	Unquoted shares and other equity																							
14	**Insurance technical reserves**																							
15	Net equity of households in life insurance and pension funds reserves																							
16	Net equity of households in life insurance reserves																							
17	of which: unit linked																							
18	of which: non-unit linked																							
19	Net equity of households in pension fund reserves																							
20	of which: Defined Contribution																							
21	of which: Defined Benefit																							
22	of which: Hybrid schemes																							
23	Prepayments of ins. premiums and res. for outstanding claims																							
24	**Other accounts receivable/payable**																							
25	**Net worth**																							

Cells marked light grey (only among liabilities) are accepted with a longer timeliness (T+9 months).

References

ECB (2010a), “Harmonised ECB statistics on euro area investment funds and their analytical use for monetary policy purposes”, ECB Monthly Bulletin, pp. 109–122, ECB, August 2010.

ECB (2010b), “Using provisional ECB statistics for insurers and pension funds to analyse their investment risks and linkages”, Financial Stability Review, pp. 114–117, ECB, June 2010.

ECB (2009), “The importance of insurance companies for financial stability”, Financial Stability Review, pp. 160–168, ECB, December 2009.

Session 6 B

Improving housing statistics

Chair: Paul Van den Bergh, Bank for International Settlements

Papers: Estimation of a semi-parametric hazard model for Mexico's new housing market
Carolina Rodriguez-Zamora, Bank of Mexico

Recent trends in the UK first-time buyer mortgage market
Dmitry Kuvshinov, Bank of England

Estimation of a semi-parametric hazard model for Mexico's new housing market

Carolina Rodríguez Zamora[1]

1. Introduction

The purpose of this paper is to study the market duration of new homes constructed by real estate developers in Mexico, that is, the time a new house stays on the market before it is sold. Making use of a particular Mexican housing-market database, a flexible hazard model was estimated in order to study how market duration is affected by structural characteristics of the home, including market supply price, and changes in economic activity and in the mortgage market. The hazard is defined as the probability that a home will be sold in quarter *t* given that it has been for sale for *t-1* quarters. The period of analysis is from the second quarter of 2006 to the fourth quarter of 2009.

Over the last ten years, Mexico has enjoyed macroeconomic stability, which has favored the housing sector. In addition, several financial regulations were introduced to improve the banking sector's supervisory and regulatory framework. These factors have contributed to an increase in funds available to finance the private sector, in particular, the housing market. Hence, this paper focuses on how the increase in credit affects the market duration of new homes constructed by real estate developers. Specifically, the interest is in how the chance of a home being sold is affected by the annualized quarterly growth rate of financing injected into the housing market by the two most important financial institutions in the mortgage market: Infonavit, a public sector intermediary, and commercial banks as a group.

Moreover, this paper investigates, state by state, whether economic activity has an effect on the probability that a housing unit will be sold given that it has been for sale during previous periods. To study this effect, the paper uses the annualized quarterly growth rate of the economic activity index by state, constructed by the Mexican central bank. As will be explained later, there are various channels through which economic activity can affect the market duration of a home.

The results indicate that growth in economic activity has a positive and significant effect on the probability that a home will be sold in quarter *t* given that it has been for sale for *t*-1 quarters. In particular, if the economic activity growth rate doubles, the chance of a home being sold increases 86.9%, which is a non-negligible effect and is statistically significant. In contrast, growth in mortgage credit by commercial banks and Infonavit has no significant effect on the chance of a home being sold. Finally, the results also indicate that if the price increases or if the housing unit is an apartment instead of a house the probability decreases, whereas if the floor size or the number of periods on the market increase, the probability of a home being sold increases.

There are two papers that estimate a hazard model for the housing market: Das (2007) and Zuehlke (1987). In both papers, the authors use a hazard model to study the relationship between the probability of a house being sold and its time on the market. They estimate a Weibull hazard model using data from the housing markets in New Orleans and Tallahassee,

---

[1] The views expressed in this paper are those of the author and do not necessarily reflect those of the Banco de México. Edgar Islas-Rodríguez and David Camposeco-Paulsen provided excellent research assistance. All errors are my own. E-mail: carolina.rodriguez@banxico.org.mx.

respectively. The data were obtained from the corresponding Multiple Listing Service books. Both authors find evidence that vacant houses have a higher rate of time dependence compared to occupied houses. Additional studies that relate other aspects of the housing market with duration analysis are Deng (1997) and Deng et al. (2003).

The rest of the paper is structured as follows: the next section explains how macroeconomic stability influenced the Mexican mortgage market, section 3 examines why it is important to control for economic activity performance, section 4 summarizes the data set and the variables used in the estimation, section 5 provides a detailed explanation of the method used, section 6 contains the estimation results, and section 7 concludes by discussing possible future directions for research.

2. Macroeconomic stability and the Mexican mortgage market

During the last ten years Mexico has enjoyed macroeconomic stability, which has favored the housing sector. Between 2001 and June of 2010 the annual inflation rate averaged 4.7%. Moreover, the public sector balance, measured by public sector borrowing requirements (PSBR) as a percentage of GDP, has steadily decreased since 2000, reaching 1% in 2007.[2] This implies that the public sector has reduced its financial needs, leaving the private sector with more resources available. Additionally, short term interest rates[3] dropped from an average of 16.2% in 2000 to an average of 4.63% in the first half of 2010.

All of these factors have contributed to the increase of funds available to the private sector. In fact, total financing to the private sector has started to recover, and represented 37% of GDP in 2009. From 2004 onwards, commercial banks' lending to the private sector has been rising. In 2002, commercial banks began to increase their consumer credit portfolio. Later, in 2005, they began participating more actively in the mortgage market, primarily in the residential mortgage segment. Finally, in 2007, commercial banks started to increase their business credit portfolio. As a result, commercial banks' participation in total financing to the private sector has continuously expanded since 2005, reaching 14.76% in 2008 and 14.26% in 2009. These factors have guaranteed an expansion of the mortgage market.

The most important public sector intermediary in the housing credit market is the *Instituto del Fondo Nacional de la Vivienda para los Trabajadores* (Infonavit). This government-sponsored agency provides credit to households that belong to the formal sector of the economy. In previous years, Infonavit financed workers who earned up to four times the monthly minimum wage.[4] The agency's traditional fixed-rate mortgage loan has had a limit of 180 monthly minimum wages and could only be used to purchase houses priced below 350 times the monthly minimum wage. More recently, Infonavit started to provide credit to other segments of the market. For example, "Apoyo Infonavit" is a joint program with banks and non-bank institutions for workers who earn more than four times the minimum wage. This program allows individuals to leverage their Infonavit savings to obtain market-based mortgage financing. This kind of initiative has made Infonavit the leading institution in the mortgage market. Infonavit's market share of total home financing increased considerably in the last 10 years, from 27.62% in 1997 to 55.85% on average for the first five months of 2010.

---

[2] However, in 2008 and 2009 the PSBR registered rebounds, perhaps as a consequence of the countercyclical fiscal measures implemented by the government during the financial crisis.

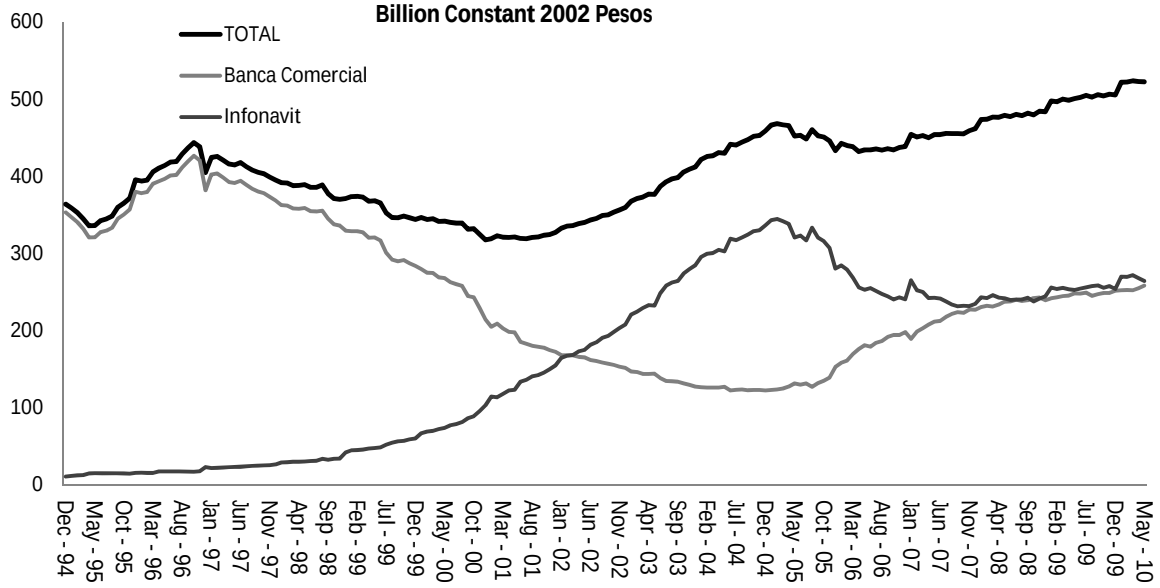
[3] This refers to the nominal interest rate of federal government three-month bonds (91-day CETES).

[4] The monthly minimum wage is 162 dollars PPP as of 2008.

Commercial banks constitute the second most important intermediary in the housing market and the first among private sector institutions. This was not always the case. Only in recent years have commercial banks been more involved in the mortgage market. This enhanced role is explained by the significant efforts that have been made to overcome the obstacles to financial sector development, in general, and housing finance, in particular. A number of legislative and regulatory efforts were made to improve the ability of financial institutions to obtain creditor information, improve contract enforcement and bolster creditor rights, by clarifying and streamlining foreclosures and repossession procedures.[5] As a consequence, the market share of commercial banks as of 2010 was 29%, compared to 21% in 2005.[6] In general, the products offered by commercial banks are in Mexican pesos, with fixed interest rate schemes, and they usually finance medium- to high-income households.

To summarize, the two most important intermediaries in the housing sector, Infonavit and commercial banks as a group, have increased the resources available for the housing sector for the period of analysis, that is, from 2006 to 2009 (Figure 1). This could have an important effect on the probability of a home being sold.

Figure 1: Mortgage Loan Portfolio
INFONAVIT & Commercial Banks
Billion Constant 2002 Pesos



Source: Banco de México

3. Recent economic activity

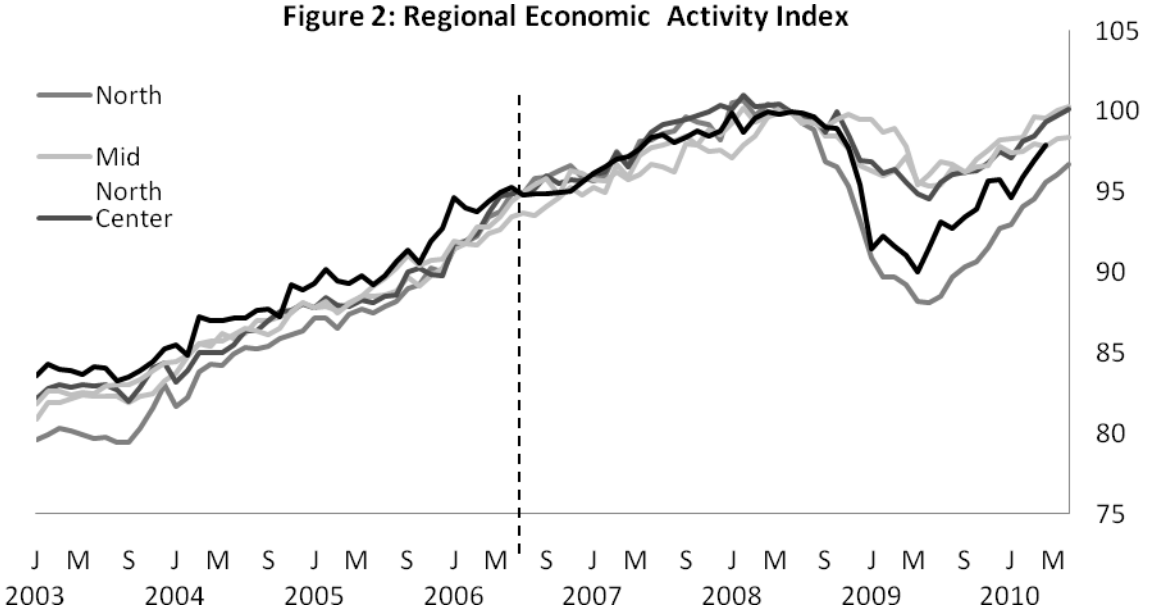
There are various channels through which economic activity can affect the market duration of a home. From the demand side, if current economic conditions deteriorate with respect to previous periods, people may be less likely to buy a home. This means a lower probability that the developer will find a buyer, thus implying decreased probability of a home being sold and increased market duration. However, from the supply side, it could be the case that

[5] See Espinosa-Vega and Zanforlin (2008).

[6] The other 15% of the credit market is shared by FOVISSSTE, development banks, and non-bank institutions such as Sofoles y Sofomes.

sellers, in view of worse economic conditions, decrease the sale price of their homes being offered, which in principle increases the probability of a home being sold and decreases the market duration. Also, the economic activity performance, in particular the behavior of the labor market, affects mortgage loan origination through different channels, as explained in Carballo-Huerta and González-Ibarra (2008). “First, available funding to allocate credit, which depends on workers’ contributions, is closely related to employment and payroll levels. Second, applicants’ Infonavit credit score depends, among other things, on the number of consecutive periods contributing to the housing fund. Third, current and expected economic conditions affect households’ mortgage loan demand.”

Figure 2: Regional Economic Activity Index



Source: Banco de México

Figure 2 plots the *Índice Coincidente Regional* (ICR), a regional economic activity index constructed by the Mexican central bank. This is a compound index, based on five variables that measure different aspects of the monthly economic activity per region. The variables are total formal workers (to control for labor market performance), wholesale and retail sales (to control for the demand for goods and services), manufacturing production index and electricity index (to control for production activity). Also, the chart includes the *Índice Global de la Actividad Económica* (IGAE), a national economic activity index. From the chart it is clear that the economy was experiencing steady performance, with positive growth rates in the ICR from 2003 up to the second half of 2008, when the financial crisis started to affect the different regions. The North was the region most affected by the crisis, since it is most closely linked to economic activity in the USA. However, even the South region had negative economic growth rates. This behavior could have an impact on the market duration of new housing units.

4. Data

The data used in this study comes from the *Dinámica del Mercado Inmobiliario* (DIME) database created by SOFTEC, a Mexican real estate consulting firm. SOFTEC collects quarterly data on new homes constructed by real estate developers in the 39 most important real estate markets in the country. The main objective of the DIME is to have a general

picture of the housing market situation in each quarter. SOFTEC uses the collected data to calculate, in a given quarter and region, the total number of homes constructed, homes sold and homes for sale, among other variables. As of 2009, SOFTEC estimates that the real estate markets it follows account for 80% of the total sales of new homes constructed by real estate developers in a given quarter for the whole country. Also, SOFTEC calculates that new homes represent between 70% and 80% of the whole housing market. Moreover, SOFTEC states that real estate developers produce approximately 60% of all the units constructed in the national new housing market. The other 40% consists of new homes constructed by owners.[7] Thus, the percentage of the housing market that SOFTEC observes through DIME is between 42% and 48%.

The main advantage of this data set is the huge number of observations it contains and the number of characteristics recorded for each observation. The sample to which I have access ranges from the first quarter of 2006 to the first quarter of 2010,[8] however the time span of the DIME is greater and includes 12,834 real estate developments. Each development has a model home. Thus, the data base contains, for each real estate development, the number of units identical to the model home and the structural characteristics of the model home, as well as the characteristics of the real estate development. Examples of these variables are floor size in square meters, lot size in square meters, number of bedrooms, number of bathrooms, whether the property is a house or an apartment, number of parking spaces, asking price at each quarter, county and state where the real estate development is located, total number of home units constructed in the development in a given quarter, total number of homes sold in a given quarter, and total number of homes for sale in a given quarter.

The DIME follows the same development over time until all home units identical to the model home are sold. In this sense, the database is a panel. However, the way the data is collected does not guarantee that, for each period, the information in the data base corresponds to the same model home. In fact, some individual characteristics such as number of bedrooms, floor size, or whether it is a house or an apartment, change over time, which implies that we cannot follow the same home model, over time, for all real estate developments. For duration analysis it is important to observe the same model home over time for each development. Thus, it was necessary to keep only the developments that make reference to the same model home. We therefore eliminate all developments with inter-temporal inconsistencies in the following variables: price and date when the real estate development started sales,[9] floor size, number of bathrooms, number of bedrooms, whether it is an apartment or a house, and economic classification.[10] Only 10,822 real estate developments survived this exercise, that is, 84% of the sample.[11]

For the purposes of the duration analysis, it is necessary to know the number of units sold in each quarter. DIME includes the accumulated number of homes sold since the real estate development started selling. Therefore, all that is needed is to subtract this variable in period *t* from the figure observed in period *t*-1 to obtain sales per quarter. However, for some periods, this calculation yields a negative number, that is, “negative sales” in a quarter. According to SOFTEC, there are different reasons that this happens. It could be the case

---

7 See SOFTEC (2009).

8 Nevertheless, the period of analysis is from the second quarter of 2006 to the last quarter of 2009, for reasons explained later in the paper.

9 This date does not necessarily coincide with the date on which the real estate development entered DIME.

10 The economic classification categories are: social, economic, medium, residential and residential plus. These categories are constructed by SOFTEC according to the price of the housing unit.

11 There is no evident reason to think that eliminating these inconsistencies yields a non-representative random sample; however, further tests need to be performed.

that the buyer decides not to buy the home, the seller did not have the unit ready, the mortgage credit was not authorized, etc. Even in these simple cases, the result is that the sales and purchase contract was never signed. To solve this issue, it is assumed that the accumulated number of homes sold at quarter *t* is the minimum of total sales reported between *t* and τ , the last period in which the development is observed. From this variable, the number of home units sold per quarter is constructed by subtracting the observed value in period *t*-1 from the value in period *t*.

4.1 Summary Statistics

After eliminating some developments that were observed for only one period, and some with missing variables, the final sample, taken from the 10,822 real estate developments that remained, consists of 9,304 developments observed between the second quarter of 2006 and the last quarter of 2009. These were equivalent to 976,960 housing units, among which 629,039 were sold and 347,921 were not. Descriptive statistics for this sample are in Table 1. The characteristics of the housing unit included as covariates in the hazard model are: logarithm of the floor size in square meters, logarithm of the market supply price at each quarter, indicator that the housing unit is an apartment versus a house, logarithm of the number of quarters the home has been for sale since development sales started, state indicators, and starting quarter indicators.

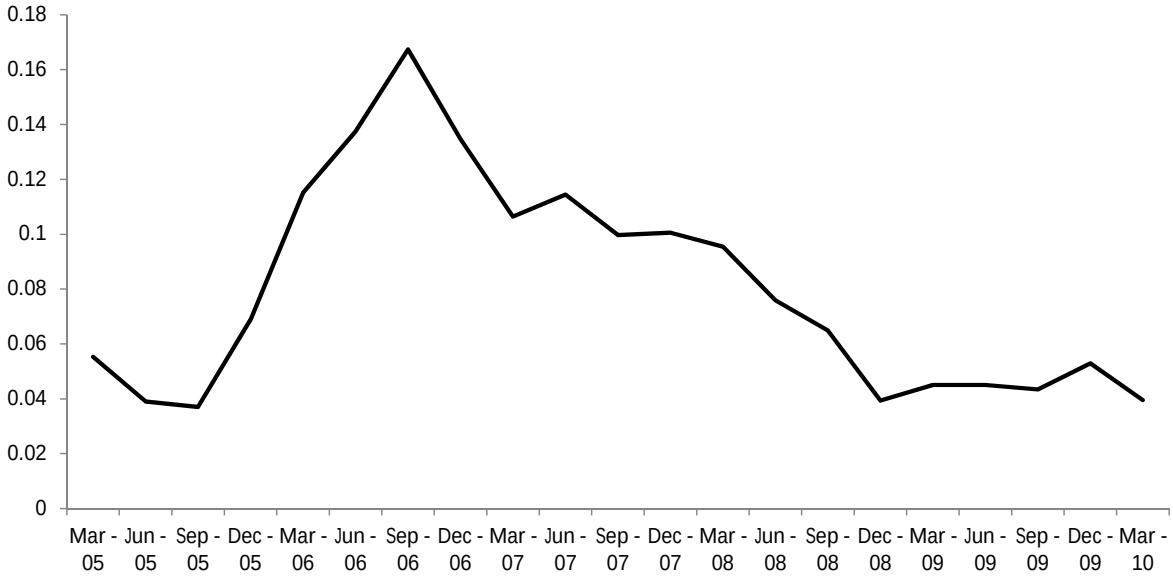
Table 1: Summary Statistics

Variables	Mean	Std. Dev.	Min	Max
Floor Size in m^2	72.57	49.127	26	1000
Price $_t$ [a,†]	656802	1298253	159948	72600000
Apartment Indicator	0.0966	0.2953	0	1
House Indicator[‡]	0.9034	0.2953	0	1
Quarters Since Development Started [a]	4	4	1	40
Duration range begins in:				
2006 - I	0.279	0.449	0	1
2006 - II	0.050	0.217	0	1
2006 - III	0.079	0.270	0	1
2006 - IV	0.044	0.205	0	1
2007 - I	0.069	0.253	0	1
2007 - II	0.092	0.289	0	1
2007 - III	0.079	0.269	0	1
2007 - IV	0.045	0.208	0	1
2008 - I	0.030	0.171	0	1
2008 - II	0.046	0.209	0	1
2008 - III	0.030	0.171	0	1
2008 - IV	0.028	0.166	0	1
2009 - I	0.054	0.226	0	1
2009 - II	0.040	0.195	0	1
2009 - III	0.035	0.185	0	1

Total number of observations is 976,960.
[a] Since these variables are time variant, statistics refer to the period when market duration range begins.
[b] Annualized quarterly growth rate.
[†] Constant 2008 Pesos.
[‡] Omitted Variable.

On average, the floor size of a housing unit is 72 square meters. Approximately 90% of the entire sample consists of houses. The average price of a housing unit when the market duration spell[12] begins is $656,802.2 real Mexican pesos as of January 2008. For almost all homes in the sample, the market duration range started before the real estate development was observed for the first time by SOFTEC. In fact, when the real estate development is first observed in DIME, the average duration since the real estate development started sales is 4 quarters. Most of the real estate developments, 28% of the sample, entered DIME in the second quarter of 2006.

Figure 3: Commercial Banks and Infonavit Loans to the Housing Sector
Annualized Quartely Growth Rate



Source: Banco de México

To measure the effect of commercial bank and Infonavit credit on the market duration of a home, the annualized quarterly growth rate of both commercial bank and Infonavit lending to the housing market was included as a covariate in the hazard model estimation. As shown in Figure 4, the growth rate is consistently positive between March of 2005 and March of 2010. For the period of analysis, from the second quarter of 2006 to the last quarter of 2009, the annual growth rate reached a maximum of 17% in the third quarter of 2006, followed by a steady decline until the last quarter of 2008, when the growth rate registered 4%. Between 2009 and the first quarter of 2010, the growth rate of total lending by Infonavit and commercial banks stayed at around 5%.

Finally, to control for the performance of economic activity at the state level in the hazard model estimation, the annualized quarterly growth rate of the *Índice Coincidente Estatal* (ICE) was included as a covariate in the hazard model. This index is similar to ICR, but covers states rather than regions.

[12] Range and spell are used interchangeably.

5. Method

A flexible hazard model estimates the market duration of a new home before it has been on the market for *t* quarters. The focus is on the effect that different factors have on the probability of selling a new developer-constructed home between quarters *t* and *t*+1, given that it has not been sold before quarter *t*. The method used here is the same presented in Meyer (1990). Although the unit of observation is the housing unit, a panel was constructed in which each observation corresponds to a specific real estate developer in a specific quarter. The reason for this is that only one type of housing unit per real estate development is observed, so all housing units within a development are identical except that they have different market durations and prices. Each row of the panel indicates the number of homes sold in the corresponding quarter by the real estate developer, their duration in the housing market, the number of censored homes per quarter in the real estate development, and their corresponding vector of covariates. In this paper a home is censored if it has not been sold during the last quarter in which it was observed. The maximum number of periods for which a housing unit is observed is 15.

The main benefits of using a flexible hazard model, compared to parametric hazard models like the Weibull or the logistic models, is that no assumptions about the distribution of the duration range are necessary. Also, this semi-parametric hazard model naturally allows for time dependent covariates.[13]

Let T_i be the market duration of home i, that is, the time it stays on the housing market before it gets sold. Then, the hazard in this case is defined as the probability that home i will be sold between quarter *t* and quarter *t*+1, given that home i has survived on the market up through quarter *t*. With this definition, the hazard is parameterized using a proportional hazard form as follows:

Let $\lambda_o(t)$ be the baseline hazard at time *t*, $\mathbf{x}_i(t)$ be the vector of possibly time varying explanatory variables for home i, and β be the vector of parameters. Then the hazard function for home i is:

$$\lambda_i(t) = \lambda_o(t)exp[\mathbf{x}_i(t)'\beta] \quad (1).$$

Using equation (1) we can write down the probability that a duration range will extend until time *t*+1 given that it has lasted until *t*.

Using the fact that $\mathbf{x}_i(t)$ is constant in the interval [*t*,*t*+1) and the following definition from Meyer (1990),

$$\gamma(t) = log \int_t^{t+1} \lambda_o(u)du \quad (2)$$

the probability of a home not being sold in the first k_{i-1} intervals can be written as:

$$\prod_{t=1}^{k_i-1} exp\{exp[\gamma(t) + \mathbf{x}_i(t)'\beta]\} \quad (3)$$

Moreover, the probability that duration T_i falls into interval k_i is given by:

$$1 - exp\{-exp[\gamma(k_i) + \mathbf{x}_i(k_i)'\beta]\} \quad (4).$$

Using the probabilities defined in equations (3) and (4), the log-likelihood function for a sample of *N* homes is:

[13] For more detailed explanations of these and other advantages please refer to Meyer (1990).

$$L(\gamma,\beta)=\sum_{i=1}^{N}\left\{\delta_i log[1-exp[-exp[\gamma(k_i)+x_i(k_i)'\beta]]]-\sum_{t=1}^{k_i-1}exp[\gamma(t)+x_i(t)'\beta]\right\} \quad (5).$$

Where $\gamma=[\gamma(1),\ldots,\gamma(T)]'$, C_i is the censoring time for individual i, $\delta_i=1$ if $T_i \leq C_i$, i.e., the observation is censored, and 0 otherwise, and $k_i=min\{int(T_i),C_i\}$.

Since the maximum number of periods in which a home is observed is 15, the log-likelihood function is maximized through standard techniques with respect to the 15 elements of γ and the vector β.

Before explaining the empirical hazard of the data, two clarifications must be made. First, notice that the market duration observed by SOFTEC was used in the estimation procedure, rather than the market duration since the real estate development started sales. This is because the time variant covariates related to the home, like the price, are not observed for the periods before the development is first observed in the database. However, the market duration since the real estate development started sales was included as a control variable. Second, the hazard is constructed according to the number of quarters the housing unit has been for sale since the real estate development entered the DIME database, although housing units entered the sample in different calendar quarters. In other words, all durations are aligned to the same starting point because all that matters is the number of periods they have been for sale since they were first observed by SOFTEC.

Table 2: Failures, Censoring, and the Kaplan-Meier Empirical Hazard

Quarter *t* in sale	Risk Set	Exits	Censoring	Hazard	Std. Error
1	907393	117565	69567	0.130	0.000
2	740816	89104	49012	0.120	0.000
3	600785	83068	50927	0.138	0.000
4	490248	73023	27469	0.149	0.001
5	391402	63685	25823	0.163	0.001
6	298360	45085	29357	0.151	0.001
7	232345	38338	20930	0.165	0.001
8	179151	48830	14856	0.273	0.001
9	119201	26778	11120	0.225	0.001
10	80223	20229	12200	0.252	0.002
11	49706	8485	10288	0.171	0.002
12	35032	5063	6189	0.145	0.002
13	24956	3042	5013	0.122	0.002
14	17545	5021	4369	0.286	0.003
15	1723	1723	10801	1.000	0.000

Table 2 summarizes the variables to construct the hazard function. The risk set at the beginning of quarter *t* refers to the number of housing units for which the range has not ended or been censored at the beginning of quarter *t*. Total exits refers to the number of homes for sale that were sold during quarter *t*. As an example, 117,565 home units were sold during the first quarter, that is, about 12% of the sample. As was mentioned before, censored exits refers to the number of homes not sold as of the last period in which they were observed. For example, being censored in the first quarter implies that the home was not sold during the first quarter and that this was the last period in which it was registered in the

sample. Actually, 69,567 homes were censored during the first quarter, around 7% of the sample. Finally, the hazard in Table 2 corresponds to the Kaplan-Meier empirical hazard for the whole sample. The empirical hazard is the fraction of ranges, ongoing at the start of a quarter, which end during the quarter. The empirical hazard is relatively low and stable for the first seven periods (0.145 on average). Then the hazard of being sold in the 8th, 9th, and 10th period of being on the market increases to 0.250 on average. The hazard is one in the last period because no observations last more than 15 periods. Therefore, once one subtracts the censored observations from the risk set, all remaining homes are sold in that period.

6. Results

Column 1 of Table 3 shows the results from the flexible hazard model when only characteristics of the home are included as explanatory variables. According to the estimates, a 1% increase in floor size increases the probability of a home being sold by 6.9%. If the housing unit is an apartment, the probability of being sold increases 9.4%. Perhaps people simply prefer apartments to houses. However, new apartments are usually in urban areas, whereas new houses are, in most cases, located in areas where the cost of land is cheaper. Hence, prospective buyers may prefer an apartment compared to a house because of its location. A 1% increase in the asking price decreases the probability of a home being sold by 19.2%, everything else being equal. If the market duration, since the real estate development sales started, increases by 1%, then the probability of a home being sold increases 22.2%. All coefficients are statistically significant at the 1% level.

Table 3: Flexible Hazard Estimated Coefficients

Variables	(1)		(2)		(3)	
log(Floor Size in m2)	0.069	**	0.138	**	0.138	**
	(0.006)		(0.007)		(0.007)	
Apartment indicator	0.094	**	-0.113	**	-0.113	**
	(0.006)		(0.008)		(0.008)	
log(Sale Price)[a]	-0.192	**	-0.252	**	-0.256	**
	(0.004)		(0.005)		(0.005)	
log(Quarters since Development Sales Started)	0.222	**	0.412	**	0.427	**
	(0.003)		(0.003)		(0.003)	
State's Economic Activity Index [a,b]					0.869	**
					(0.063)	
National Commercial Bank and Infonavit Credit to Housing Sector [a,b,†]					-0.085	
					(0.127)	
Starting Date Indicators	No		Yes		Yes	
State Indicators	No		Yes		Yes	
Log-likelihood	-1737744.2		-1713411.3		-1711549.3	
Sample Size	976960		976960		976960	

Standard Errors in parentheses.

Estimated γ vector not included in table, but available upon request.

[a] Since these variables are time variant, statistics refer to the period when market duration range begins.

[b] Annualized quarterly growth rate.

[†] Excludes non-bank institutions.

**p<0.01; *p<0.05.

Column 2 of Table 3 includes the variables in column 1, plus state indicators and indicators for the quarter in which the real estate development was first observed by SOFTEC and incorporated in DIME, in other words, starting date indicators. State indicators are necessary to control for differences across states. The omitted state is Aguascalientes. The starting date indicators are useful to control for seasonal differences in duration distributions. The omitted quarter is the second quarter of 2006. The coefficients for these indicators were not included in Table 3, but are available upon request. A 1% increase in floor size increases the probability of a home being sold by 13.8%, and the coefficient is statistically significant. The sign of this estimate is equal to what we found in column 1, but the magnitude increased from 6.9% to 13.8%. Once we control for location through state indicators, apartments are 11.3% less likely to be sold than are houses. In other words, people prefer houses to apartments once we control for location. Also, a 1% increase in the sale price decreases the probability of being sold by 25.2%. This coefficient is larger than the corresponding coefficient in the previous column. The coefficient on market duration is still positive and of higher magnitude, 41.2% compared to 22.2%. This means that once we control for state and seasonal differences, the more time the house spends on the market, the higher is the probability of its being sold. All coefficients are statistically significant at the 1% level.

The most interesting results for the purposes of this paper are in column 3 of Table 3. This column, besides including all regressors from previous columns, includes two variables, one that measures state economic activity and another that measures mortgage credit loans made to households by commercial banks and by Infonavit. The effect of the state economic activity on the probability of a home being sold is measured by the annualized quarterly growth rate of the state economic activity index, ICE. It is expected that a greater growth in economic activity will increase the probability of selling a home constructed by real estate developers. The annual growth rate for national mortgage loans given to households was included in order to measure the effect that financial resources available to buy a home have on the probability of a home being sold. It can be expected that having more resources available to buy a home increases the probability of selling a new home.

According to the figures in this column, if a state's annual economic growth doubles, then the probability of a home being sold there increases by 86.9%, and the coefficient is statistically significant at the 1% level. However, the results indicate that if the annual growth rate in mortgage loans given by Infonavit and commercial banks to households doubles, there is no significant effect on the probability of a home being sold. One reason that could explain this is the fact that the series used to construct the variable for the annual growth rate in mortgage credit vary only over time, not across states, as is the case with the series used to construct the annual growth rate of economic activity. Thus, perhaps there is not enough source of variation in the series used to identify the effect of mortgage credit on the probability of a home being sold. Another explanation could be related to the fact that the percentage of the housing market that SOFTEC follows is around 45%. Therefore, it could be that for this fraction of the market, mortgage credit is not relevant.

7. Conclusion

Making use of a particular Mexican housing-market database, a flexible hazard model was estimated to study the market duration of new homes constructed by real estate developers in Mexico. The period of analysis is from the second quarter of 2006 to the fourth quarter of 2009. As expected, the results indicate that, all else being equal, the market duration of a home for sale is greater if the sale price is high, if the floor size decreases, if it is an apartment instead of a house, or if the economic activity deteriorates. Also, the probability of a new home being sold increases the longer it has been on the market.

Future extensions of this paper will investigate further the question of why mortgage credit given by Infonavit and commercial banks, as a whole, do not significantly affect the

probability of a home being sold. Also included will be an exploration of how different structural characteristics of a home, the sale price, economic activity performance and the mortgage market affect different housing market segments and different regions.

8. References

CARBALLO-HUERTA, J. AND J. P. GONZÁLEZ-IBARRA (2008): "Financial innovations and developments in housing Finance in Mexico," IFC Bulletin 31, Bank of International Settlements.

DAS, A. (2007): "A Hazard Model for New Orleans Housing Market," *American Journal of Economics and Sociology*, 66, 443-455.

DENG, Y. (1997): "Mortgage Termination: An Empirical Hazard Model with a Stochastic Term Structure," *The Journal of Real Estate Finance and Economics*, 14, 309-31.

DENG, Y., S. A. GABRIEL, AND F. E. NOTHAFT (2003): "Duration of Residence in the Rental Housing Market," *The Journal of Real Estate Finance and Economics*, 26, 267-85.

ESPINOSA-VEGA, M. AND L. ZANFORLIN (2008): "Housing Finance and Mortgage-Backed Securities in Mexico," IMF Working Papers 08/105, International Monetary Fund.

MEYER, B. D. (1990): "Unemployment Insurance and Unemployment Spells," *Econometrica*, 58, 757-82.

SOFTEC (2009): "Mexican Housing Overview 2009," Tech. rep., See http://www.softec.com.mx/ for more information.

ZUEHLKE, T. W. (1987): "Duration Dependence in the Housing Market," *The Review of Economics and Statistics*, 69, 701-04.

Recent trends in the UK first-time buyer mortgage market

Dmitry Kuvshinov[1]

Summary

First-time buyers (FTBs) represent an important component of the mortgage lending market in the UK, accounting for almost 40% of house purchase loans over the past decade. But since FTBs are normally defined by lenders as those who do not have to sell a property in order to purchase, this includes some who owned a property before, estimated to be around 20% of FTBs.

Lending to FTBs contracted sharply in late 2007 and 2008. This decline can be attributed to both credit demand and supply. Credit availability has tightened considerably, as lenders have lowered the loan-to-value (LTV) ceilings on their lending, and increased the interest rate spreads on high LTV products in particular. Moreover, demand is likely to have been adversely affected by lower job security and a weakening of housing market confidence.

2009 saw some recovery in FTB lending, consistent with reports of stronger demand, partly reflecting pent-up demand from FTBs coming back to the market, perhaps encouraged by lower house prices. More recently there have also been reports of lenders loosening LTV criteria, consistent with a slight improvement in credit availability, but the median LTV ratio on FTB lending has remained low. Lending volumes actually fell back in early 2010 as demand weakened, and although this was reported largely to reflect one-off factors, it makes the underlying strength of the market difficult to assess.

For those FTBs able to access the mortgage market, servicing payments has generally become easier overall, as they have benefited from lower levels of the official Bank Rate of interest and lower house prices. But estimates from the Council of Mortgage Lenders (CML) suggest that in 2009 around 85% of FTBs aged under 30 have had to receive assistance, often from parents, to finance the large deposits required – compared to around 50% in 2007 and 8% in 1995-97.

Despite the recent stabilisation, market conditions remain challenging, and both the supply and demand for loans appear to be weaker than before the crisis. In discussions with the Bank in June 2010, the major UK lenders expected lending to FTBs to remain subdued over the remainder of 2010.

[1] Monetary and Financial Statistics Division, Bank of England. E-mail: dmitry.kuvshinov@bankofengland.co.uk.

Not for publication without express permission. This paper should be treated as work in progress. The views expressed in this paper are those of the author, and not necessarily those of the Bank of England or its Monetary Policy Committee. The paper has benefited from helpful comments by David England, Mark Robson and Sally Srinivasan.

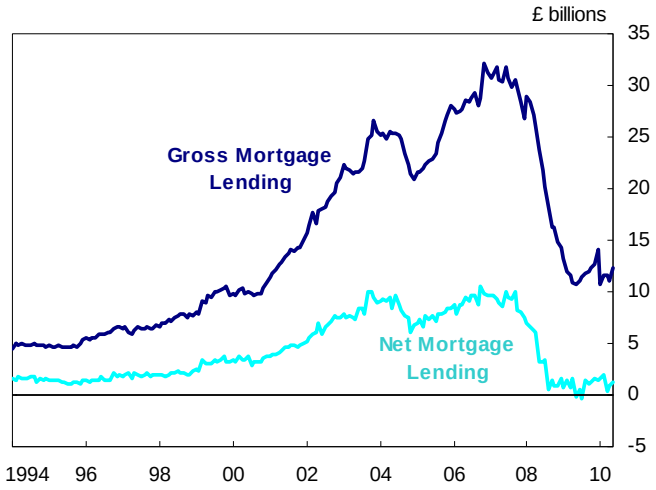
Background

1. The mortgage market has undergone a significant contraction since the beginning of the financial crisis. House prices fell by around 20% from their peak to their recent trough, and mortgage lending fell sharply in 2008 and early 2009 (**Chart 1**). Although market conditions appear to have stabilised somewhat, and with some increase in house prices from their lows, mortgage lending remains subdued. With remortgaging activity very weak, the mortgage market is currently dominated by lending for house purchase, both to first-time buyers (FTBs) and home movers.

2. FTBs account for around 40% of loans for house purchase (**Chart 2)**. However, the definition of FTB generally used by lenders is all who do not have to sell a property in order to purchase, and will therefore include those who have let out their home and are now buying a second property (e.g., accidental landlords, or those needing to move to another part of the country) or who have previously sold their home and rented for an extended period. Estimates from the Council of Mortgage Lenders (CML) suggest that around 20% of FTBs may fall into this category,[2] but there is little evidence that the proportion of "returners" has changed recently.[3]

Chart 1

Gross and net mortgage lending

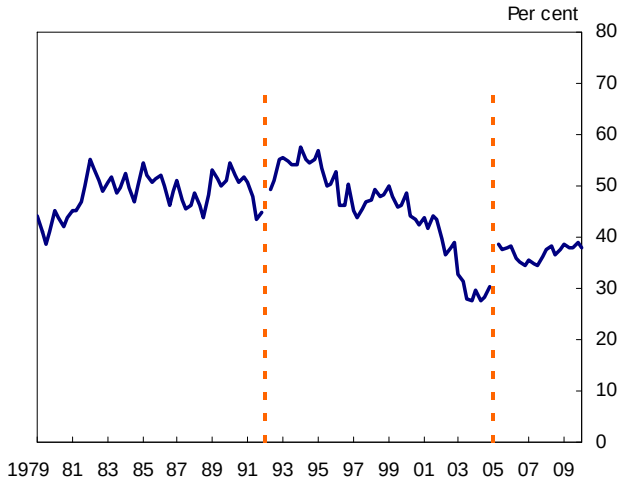


Source: Bank of England.

Monthly data to May 2010. Seasonally adjusted.

Chart 2

Number of new loans to first-time buyers as a proportion of total for house purchase



Source: CML

Quarterly data to 2010 Q1. Dotted lines indicate breaks in series. See the Annex for details of the series breaks. Non seasonally adjusted.

3. This paper describes the recent trends in FTB lending and attempts to identify the factors driving these developments. It finds that notwithstanding a recent stabilisation, credit

[2] Smith et al (2005): Understanding first-time buyers, Chapter 3 provides further information on "returners", and characteristics of FTBs in general.

[3] See "Disaggregating first-time buyer lending" section of this paper for further information on "returners".

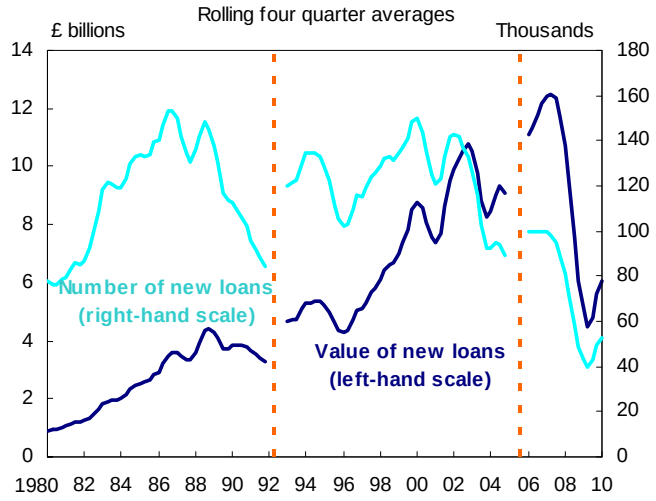
conditions for FTBs remain tight, mainly due to high deposit requirements for mortgages. And although demand and lending have increased over the last year, many FTBs are dependent on assistance, often from parents, to raise the large deposits required. In discussions with the Bank in June 2010, the major UK lenders expected lending to FTBs to remain subdued over the remainder of 2010.

Lending to first-time buyers

4. Looking over the longer term, the value of new loans to FTBs showed fairly steady growth between 1980 and 2006 (**Chart 3**). Much of this was driven by rising house prices and loan values, as over that period the number of new loans was little changed in comparison. But since the start of the financial crisis in late 2007 both the value and number of new loans to FTBs contracted rapidly, with the number of loans reaching 30,000 in 2009 Q1 (**Chart 4**) – the lowest quarterly value reported since records began in 1974.

Chart 3

Lending to first-time buyers: long-run smoothed data (rolling four quarter averages)

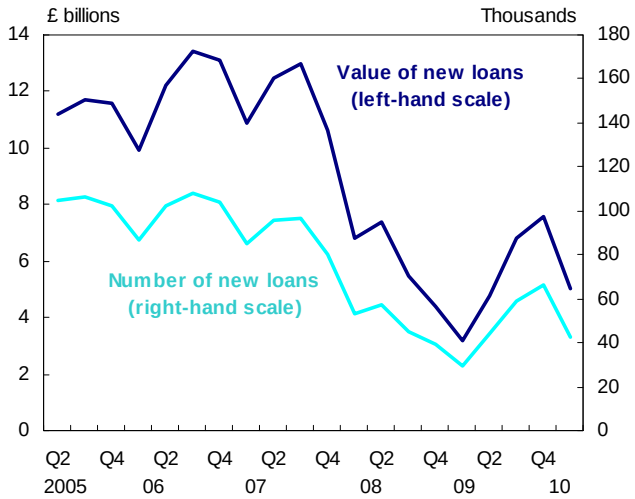


Source: CML.

Rolling four quarter averages of the value and number of new loans to FTBs, to 2010 Q1. For example, the 2010 Q1 figure is the average of 2009 Q2 – 2010 Q1 values. Dotted lines indicate breaks in series. See the Annex for details of the series breaks. Non seasonally adjusted.

Chart 4

Lending to first-time buyers: short-run data, not smoothed



Source: CML.

Non seasonally adjusted.

5. More recently, there has been some increase in both the number and value of new loans to FTBs in 2009, and although lending fell back in 2010 Q1, it remains stronger than a year ago. The fall in 2010 Q1 was largely reported to reflect one-off demand-side factors, such as the end of stamp duty tax relief at the end of 2009 and adverse weather around the turn of the year. These effects make assessing the current underlying strength of the market difficult, though looking through these recent movements, new loan numbers remain far below the levels immediately before the crisis and those of the early 1990s recession. In order to understand how significant the recent recovery in lending has been and whether a

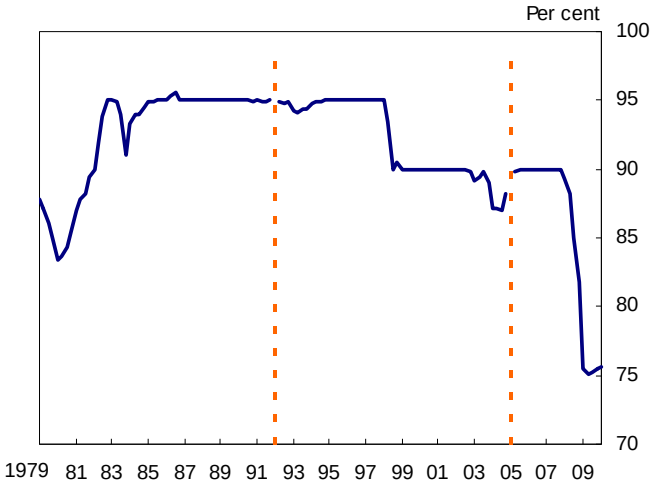
further increase is likely, we need to look into the factors driving the aggregate trend, in terms of supply and demand for credit.

Lending Criteria

6. Discussions with the major UK lenders in June indicated that loan-to-value (LTV) ratios are currently the most significant constraint on borrowing for FTBs. Since the early 1980s FTBs have tended to borrow at high LTVs, of at least 90%, as they tend to be younger and have smaller savings and, unlike home movers and remortgagors, cannot use the equity in a property they own to finance the deposit. But **Chart 5** shows that after a prolonged period of relative stability, the median LTV ratio on FTB loans fell sharply following the start of the financial crisis, and stood at some 75% in 2009. The proportion of FTB mortgages advanced at LTV ratios of 90% or above fell from around 45% in 2007 to less than 5% in 2009 (**Chart 6**). Although the tightening of LTV criteria should help contain lenders' exposure to risk and would be consistent with a more prudent approach to lending, one effect has been to make it more difficult for FTBs to get on the housing ladder.

Chart 5

Median LTV ratio on new loans to first-time buyers

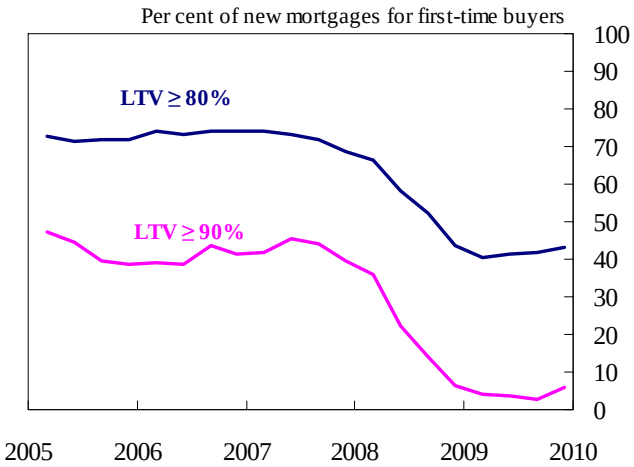


Source: CML.

Quarterly data to 2010 Q1. Dotted lines indicate breaks in series. See the Annex for details of the series breaks. Non seasonally adjusted.

Chart 6

First-time buyer high LTV lending

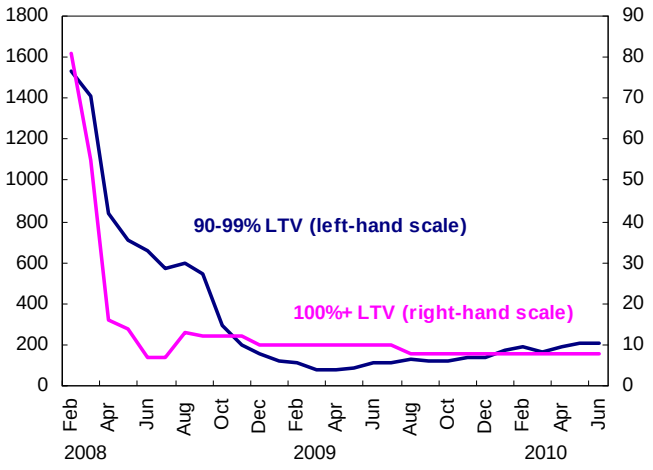


Source: FSA Product Sales Database (PSD).

Quarterly data from 2005 Q2 to 2010 Q1. The data submitted by each lender to the PSD are the same as that for post-2005 Q2 CML data in **Chart 5**, but the PSD has slightly larger coverage than CML data. Non seasonally adjusted.

Chart 7

Number of advertised high LTV products

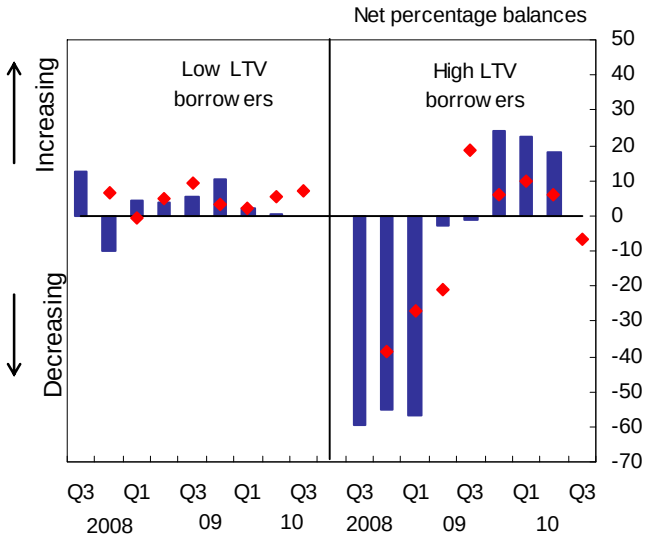


Source: Moneyfacts Group plc.

Monthly data to June 2010.

Chart 8

Secured credit availability by LTV ratio



Source: Bank of England's *Credit Conditions Survey*.

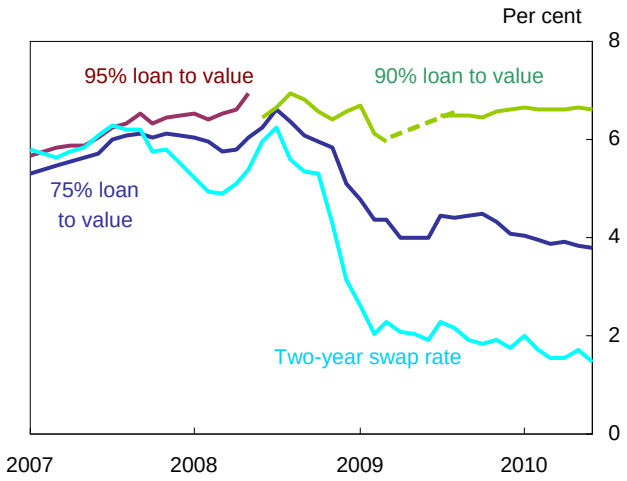
The blue bars show the responses over the previous three months. The red diamonds show the expectations over the next three months, moved forward a quarter. A positive balance indicates that more credit is available.

7. The fall in the median LTV on FTB loans has coincided with a sharp reduction in the number of high LTV products available on the market (**Chart 7**), which suggests that it was caused by banks tightening lending criteria rather than a shift in borrower preferences. In addition to this, evidence from the Bank's *Credit Conditions Survey* (**Chart 8**) shows that over the year to 2009 Q3 lenders significantly reduced credit availability for high LTV borrowers, while credit availability for low LTV borrowers was little changed. It is likely that house price falls, funding and capital constraints, and a re-assessment of the risk on high LTV mortgages have all contributed to reduced availability of these products. But more recently there have been signs of stabilisation in the high LTV mortgage market. In recent discussions with the Bank some major UK lenders reported a tentative increase in their willingness to lend at high LTV ratios, partly reflecting improved house price outlook, lower than expected arrears and unemployment, and some easing in wholesale funding conditions. This is in line with the *Credit Conditions Survey* finding of increased credit availability at higher LTV ratios in 2009 Q4 – 2010 Q2 (**Chart 8**).

8. Perhaps reflecting the easing in high LTV credit availability, the proportion of FTB loans advanced at LTV ratios of 90% or more ticked up in 2010 Q1 (**Chart 6**). But the share of loans advanced at higher LTV ratios remains very low, and estimates based on CML data suggest that, despite the fall in house prices, the median FTB deposit increased from £13,000 in 2007 to £32,000 in 2010 Q1. The high deposit requirements have made it harder for FTBs to access mortgages, perhaps particularly given the effects of recession in restraining wage growth and reducing job security. Those effects may also have encouraged households to hold higher levels of precautionary savings, rather than commit their savings to house deposits.

Chart 9

Quoted rates on two-year fixed rate mortgages

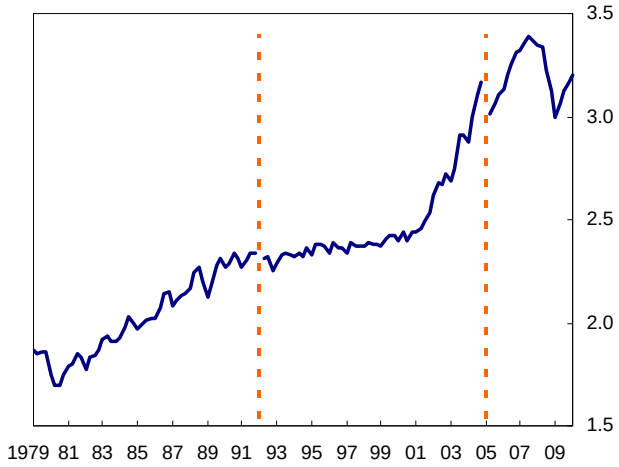


Source: Bank of England.

End month rates. Monthly data to May 2010. 95% LTV series finishes in April 2008, and 90% LTV starts in May 2008, and is not published for March–May 2009, as fewer than three products were offered in these periods.

Chart 10

Median loan-to-income ratio for first-time buyers



Source: CML.

Quarterly data to 2010 Q1. Dotted lines indicate breaks in series. See the Annex for details of the series breaks. Non seasonally adjusted.

9. Those FTBs able to access high LTV products are paying high interest rates relative to those borrowing at lower LTV ratios. **Chart 9** shows that while the quoted rate on two-year fixed 75% LTV mortgages fell following reductions in swap rates in late 2008, the rate on 90% LTV mortgages in recent months has remained little changed, and above rates seen on 95% LTV mortgages in early 2007, despite large falls in swap rates since that time. Although the high spreads between the 90% and 75% LTV mortgages partly reflect heightened credit risk and so capital costs, they are also likely to reflect a low level of competition in the high LTV mortgage market, following a withdrawal of some lenders after the start of the financial crisis. In discussions with the Bank in early 2010, some major UK lenders suggested that competition was focused on low LTV lending.

10. Where lenders have lent to FTBs, the loan-to-income (LTI) ratios have been only slightly lower than at their peak in 2007 (**Chart 10**). LTI ratios remain at much higher levels than in the 1980s and 1990s, following a period of rapid growth between 2001 and 2007. In recent discussions with the Bank, some of the major UK lenders reported that although they have not made significant changes to LTI criteria over recent months, they tend to rely more on other affordability checks, such as testing the ability to maintain repayments at “stress level” interest rates of around 6-8%. Some lenders also said that credit scoring and affordability criteria for high LTV products on which FTBs tend to rely are more restrictive than those on lower LTV products, reflecting the greater credit risks in higher LTV lending.

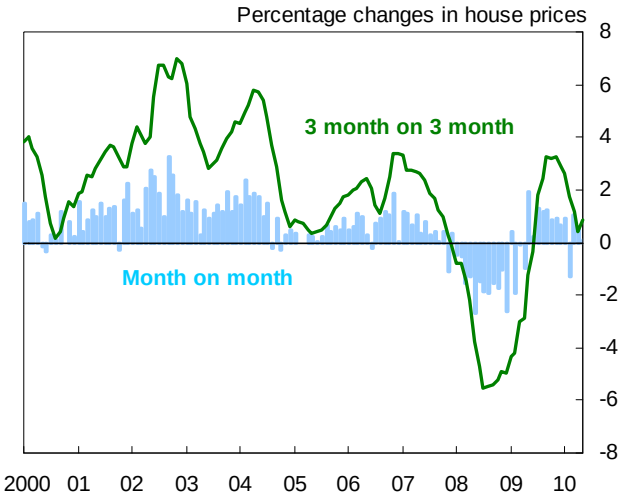
11. So overall, market indicators point to reduced mortgage availability compared both to the pre-crisis period and the longer term, in the form of tighter LTV criteria and elevated spreads on high LTV products. However, LTVs appear to have stabilised and LTI ratios have only fallen slightly since the 2007 peak, with some lenders indicating recently an increased willingness to lend at high LTVs.

Demand

12. The fall in FTB lending since early 2007 appears to have reflected reduced loan demand as well as tighter loan availability, though it may be that the tightening in credit availability has contributed to the weakening of demand. The weakening of economic activity following the start of the crisis, and the associated uncertainty around household incomes, will have made FTBs more reluctant to borrow: in particular, for those looking to borrow at higher LTV ratios, who will face higher mortgage spreads (**Chart 9**). The March 2010 *Building Societies' Association Property Tracker* survey shows that the lack of job security was considered one of the top three barriers to property purchase by around 60% of borrowers between December 2008 and March 2010, compared to only 12% in June 2008. Finally, for those households who are able to raise the deposits and can afford repayments, demand has been constrained by the low levels of housing stock for sale – though this appears to have eased somewhat in recent months. And overall housing market confidence is likely to have fallen in light of the falls in house prices in 2007-09 (**Chart 11**) and increased uncertainty about the housing market prospects.

Chart 11

House price inflation



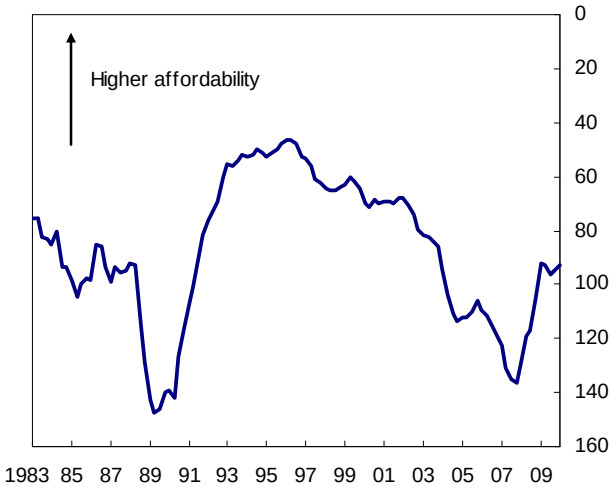
Sources: Nationwide, Halifax and Bank calculations.

House price inflation is calculated using the average of the Halifax and Nationwide indices. The published Halifax index has been adjusted in 2002 by the Bank of England to account for a change in the method of calculation. Monthly data to May 2010. Seasonally adjusted.

Chart 12

Nationwide's first-time buyer affordability index

(base = 1985 average)



Source: Nationwide.

Quarterly data to 2010 Q1. The index measures the proportion of initial mortgage payments to take-home pay. Inverted scale. Higher numerical values of the index indicate lower affordability. Non seasonally adjusted.

13. Following the initial slowdown, demand from FTBs is likely to have increased in 2009, alongside a more general increase in demand for house purchase indicated in the Royal Institution of Chartered Surveyors (RICS) *Housing Market Survey* and the Bank's *Credit Conditions Survey*. The September 2009 RICS survey also pointed to increased

demand from FTBs, specifically over the three months to August 2009.[4] A number of major UK lenders said that the rise in demand in 2009 partly reflected pent-up demand from FTBs coming back to the market, perhaps encouraged by lower house prices. Lenders also noted that the stamp duty tax relief on purchases of property valued up to £175,000, effective between September 2008 and December 2009, brought forward some planned purchases.

14. In the most recent months, however, demand from FTBs looks to have fallen back, which helps explain the slowdown in lending in 2010 Q1 (**Chart 4**). The major UK lenders attributed most of this fall to temporary one-off factors, such as the end of the stamp duty relief and adverse weather around the start of the year, though it appears that the weakness in demand has been somewhat more persistent than initially anticipated. It is possible that the pent-up demand evident in 2009 has been sated, and the recent rise in house prices (**Chart 11**) has put some properties out of reach of aspiring FTBs. So despite the apparent recent recovery, there is some uncertainty about the underlying strength of the market. But for those borrowers able to access a mortgage, there is evidence to suggest that repayment affordability has improved.

Affordability

15. Repayment affordability generally depends on the size of the loan, the interest rate and borrower income. The fall in house prices following the start of the financial crisis (**Chart 11**) and tighter LTV criteria have led to a reduction in the size of a typical FTB mortgage. And although mortgage spreads have increased, the sharp reductions in Bank Rate and swap rates mean that those FTBs able to finance larger deposits, for example of some 25% of the property value, have generally faced lower interest rates in 2009 compared to 2007-08 (**Chart 9**).

16. Nationwide Building Society publish an index of FTB affordability, which uses data on mean earnings of a full-time worker on adult rates from the ONS earnings surveys, and on repayments for a typical 90% LTV mortgage to an FTB, to estimate the ratio of initial mortgage payments to take-home pay. This index suggests that affordability increased in 2007-08 to around its long-term average, and remained at this level in 2009-10 (**Chart 12**). Some caution is required in interpreting these figures, however: for example, affordability at the moment is supported by the low level of Bank Rate and swap rates, which are offsetting the effect of high spreads on mortgage rates. However, in the shorter term, with FTB demand and affordability having increased, the biggest obstacle to getting a mortgage is likely to be the high deposit requirement.

Disaggregating First-time Buyer Lending

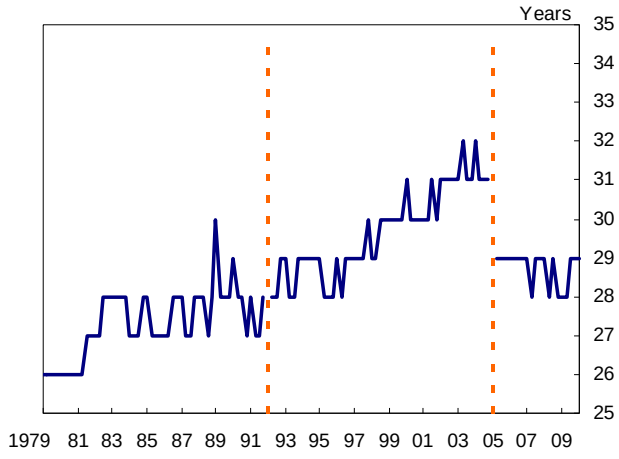
17. It is perhaps surprising that FTBs have continued to be able to raise the deposits required to access mortgage products. One explanation for this could be an increase in "returners" among FTBs, which may include second-home buyers and those borrowers who have sold a property previously and so can afford the larger deposits. CML estimates suggest that "returners" tend to be over 30 years old, older than "genuine" FTBs. So the median FTB age should provide an indication of whether the proportion of returners in the

[4] The specific question on demand from FTBs was a one-off question asked in the September RICS survey, available at http://www.rics.org/site/download_feed.aspx?fileID=4591&fileExtension=PDF.

market has increased. CML data show, however, that the median FTB age has remained little changed since 2005 (**Chart 13**).

Chart 13

Median first-time buyer age

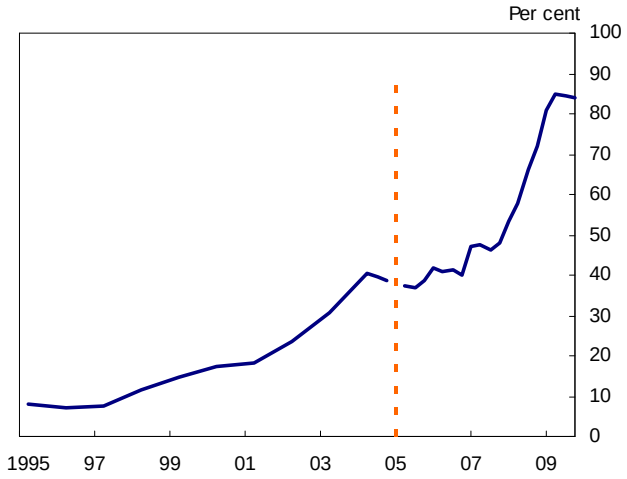


Source: CML.

Quarterly data to 2010 Q1. Dotted lines indicate breaks in series. See the Annex for details on the series breaks. Non seasonally adjusted.

Chart 14

Proportion of "assisted" first-time buyers aged under 30



Source: CML.

Annual data up to 2004 and quarterly data from 2005 Q2 onwards. Dotted line indicates the break in series in 2005 Q2 due to two different surveys used. The data before and after 2005 Q2 are not strictly comparable.

18. Even though the median age data suggest little change in the proportion of "returners" among FTBs overall, looking further into FTB statistics sheds some light on how FTBs are able to access mortgages in the current market. CML have produced estimates of the proportion of FTBs aged under 30 receiving deposit assistance (**Chart 14**), by estimating the number of FTBs whose deposits are higher than their savings to date.[5] These data suggest that the proportion of assisted FTBs has increased from around 50% in 2007 to 85% in 2009. The longer-term change has been even greater, as the proportion of assisted FTBs in 1995-97 was around 8%. With a rising proportion of younger FTBs receiving assistance, it is likely that the proportion of "returners" among unassisted FTBs has increased since the beginning of the crisis.

19. Some major UK lenders have confirmed that increased FTB activity has been supported by higher levels of parental deposits. And there are products on the market that are aimed specifically at assisted FTBs. The UK Government also provides support to FTBs, for example via the "HomeBuy"[6] shared ownership schemes, where the Government takes an equity stake in the property, reducing the deposit which needs to be raised by the borrower.

---

[5] Deposits data are collected directly from lenders. Savings to date are estimated based on a lifecycle savings model, using national earnings, taxation and savings rate data. For more details on the estimation see Tatch and Pannell (2006) "Will the real first-time buyers please stand up", Annex A.

[6] For further information on the HomeBuy shared ownership schemes see http://www.homesandcommunities.co.uk/homebuy.

Market Outlook

20. The high degree of deposit assistance among younger FTBs indicates that conditions in this market remain challenging. Looking forward, a number of factors affecting the UK financial sector and the broader macroeconomy may restrain lending to FTBs, and mortgage lending more generally.

21. The recent editions of the Bank of England's *Trends in Lending* report have indicated that bank funding conditions remain tight,[7] with term funding costs elevated, placing a potential limit on the volume of lending banks can support. Although conditions in wholesale and securitisation markets have improved relative to earlier in the crisis, recent concerns about sovereign risks have caused further disruption in these markets. Retail funding has remained relatively expensive as competition for these deposits has been high. The Bank's June 2010 *Financial Stability Report*[8] has highlighted that UK banks need to refinance a significant amount of wholesale funding over the next few years, which may be costly and difficult to raise, especially if banks seek to improve their liquidity position by increasing reliance on retail and long-term wholesale funding.

22. FTB demand may also remain subdued, reflecting the broader weakness in the macroeconomy and weak earnings prospects. The Bank's May 2010 *Inflation Report* suggested that the level of economic activity is very unlikely to return to its pre-crisis trend for a considerable period, and that high unemployment is likely to continue to exert downward pressure on earnings growth in the near term.

23. Overall, the data and market intelligence indicate that conditions in the FTB market have stabilised, but activity remains subdued and the structure of the market, in terms of lenders' ability to supply loans and households' ability to borrow, is very different from that before the crisis. In discussions in June, the major UK lenders expected lending to FTBs to remain weak over the remainder of 2010, and the CML have forecast only a modest increase in gross mortgage lending in 2010 for the housing market as a whole.[9]

---

7 For example, see the June 2010 edition of *Trends in Lending* Section 1, available at http://www.bankofengland.co.uk/publications/other/monetary/TrendsJune10.pdf.

8 Available at http://www.bankofengland.co.uk/publications/fsr/2010/fsrfull1006.pdf (see Chapter 4 in particular).

9 The CML forecast published in November 2009, available at http://www.cml.org.uk/cml/publications/marketcommentary/186.

Annex:
Data sources used in the paper

This paper draws on a variety of data sources, however the bulk of data on lending to FTBs is sourced from the CML (Charts 2-5, 10, 13, 14). CML data cover three different surveys, which collect data on individual mortgage transactions. Prior to 1992 Q2, data are for building societies only, grossed up from a 5% sample of mortgage completions. From 1992 Q2 onwards, CML data cover all mortgage lenders, however two different surveys are used before and after 2005 Q2. The Regulated Mortgage Survey used from 2005 Q2 onwards has a greater market coverage (over 90%) and more accurate data than the Survey of Mortgage Lenders used before 2005 Q2 (50% coverage). The FSA Product Sales data used in Chart 6 use the same definitions as the CML Regulated Mortgage Survey data, but are based on a larger sample of lenders.

The paper also draws on data collected by the Bank of England. The mortgage lending data in Chart 1 are based on a near-census survey collecting statistical data from UK-resident mortgage lenders. The quoted mortgage rates data in Chart 9 are also produced by the Bank of England, and are a weighted average of advertised mortgage rates for 30 UK-resident lenders (weights are derived from mortgage balances data). The advertised rates data are sourced from Moneyfacts Group Plc, who are also the source for the data on the number of advertised products by LTV (Chart 7). Chart 8 uses data from the Bank's *Credit Conditions Survey*, which has over 90% coverage for mortgage lending. This survey's net balances represent weighted sums of individual lenders' responses (weighted using balance sheet data).

The paper also makes use of data published by lenders, such as house price indices (Chart 11) derived from data on house purchase transactions financed by the lender, and an FTB affordability index (Chart 12), which measures the ratio of initial mortgage payments to take-home pay, using data from the CML and ONS earnings surveys.

Data analysis is supplemented by intelligence gathered by the Bank of England, based on regular discussions with the major UK lenders (Banco Santander, Barclays, HSBC, Lloyds Banking Group, Nationwide and Royal Bank of Scotland).[10]

[10] Membership of the group of major UK lenders is based on the provision of credit to UK-resident companies and individuals, regardless of the country of ownership.

Bibliography

Bank of England (2010a): Inflation Report, May 2010, Bank of England, London http://www.bankofengland.co.uk/publications/inflationreport/ir10may.pdf.

Bank of England (2010b): Financial Stability Report, June 2010, Bank of England, London http://www.bankofengland.co.uk/publications/fsr/2010/fsrfull1006.pdf.

Bank of England (2010c): Credit Conditions Survey, 2010 Q2, Bank of England, London http://www.bankofengland.co.uk/publications/other/monetary/creditconditionssurvey100701.pdf.

Bank of England (2010d): Trends in Lending, Bank of England, London http://www.bankofengland.co.uk/publications/other/monetary/trendsinlending.htm.

Building Societies Association (2010): BSA Property Tracker Survey, March 2010, Building Societies Association, London http://www.bsa.org.uk/docs/presspdfs/pt_Mar2010.pdf.

Royal Institution of Chartered Surveyors (2009): Housing Market Survey, Royal Institution of Chartered Surveyors, London http://www.rics.org/housingmarketsurvey.

Smith, Pannell, Holmans, Thomas (2005): Understanding first-time buyers, Council of Mortgage Lenders, London www.cml.org.uk/cml/filegrab/pdf_pub_resreps_56.pdf.pdf?ref=3875.

Tatch and Pannell (2006a): New mortgage market data: key changes and better information, Council of Mortgage Lenders, London www.cml.org.uk/cml/filegrab/Newmortgagemarketdata-keydifferencesbetweenRMSandSML_.pdf?ref=4635.

Tatch and Pannell (2006b): Will the real first-time buyers please stand up, Council of Mortgage Lenders, London www.cml.org.uk/cml/filegrab/03-2006-ftbs.pdf?ref=4640.

Session 6 C

Improving data on debt markets and securitisation

Chair: Joe McNeill, Central Bank & Financial Services Authority of Ireland

Papers:

Developing a database on securities holders: the case of Japan
Yoshiko Sato and Satoru Hagino, Bank of Japan

The development of securitisation statistics in Ireland
Clive A Jackson, Central Bank of Ireland

Developing data and information on Israel's credit market
Yair Haim, Bank of Israel

Developing a database on securities holders: the case of Japan

Yoshiko Sato and Satoru Hagino[1]

1. Introduction

Identifying the exact holder or the holding sector of securities is always one of the most challenging tasks for statistical compilers.

In macroeconomic statistics such as the flow of funds accounts, a balance sheet provides useful information on the amount of securities held, but aggregating balance sheets does not always provide a full picture of the economy. Balance sheets of non-financial corporations and some of other financial institutions, for example, are not always available, and households do not prepare balance sheets.

Under such constraints, some central banks and statistical authorities have started projects to build up securities databases to store information on securities holders. The ECB (2009) explains that its intention of establishing a single authoritative data source – the centralized securities database – is aimed at meeting the needs of the ECB itself. The BIS, ECB, and IMF (2010) are proponents of focusing on the holding side of securities statistics. This kind of movement is gaining ground especially after the recent financial crisis, in which securitized products incurred considerable financial losses to their holders, thereby transmitting risks throughout the financial system. The Financial Stability Board (2009) advocates the importance of knowing where risks actually lie across institutions.

This paper introduces the Bank of Japan's recent exploration of the Central Securities Depository (CSD) data as a statistical source of securities holders' information. This paper is organized as follows: Section 2 explains the features of the CSD in Japan. Section 3 introduces the recent achievement as a result of applying the CSD data to the flow of funds accounts statistics. Section 4 presents general challenges pertaining to CSD data as a statistical source to identify final holders of securities, sometimes referring to the results of the survey that the Bank of Japan conducted for seven OECD countries in April and May 2010. Section 5 offers concluding remarks.

2. Features of the CSD in Japan

CSD data in general are considered to have at least two advantages in data collection. One is the centralising of information, as detailed in this section, and the other is having a universe wider than that of administratively collected data. While the latter type of data is accurate, powerful, and quick, providing a view of the conditions of a specific sector, these data would appear to be weak in the sense that a data gap may exist outside the scope of authorities.

---

[1] Research and Statistics Department, Bank of Japan. The paper "Developing database on securities holders information: the case of Japan" was mainly written by Yoshiko Sato, and its annex "Securitization data and securitization ratio: some development issues" was mainly written by Satoru Hagino. The views expressed here are those of the authors and do not necessarily represent the views of the Bank of Japan. The authors are responsible for any errors and omissions.

2-A. The sole platform for book-entry transfers other than those involving central government bonds

The book-entry transfer services for securities other than central government bonds are provided by one CSD in Japan, which is the Japan Securities Depository Center, Inc. (JASDEC). The book-entry transfer services of central government bonds are provided by the Bank of Japan. This paper discusses the former.

The JASDEC is a privately owned stock company licensed under the Act on Transfer of Bonds, Shares, etc. (hereafter "the Law"). It operates the book-entry transfer system for general securities such as corporate bonds, stocks, commercial paper and investment trusts. Since the JASDEC is the sole platform for book-entry transfers for those securities, the information is centralized in this system on a security-by-security basis, thus giving it the potential to collectively gather information on securities holdings.

The Law provides for the company's book-entry transfer function but does not require it to supply data for statistics. So far there is no data exchange contract between the JASDEC and the central bank or statistical authorities.

The book-entry transfer system has been in operation since 2002. The rate of use of the system in CP transactions is almost 100%. That of other securities transactions is thought to be close to 100%.

2-B. Chain of accounts

The JASDEC system uses a cascade structure of accounts. As illustrated in the attached Chart, an investor who wants to make a transaction opens a customer account at either a direct account management institution (DAMI) or an indirect account management institution (IAMI). Once a deal is reached, the transactional information is transferred from the institution at which the investor holds an account to the institution keeping an account of the investor's transaction counterparty. If the investor indicated as "Participant (i)" in the Chart sells securities to the investor indicated as "Participant G", the information on the deal goes through institutions E, A, the JASDEC, and finally to C, where securities sold are entered on the books under the customer account of G (Case 1). However, if "Participant (i)" sells securities to "Participant (ii)", the transactional information is processed within E. IAMI E transfers the transactional amount from Participant (i)'s account to Participant (ii)'s account, and the transaction is completed within E (Case 2).

The DAMI or IAMI – usually banks or securities companies – can also hold its own accounts. Those accounts are called self accounts, which are separated from customer accounts in this system. As of May 2010, there are 89 DAMI and 407 IAMI in the book-entry transfer system for corporate bonds.

2-C. Finality of ownership (direct system vs. indirect system)

One of the features which is different from the CSDs of some other countries is the finality of the ownership of securities. In the JASDEC system, neither DAMI nor IAMI takes over the ownership of transacted securities at customer accounts, even though the process itself occurs in chains of accounts held by such intermediate institutions. Kanda (2009) describes the system as the "direct system". An account management institution merely keeps an investor account and provides book-entry transfer services. The legal ownership of securities remains with the investor and does not move to any other institution.

As opposed to the direct system, there are some countries in which an account management institution legally holds assets and an investor keeps an equitable interest in these assets, or a securities entitlement is moved from an investor to an account management institution. In this indirect system, it might be difficult to detect the final holder of securities.

2-D. Security by security

All data are handled on an individual issue basis in the book-entry transfer system. Information available for each issue includes the name of issue, name of issuer, face value, maturity, etc. Information on the current outstanding amount is also available. For example, with regard to corporate bonds whose data are required to be open to the public, one can obtain detailed information by searching the JASDEC website, using the name of the issue or the ISIN code as an identifier. This security by security system will enable compilers to sort data in accordance with the System of National Accounts, and it also has the potential to be used for multi-purpose securities databases.

3. Application of CSD data to flow of funds accounts

The Bank of Japan started discussing the possible use of data as a statistical source with the JASDEC in late 2009. This was primarily motivated by the need to secure a more accurate source of data for the flow of funds accounts statistics. In March 2010, some statistical improvements were made in handling the data, as a result of efforts by JASDEC to respond to the Bank of Japan's inquiry on data definition. Some of these improvements are summarized below.

3-A. ABCP

Asset-backed commercial papers (ABCP), a part of structured-financing instruments, had no reliable data source before the revision. Figures for the ABCP used to be estimated by assuming that they were part of other structured-financing instruments (Sato [2009]). Through the aforementioned process of discussions on the data, we confirmed that some data released by the JASDEC were consistent with our ABCP definition and decided to use them as new source data. As a result, the market size of the ABCP was more accurately reflected in the flow of funds accounts statistics.

3-B. Local government bonds

The information on the outstanding amount of local government bonds had not been centralized. Before the dematerialization started in 2006, the total outstanding amount had been estimated based on registered bonds. There were problems in the frequency of the data, which was annual, and in the existence of non-registered bonds (held in certificate) of which the amount had been deemed to be non-negligible.

As the dematerialization proceeded, a majority of local government bonds shifted from registered bonds to those in the book-entry transfer system. Since the system is open on the web every day and the data are stored security by security, we are able to confirm whether each issue falls within the definition of our statistics on any given date. Further, we successfully determined that non-registered bonds still exist but that their numbers are not so significant as to make estimation impossible. By conducting a series of examinations, we then concluded that the CSD's aggregate data were the most centralized and reliable primary data source at present to describe the total market size of local government bonds.

3-C. Privately placed asset-backed securities

Although we have improved the quality of the ABCP, the remaining part of structured-financing instruments, such as privately placed asset-backed securities, are still under examination. Classification of these issues by type of collateral (e.g., financial assets or real

estate) is required in order to designate transaction items as either securitized products or other kinds of corporate bonds.

We expect further improvement in the flow of funds accounts statistics as a result of incorporating information about privately placed asset-backed securities from CSD as of March 2011.

4. Challenges for statistical development of CSD data

While the CSD has a distinct advantage in data collection because of its electronically processed centralized system, challenges remain in developing the data as a source of information on final holders.

In this section, we examine the general challenges pertaining to CSD data as a statistical source to identify final holders of securities. We sometimes refer to the results of the survey that the Bank of Japan conducted in April and May 2010 asking central banks and statistical authorities whether they use CSD data for compiling financial statistics. Seven countries (the U.S., the U.K., Australia, Germany, Spain, Chile, and Canada) responded to the survey. The results of the survey are summarized in the Table.

4-A. Cascade structure of accounts

The major difficulty in identifying final holders from CSD data is a practical one that exists in a cascade structure of accounts. The transactional information is transferred from one institution to another as explained in 2-B. However, detailed information on an investor, such as the sector in which it is statistically classified, is held only by the account management institution at which the investor holds the account. In other words, detailed information on the investors is decentralized among account management institutions in the book-entry transfer system. System participants know the name, the characteristics and the amount of individual securities in the accounts they offer, but they do not have information about the ultimate owners of securities when the account is a customer account. For instance, the CSD and DAMI, which are located upstream in the chain structure, do not know of changes in the ownership of securities when a transaction is completed within the IAMI, as seen in Case 2 in section 2-B. Therefore, for statistical purposes, compilers should adopt another measure to obtain information on the entire market.

Most countries, by accessing supplementary source data other than CSD, can overcome the cascade account structure problem. In countries that have an indirect system and where it is considered difficult to detect final holders, CSD data are either selectively used or are not used for compilation at all. In the U.S., CSD data are used along with private vendor data for bonds and stocks issued by non-financial corporate businesses. The amount of asset-backed securities issued is measured as the assets removed from the balance sheets of originators. CSD data are used selectively for ABCP because they cover 100% of the market. The amount of ABCP is then used to calculate the amount of asset-backed corporate bonds by deducting it from the total amount of asset-backed securities. In the U.K., the CSD data are used as part of a quality assurance process but not for data compilation. Instead, data collected from London-based issuing and paying agents are used for published securities issues statistics.

Even in the countries with a direct system, data given by intermediate institutions are also used for financial statistics. In Spain, for Balance of Payments and International Investment Position, the CSD data are used for debt securities issued by residents and held by non-residents. The data incorporate the country of residence of the first-known counterpart but not of the final holder. If there is a resident custodian between non-resident and CSD, it is the resident custodian that has the information, and CSD data do not cover the transaction.

Information provided by resident custodians is also used, on an aggregated basis, to identify the holdings of securities by non-financial corporations and by households. In Germany, the CSD is one of about 2,000 reporting agents.

In Chile, the Central Bank of Chile does not currently use information given by CSD for the compilation of yearly financial accounts statistics. Nevertheless, it is working on a project related to quarterly financial accounts, in which CSD data – including information on securities holders – will be used intensively.

In Japan, one of the challenges in using CSD data is to obtain supplementary information about customer accounts in the DAMI. At present, accounts of which the JASDEC manages the outstanding amount are basically limited to those set up within the JASDEC itself, illustrated in the Chart as accounts for A, B, and C. Ideally, the data should cover all participants of the book-entry transfer system, including both the DAMI and the IAMI. Most major financial institutions participate in the system as DAMIs. If the owners' information on securities in DAMIs' customer account becomes available with the cooperation of JASDEC and DAMIs, the information can be applied to the composition of customer accounts in the IAMI to estimate the amount of each type of security held by each sector. The estimation could be conducted with relative accuracy since all DAMIs and IAMIs are registered at JASDEC and since it is known that the chain structure does not extend to more than a few layers.

4-B. Confidentiality of customer accounts

The other reason for the difficulty in obtaining accurate information is the confidentiality of customer accounts. Even if the cascade account structure problem is technically solved, the confidentiality problem remains. There are self accounts and customer accounts, as explained in 2-B. We can relatively easily identify, in our direct system, whether an account held by an account management institution is a customer account or a self account. But detailed information on a customer, which is necessary for compiling statistics, is usually hard to obtain. This is partly because contracts with customers commonly require custodians or account management institutions to keep the accounts confidential, thus making them reluctant to provide customer information.

In order to overcome the confidentiality problem, central banks or statistical authorities will need a contract with CSD or with custodians stating that only aggregate data will be provided and that individual data will not be shared. In the U.S., the Federal Reserve receives data from the CSD based on a contract that contains a confidentially clause prohibiting it from sharing data of individual firms. From a statistical point of view, compilers do not need firm-level information. They only need aggregate data classified according to institutional categories of securities holders. Such data do not need to be security by security as long as they are correctly reported.

4-C. Cooperation with CSD and with securities-related industries

The third factor is the cooperation with CSD and with securities-related industries. According to our survey, all of the three countries using CSD data (the U.S., Australia, and Chile) are confirmed to have a contract or an agreement with CSD on obtaining data. This suggests that the securities-related industries agree, in principle, to using CSD data. Germany and Spain go further; they have official central bank regulations that stipulate a mandatory data collection scheme. Therefore, it seems that there is a general understanding of the statistical value that CSD data has in the economy.

Also, in Japan it is understood that the development of financial and securities statistics is an important issue and will contribute to the growth of the securities market. Based on such an understanding, a conference was held in late 2009 – the Japan Securities Dealers

Association was the organizer – with participants such as the members of securities-related industries; the Bank of Japan also participated as an observer. Participants argued that the availability of additional CSD data could increase understanding of securities markets.

5. Concluding remarks

This paper has introduced the Bank of Japan's recent exploration of the CSD data as a statistical source of information on securities holders. The CSD in Japan has several features suitable for data collection: the fact that it is the sole platform for book-entry; the finality of ownership; and its security by security nature. Through communication with the CSD, we have achieved statistical improvement in our flow of funds accounts statistics mainly for a specific market size – the ABCP and local government bonds – and we can expect further improvement by incorporating privately placed asset-backed securities in the CSD data next year.

While CSD data have a distinct advantage in data collection because of the electronically processed centralized system, there are challenges to overcome in developing the data as a source of information on final holders. General challenges are: the cascade structure of accounts; confidentiality of customer accounts; and cooperation with CSD and securities-related industries.

Approaches to data gaps being considered to address the recent financial crisis should focus on developing a wider and more reliable source of information. Although there are many challenges, CSD data will continue to be a strong candidate in shedding light on sectors such as households, non-financial corporations, and certain other financial institutions.

Chart : Accounts structure of the JASDEC

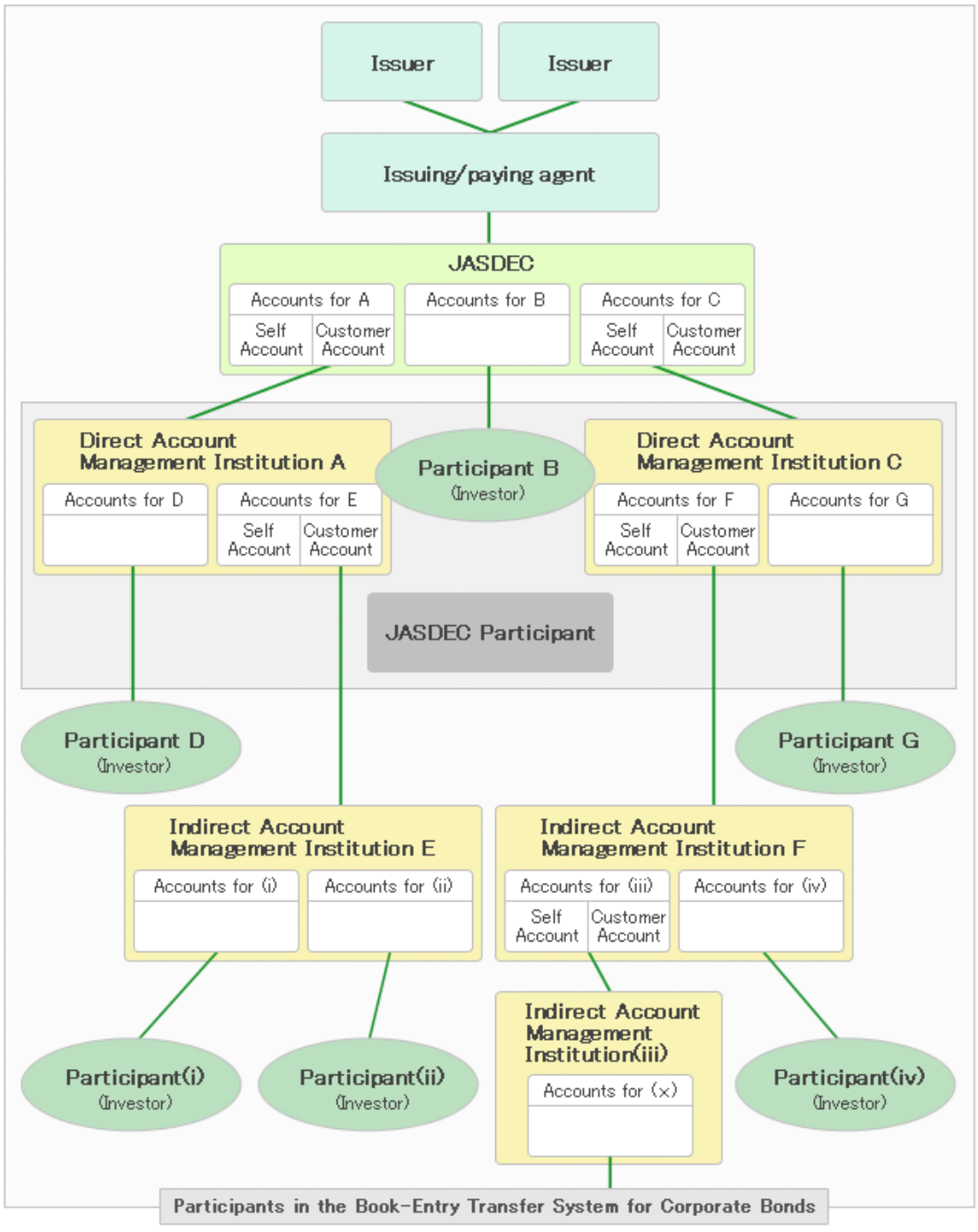


Table. CSD data usage in financial statistics

	Respondent	CSD				Data used other than CSD (i.e. custodians)
		Data usage	Holders' information	Coverage	Contract/agreement	
U.S.	Federal Reserve	○ 1)	×	Low (ABS) High (ABCP)	○	
U.K.	Bank of England	×	-	-	-	○ (London based issuing and paying agents)
Australia	Australian Bureau of Statistics	○	×	Low (voluntary registration)	○	○
Canada	Statistics Canada	×	-	-	-	○
Germany	Deutsche Bundesbank	○	△ (Not in all cases final holders)	Low	○	○
Spain	Banco de España	○	△ (debt securities issued by residents and held by non-residents)	Low (If between the non-resident and the CSD there is a resident custodian, it is the latter who declares.)	○	○ (custodians, used to identify the holdings of securities by Non-financial corporations and by Households.)
Chile	Banco Central de Chile	× → ○ 2)	- → ○	—	- → ○	
Japan	Bank of Japan	○	× → ○ (e.g. Local government bonds held by non-residents) 3)	High	×	×

Notes: 1) CSD data is used for bonds and stocks issued by non-financial corporate businesses along with other private vendor data. CSD data gives inadequate coverage for asset-backed bonds (probably less than 20 percent of the market), while CSD data on asset-backed CP is 100 percent of the market.

2) Currently, the Banco Central de Chile does not use the information given from the CSD for the compilation of yearly financial accounts statistics. Nevertheless, it is working in a project of quarterly financial accounts, where CSD data will be used intensively, including the securities holders' information.

3) It is identifiable by aggregating the amount of the tax exempt accounts which are specially allowed for non-residents. The figure is released by JASDEC.

Annex:
Securitization data and securitization ratio: some development issues

This annex discusses the source data on holdings of securitized instruments issued by foreign special purpose companies (SPCs) and domestically established SPCs. Such data are useful for a comparison with the development of global securitization data. The core of this approach concerns the securitization ratio[2] and the need to improve its accuracy and relevance. Needless to say, improved measurement of ABSs, as discussed above, will improve the accuracy of the securitization ratio.

1. Measuring Holdings of Securitized Instruments issued by foreign SPCs

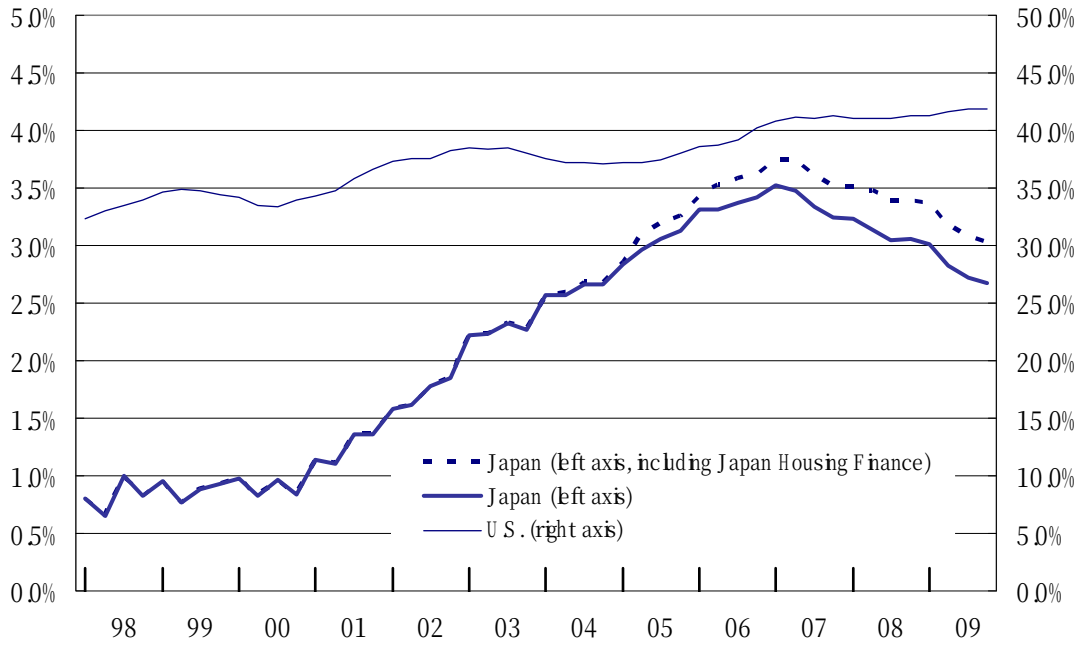
Japan's securitization ratio started to decline in 2007, while the U.S. ratio appears to have increased in 2008 (see Chart 1). Some parts of securitized instruments issued in the U.S. were purchased by Japan's financial institutions in 2008. This implies that the securitization ratio needs to be supplemented by the amount of purchases of securitized instruments issued abroad. However, measuring such purchases is no easy task.

In fact, purchases of securitized instruments issued abroad are not statistically separated from other outward investments in securities, either in statistics on flow of funds accounts or in statistics on balance of payments and international investment positions.

Ideally, the amount of purchases of securitized instruments issued abroad should be identified in these statistics. If this is plausible, such amounts could be shown in a separate item within statistics on outward investments in securities. Alternatively, such amounts can be included in structured-financing instruments within securities other than shares. However, this compilation method blurs the distinction between instruments issued by foreign SPCs and those issued by domestically established SPCs and thus a part of from-whom-to-whom information on this item is lost.

[2] A securitization ratio – which is calculated by dividing the amount of securitized instruments (domestically issued) by the total amount of financial assets that can be securitized – is a typical indicator derived from the flow of funds accounts.

(Chart 1) Securitization Ratios: the U.S. and Japan



Based on the report on "Leading-Practice Disclosures for Selected Exposures," published in April 2008, the Financial Service Agency (FSA) has published data on depository corporations' holdings of securitized instruments. The data start from September 2007 for sub-prime instruments, and from March 2008 for securitized instruments other than sub-prime instruments (see Chart 2). Sub-prime instruments can be regarded as securitized instruments issued abroad. For securitized instruments other than sub-prime instruments, the FSA data separate out instruments with underlying assets originating abroad. Such instruments can be regarded as securitized instruments issued by foreign SPCs. Thus, FSA data may be used as sources for the flow of funds accounts statistics.

One shortcoming[3] of the FSA data is the exclusion of residential mortgage-backed securities (RMBS) issued by the U.S. government-sponsored enterprises (GSEs). This is because RMBS are not as risky as other securitized instruments such as sub-prime instruments. According to the FSA, this information gathering is aimed at determining how the magnitude of securitized instruments held affects the soundness of depository corporations. Thus, the RMBS are not necessarily the focus of the FSA.

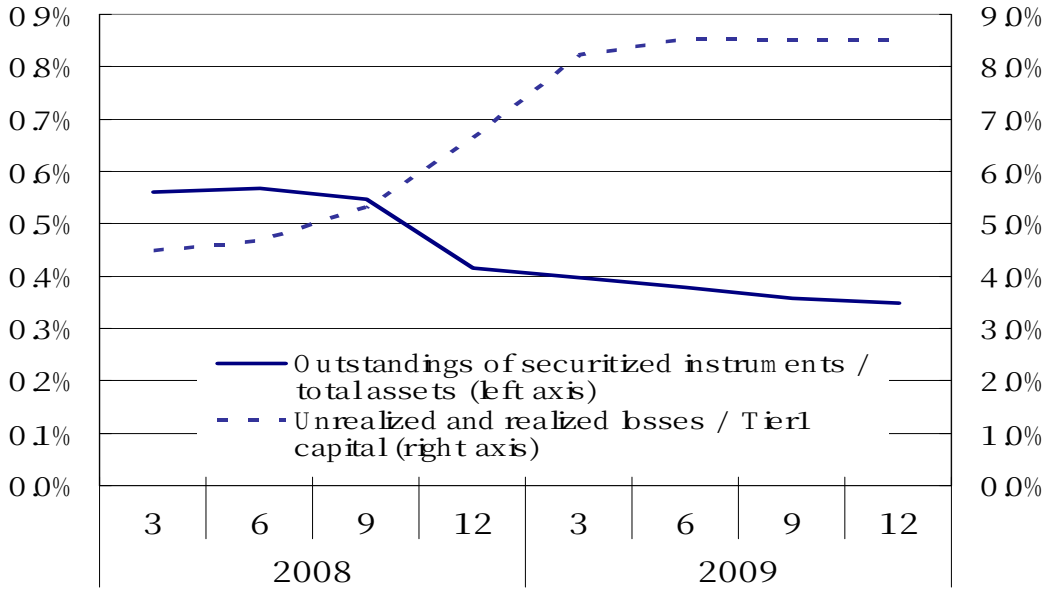
The FSA data are an example that highlights the difficulty of reconciling macro-prudential perspectives and macro-economic perspectives. Specifically, the amount of unrealized and realized losses in such securitized instruments, excluding GSEs' RMBS, exceeds 8% of Tier 1 capital. In contrast, based on the FSA data, the ratio of the outstanding of depository corporations' holdings of securitized instruments issued abroad against their total assets remains around 0.5%. Even if GSEs' RMBS are added to the outstanding of depository corporations' holdings of securitized instruments, using a research result for four large Japanese depository corporations, the ratio barely exceeds 1%. Thus, the importance of securitized instruments from a macro-prudential perspective has increased, while their

[3] Another shortcoming is that the FSA does not collect data on holdings of securitized instruments by institutional investors such as insurance companies and pension funds.

importance as a means of financial intermediation by depository corporations has decreased, as the maneuver of changing asset composition has been reined in.

Differences in statistical coverage need to be reconciled in converting macro-prudential data to macro-economic data. Specifically, the FSA data are compiled on a consolidated basis, i.e., holdings of securitized instruments by foreign subsidiaries and branches of depository corporations are included. For the purpose of the flow-of-funds accounts statistics, which are compiled on a residency basis, such holdings need to be separated and recorded as holdings of the rest-of-the-world sector.

(Chart 2) Magnitude of Depository Corporations' Holdings of Securitized Instruments Issued Abroad



2. Development of Statistics on domestically established SPCs

Under Japan's Act on Securitization of Assets, all SPCs established in Japan must register at the FSA and submit their annual financial reports. However, the FSA has not published an aggregate balance sheet of SPCs. In the absence of such a balance sheet, data for the financial positions of Japan's SPCs, including their liquidity and leverage ratio, have not been compiled. In compiling flow-of-funds accounts statistics, ABSs and their underlying assets are recorded using data on ABS issues and balance sheet data of banks' trust accounts. In Japan, trust accounts are generally used as the first receptor of liquidated assets, and trust beneficiary rights are held by SPCs as underlying assets of ABSs. Financial assets and liabilities of SPCs, other than structured-financing products and underlying assets, such as their deposits and shares, need to be estimated using asset/liability composition ratios.

The composition of financial assets and liabilities of SPCs can be assumed from the balance sheet of the Securitization Support Account of the Japan Housing Finance Agency, which is disclosed on an annual basis (see Table below). The amount of purchased housing loans nearly corresponds to that of RMBS issued; this accounts for about 80% of total assets/liabilities. However, the amount of holdings of securities, including the positive and negative market value of financial derivatives, cannot be ignored. Thus, the balance sheet of such accounts should be made available more frequently for the compilation of flow of funds accounts statistics.

A conceptual problem exists in the treatment of the Securitization Support Account. At present, this account is not included in the flow of funds' Structured-Financing Special Purpose Companies and Trusts sector, because it is not an independent legal entity. Rather, it is included in the Government Financial Institutions sector. However, its economic function[4] is similar to that of SPCs used in Japan's securitization process. In addition, analyzing this account in the Structured-Financing Special Purpose Companies and Trusts sector would be analytically useful, since the issuance of RMBS by this account represents more than half of the recent issuance of securitized instruments. Japan's securitization ratio, as shown in Chart 1, did not fall significantly even after 2007, if one includes RMBS in the calculation of the ratio.

[4] Activities of the Securitization Support Account of Japan Housing Finance Agency aim at facilitating the provision of long-term housing loans with fixed interest rates by private financial institutions. Just as SPCs are used in Japan's securitization process, the Securitization Support Account purchases and entrusts housing loans of private financial institutions and issues RMBS using the trust beneficiary rights as collateral.

(Table) Balance Sheet of Securitization Support Account of Japan Housing Finance Agency

(Unit: million yen)

item	FY 2007	FY 2008	item	FY 2007	FY 2008
(Assets)			(Liabilities)		
Cash and due from banks	13,119	18,260	Bonds	2,653,273	3,202,424
Cash	0	0	Mortgage-backed securities	2,591,147	3,071,071
Due from banks	857	761	General mortgage bonds	62,142	131,399
Agency deposits entrusted	12,262	17,499	Bond issue premiums (△)	△ 17	△ 46
Receivables under resale agreement	-	17,494	Reserve for insurance	-	105
Securities	219,381	293,982	Reserve for payment	-	105
Government bonds	122,302	120,782	Other liabilities	259,685	277,053
Local government bonds	2,510	6,429	Accrued expenses	3,626	4,593
Government guaranteed bonds	16,030	16,624	Financial derivative products	114,053	165,238
Corporate bonds	68,240	150,147	Financial derivative product gain carry forward	11,256	13,314
Certificates of deposit	10,300	-	Accounts payable	128,912	88,940
Purchased loans	2,781,729	3,286,301	Other liabilities	249	3,474
Other assets	130,953	181,404	Accounts payable for other accounts	1,590	1,494
Accrued revenue	4,386	5,319	Allowance for bonuses	294	300
Financial derivative products	107,992	152,317	Allowance for retirement benefits	9,427	10,169
Financial derivative products loss carry forward	17,810	22,487	Guarantee obligation	28,058	197,097
Accrued insurance premiums	14	43			
Other assets	146	193	Total liabilities	2,950,736	3,687,149
Accounts receivable for other accounts	605	1,045			
Tangible fixed assets	38,532	39,815	(Net assets)		
Buildings	16,256	16,323	Capital	271,300	357,300
Accumulated depreciation (△)	△ 865	△ 1,738	Government investment	271,300	357,300
Accumulated impairment losses (△)	-	△ 514	Capital surplus	-	△ 873
Land	22,747	22,747	Accumulated impaired loss not included in profit and loss (△)	-	△ 873
Accumulated impairment losses (△)	-	△ 352	Loss carry forward	△ 16,505	△ 19,292
Other tangible fixed assets	511	4,361	Unappropriated loss	△ 16,505	△ 19,292
Accumulated depreciation (△)	△ 117	△ 1,005	(of which, gross loss for the current fiscal year)	(△3,297)	(△2,787)
Accumulated impairment losses (△)	-	△ 7			
Guarantee obligation reversal	28,058	197,097	Total net assets	254,795	337,136
Reserve for possible loan losses (△)	△ 6,242	△ 10,069			
Total assets	3,205,530	4,024,284	Total liabilities and net assets	3,205,530	4,024,284

Reference

BIS, ECB, and IMF (2009). Handbook on Securities Statistics, Part 1: Debt securities issues. May 2009.

——— (2010). Handbook on Securities Statistics, Part 2: Debt securities holdings. Draft, February 2010.

ECB (2009). The centralised securities database in brief. February 2010.

Financial Stability Board (2009). The Financial Crisis and Information Gaps. Prepared by the IMF Staff and the FSB Secretariat.

Kanda, Hideki (2009). The Legal Environment for Holding and Transfer of Intermediated Securities: UNIDROIT Draft Convention.

Sato, Yoshiko (2009). Measuring Securitization in the Flow of Funds Accounts in Japan. COM/STD/DAF document presented at the WPFS of OECD meeting held on 2-4 November 2009.

The development of securitisation statistics in Ireland

Clive A Jackson[1]

1. Introduction

The recent crisis has highlighted a number of areas where the information which is available to policy makers has failed to keep pace with financial innovation. One such gap relates to credit risk transfer – an area which has increased greatly in its use and complexity in recent decades. Within the euro area, this is being tackled on two fronts: the collection of loan sales and transfers by resident monetary financial institutions (MFIs), and the collection of data from resident financial vehicle corporations (FVCs) which are engaged in securitisations.

Statistics on securitisation in Ireland developed in tandem with their use by domestic credit institutions, in order to complete data on lending to the private sector. However, in recent years, Ireland has become a prominent location for FVCs which are engaged in securitising loans of *non*-resident credit institutions and in a wide range of related activities, such as the repackaging of asset-backed securities into new securities. This sector has grown to just under 15% of the total financial sector in terms of assets. Ireland has the largest population of FVCs within the euro area by number and assets. These vehicles have been subject to reporting requirements since December 2009 under the ECB Regulation on Financial Vehicle Corporations[2].

The size and nature of the FVC population has posed numerous challenges in terms of identification and data collection, some of which are still in the process of being resolved. The purpose of this paper is to provide an overview of the collection of securitisation statistics in Ireland in terms of its early and more recent development, and a synopsis of future developments and improvements which could be made within the existing framework.

2. Background

As in other common law jurisdictions, securitisation uses a vehicle (FVC), which is typically set up as a bankrupt remote company with the beneficial shareholding held on trust by share trustees. Directors of the FVC are often provided by its "corporate services provider", which also supplies a registered address for the vehicle and other administrative functions.

Certain tax provisions for securitisation companies located in the International Financial Services Centre (IFSC) were first introduced in 1991 and allowed them to be structured as broadly tax-neutral. These provisions could be utilised by companies holding "qualifying assets", and were extended to transactions outside the IFSC in Section 110 of the Taxes Consolidation Act 1997 (effective in 1999). The range of qualifying assets was widened considerably in an amendment of Section 110, in Section 48 of the Finance Act 2003. Section 110 companies may hold equities, bonds, receivables, leases and derivatives as assets. Property is not a qualifying asset, but the vehicle may invest in another company

---

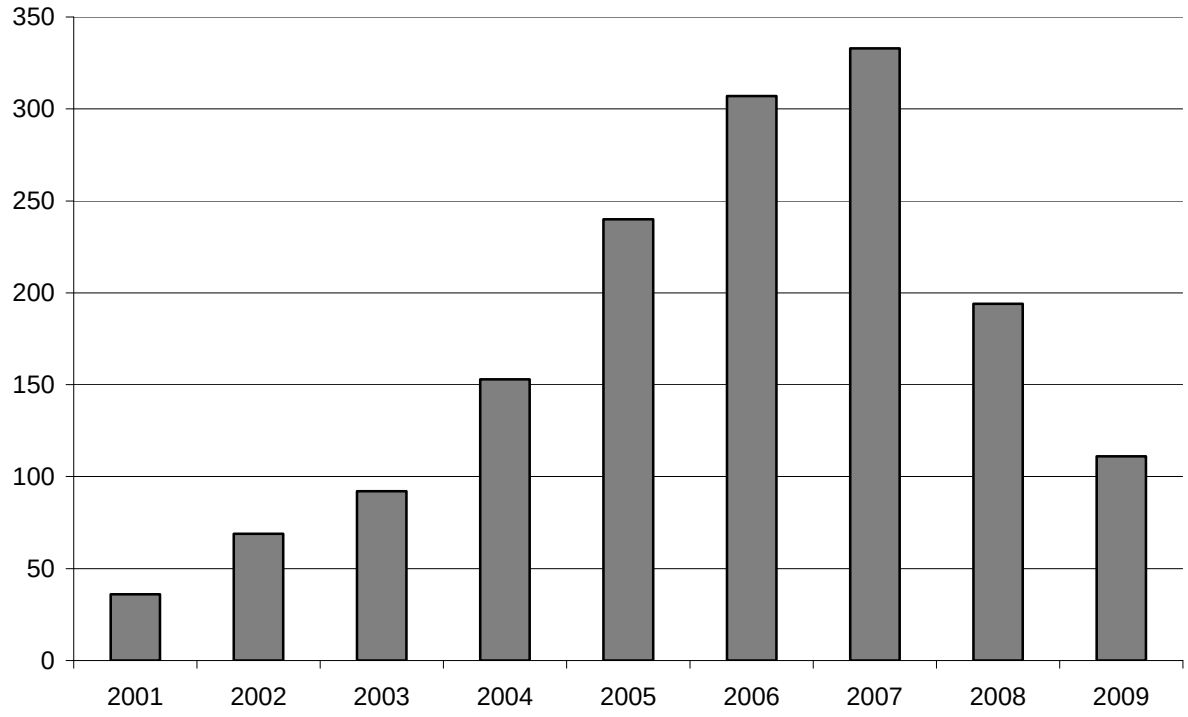
[1] Statistics Department, Central Bank of Ireland.

[2] Regulation ECB/2008/30 concerning statistics on the assets and liabilities of financial vehicle corporations engaged in securitisation transactions.

which holds property. Qualifying assets were further extended in subsequent years, to include investments in money market funds in 2006, and greenhouse gas emissions and insurance/reinsurance contracts in 2008.

Annual registrations of Section 110 companies with the Revenue Commissioners – the national tax authority – grew rapidly from 2001 (Chart 1) to over 300 companies per annum in 2006 and 2007, before falling sharply following the crisis. Although some of the registered companies may not have in actual fact taken up activities, or may be outside the scope of the FVC definition, this indicates the rapid growth in the number of companies using the provisions allowed by the above legislation in the period before the FVC Regulation came into effect.

Chart 1: Registrations of Section 110 companies with the tax authority



Source: Revenue Commissioners.

There are around 750 active vehicles which are reporting data to the Central Bank. As this paper will show, only a relatively small proportion of these (by number and by assets) are related to the securitisation activities of domestic credit institutions. The following section will look at the use of securitisation by domestic banks, before coming to the wider population of vehicles.

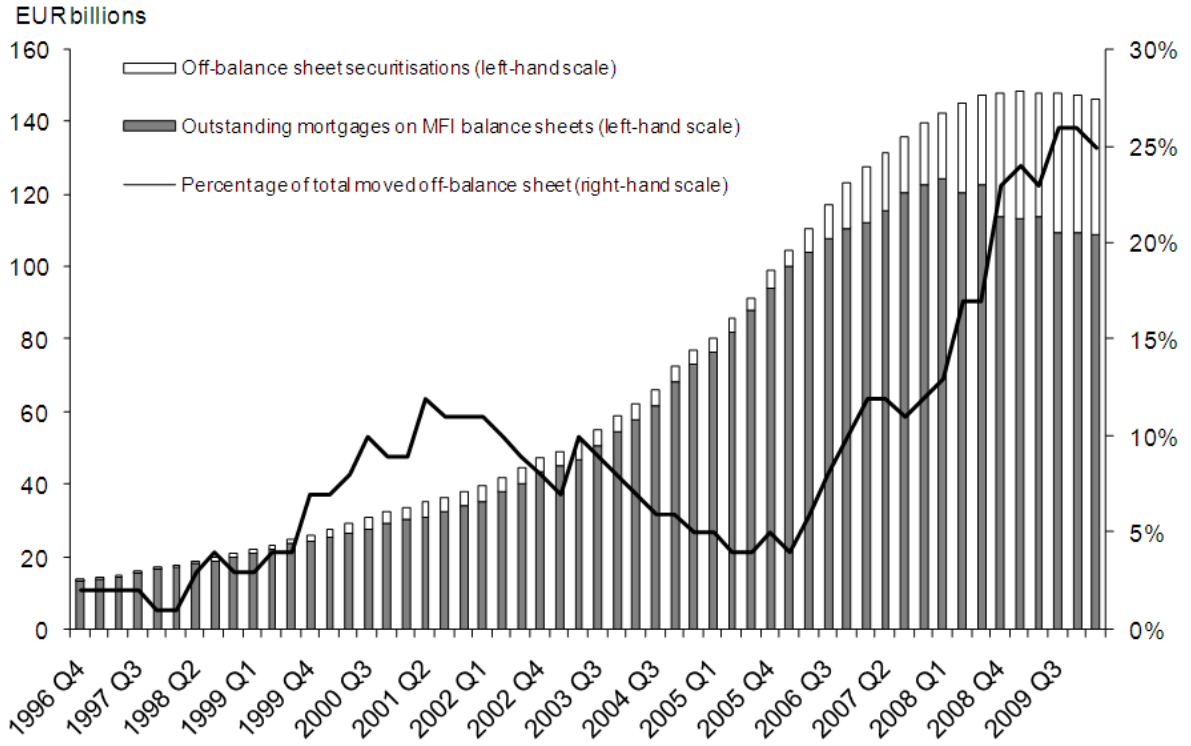
3. Capturing securitisation data from domestic credit institutions

3.1 Securitisations by domestic credit institutions

Statistics on securitisation initially responded to the need to correct outstanding lending stocks for off-balance sheet lending, and hence were first focussed on domestic credit institutions. The first securitisation of Irish mortgages was of IR£200 million in 1996, and off-balance sheet household mortgages have since grown to around €37 billion (Chart 2). As of

1996, banks were required to provide the outstanding stock of off-balance-sheet mortgages which had been securitised on a monthly basis. As is usual in such cases, the credit institution continued to act as servicer to the loans. Although outstanding mortgage balances were requested on a vehicle-by-vehicle basis from the banks, no information was requested from the FVCs themselves. These volumes were then incorporated into the statistics on lending to the household sector and credit growth rates.

Chart 2: On- and off-balance sheet mortgages of Irish MFIs



Source: Central Bank of Ireland.

The use of securitisation was initially restricted to specialist mortgage lenders, but became more widespread from 2005 to 2007 as the larger credit institutions began to rely on securitisation to fill funding gaps in a period of strong credit growth and house price increases[3]. Issuance of covered bonds also increased during this period, as some credit institutions set up "mortgage banks" in order to issue asset-covered securities[4]. However, unlike securitisations, loans transferred to mortgage banks remained within the MFI sector, and therefore were covered by banks' statistical requirements.

Despite the freezing of securitisation markets during the financial crisis, the proportion of loans that had been moved off-balance sheet reached a peak of 26% of outstanding volumes in mid-2009. The motivation for these "internal" securitisations was to create eligible assets to be used in central bank refinancing operations – a trend that was seen across many other euro area countries.

[3] See: Doyle (2009) and Addison-Smyth *et al* (2007).

[4] The issuance of covered bonds was enabled by legislation in 2001 and first carried out in 2004.

In addition, there have been securitisations carried out by domestic credit institutions which were not captured in the securitisation statistics of the Central Bank, either because the assets were not mortgages or NFC loans, or because they were not derecognised from the balance sheet of the MFI. These will be captured, however, by new statistical requirements on securitisations and loan sales.

3.2 New ECB requirements for MFI securitisation statistics

The information previously supplied by credit institutions on off-balance sheet securitisations, which was limited to the amount of loans transferred, has been superseded by the more detailed requirements of a new ECB Regulation on money and banking data[5]. The new ECB Regulation allows the collection of consistent statistics on securitisation across the euro area, as opposed to the unharmonised approach carried out before.

MFIs are requested to provide sectoral, geographic and maturity breakdowns of loans securitised – and volumes which continue to be recognised on the banks' balance sheets, or which have been derecognised. This is wider than the previous statistical collection which only captured loans moved off-balance sheet.

In addition to the monthly reporting on securitised lending required from banks, there is also a quarterly requirement for a geographic breakdown by country of residence of FVC. Where MFIs are acting as servicer to loans they have originated, a derogation may be offered by the National Central Bank (NCB) to the FVC. In such cases, the missing breakdowns will be provided by the servicing MFI and combined with the FVC data (see section 5.2).

The first data collection under these new statistical requirements took place in July 2010, with reference to the three quarters Q4 2009 to Q2 2010. This will provide data on credit risk transfer from banks through loan sales and securitisations, whether this is through transfer to another euro area resident or not. If the transfer is to a euro area FVC, information will be available through the FVC reporting framework, which is discussed in the following two sections.

4. Securitisation activities of financial vehicle corporations

4.1 Definition and register of FVCs

The FVC Regulation has a very broad definition of securitisation which encompasses the transfer of assets or a pool of assets to a securitising entity, or the transfer of credit risk through the use of credit derivatives (synthetic securitisations). The activities of the FVC which may qualify as "issuance" include issuing of debt securities publicly or through private placement, and also, potentially, funding through the use of derivatives or loans. Vehicles which do not come within the scope of the Regulation are those which solely grant loans to parties on its own account as part of an investment strategy – i.e., the entity is the "first" or "original" lender of the loans and, therefore, the loans have not been transferred to the entity from another lender. In addition, if there is a synthetic transfer of a non-credit risk (e.g. insurance risk) to an entity without any transfer of assets themselves, then that entity is not an FVC.

[5] Regulation ECB/2008/32 concerning the balance sheet of the monetary financial institutions sector.

The first challenge for the Central Bank arising from the FVC Regulation was to identify securitisation vehicles. The FVC Regulation requires that NCBs maintain a list of resident FVCs as of March 2009. This list, updated quarterly, is published on the website of the ECB to simplify the identification of FVCs by statistical reporting agents. There was no register of FVCs for statistical or regulatory purposes at the Central Bank or Financial Regulator prior to the ECB Regulation. The necessary legislation which would have allowed the Section 110 list maintained by the Revenue Commissioners to be shared with the Central Bank was not in place, but even if it had been available, it would have been deficient in a number of respects. The greatest deficiency is the matter of definition, as the companies which are allowed to utilise Section 110 do not necessarily coincide with the FVC definition. Also, there is no means by which a company can "deregister" from this list, and so it is likely to contain a large number of dormant, matured or liquidated vehicles.

Under the FVC Regulation, the onus is on FVCs to identify themselves to the NCB – initially by end-March 2009, or within one week of taking up business if established after end-March 2009. The Central Bank engaged with industry members at an early stage – beginning with bilateral meetings with corporate service providers in 2007. The Central Bank also held discussions with the local industry body, the Irish Securitisation Forum, on which a number of corporate service providers and law firms are represented. The Regulation was further publicised through an article in an industry magazine.

There were difficulties in some instances as directors and legal advisors of vehicles tried to determine if certain vehicles fell within the definition contained in the FVC Regulation. Due to the complexities of some structures and the broad nature of the definition, there were a number of cases on the borderline of the Regulation, often concerning whether or not the funding of the vehicle qualifies as issuance. Forthcoming guidance at a euro-area level will help in this regard. However, due to the breadth of structures, legal environments and innovation in the sector there are likely to remain cases for which it is difficult to determine whether some vehicles are inside or outside the scope of the Regulation, and these will have to be dealt with on a case-by-case basis.

4.2 What activities are carried out by resident FVCs?

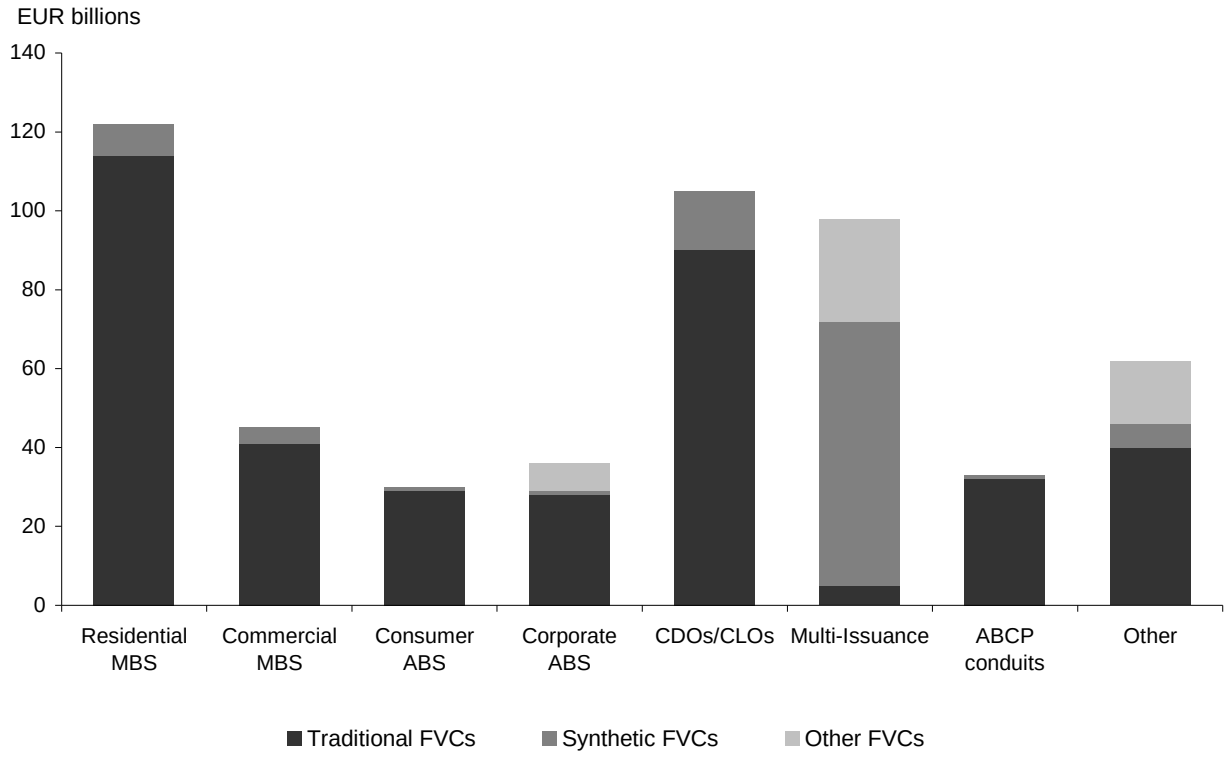
The resident population of FVCs is a very heterogenous group with a wide range of underlying assets, including residential and commercial mortgages, financial and operational leases, trade receivables, and also resecuritisations of asset backed securities. Under the FVC Regulation, three balance sheets must be aggregated on the basis of the nature of securitisation: traditional securitisations, synthetic securitisations and "other" FVCs. Traditional FVCs make up 72% of the population by total assets. The volume of synthetic securitisation is significant in Ireland relative to many other jurisdictions, at 19%. Currently, 9% of resident FVC total assets are in the "other" nature of securitisation category. "Other" primarily includes hybrid FVCs which are carrying out both traditional and synthetic securitisations, and it has not been possible yet to allocate to either traditional or synthetic (for example on the basis of the majority of activity). Once such issues are resolved, it is likely that the relative size of the "other" nature of securitisation category will be significantly reduced.

As well as the nature of securitisation, registering FVCs were also asked for their type of activity. The list of activities included: Residential MBS, Commercial MBS, Consumer ABS, Corporate ABS, Cash (i.e. true-sale) CDO, Synthetic CDO, and a residual Other category. A brief description was requested in the case of Other types of vehicles, and two common classifications were added by the Central Bank as categories: ABCP conduits and Multi-Issuance Vehicles (MIVs). If these classifications (based on commonly-used industry descriptions) were missing or unclear, alternative sources were used to determine their main activity such as prospectuses, audited annual accounts and stock exchange or rating agency categorisations.

Residential MBS is the largest group by assets, including both traditional and synthetic volumes (Chart 4). The next largest category is cash and synthetic CDOs, followed by MIVs. An MIV is a single entity which issues multiple (perhaps dozens) series of notes in which specific assets are contractually ring-fenced to a specific issuance, and are hence bankrupt-remote from each other[6]. There can be a mix of both traditional and synthetic series within one vehicle, so many have not been allocated to either of these types of securitisation. However, it may be possible to use other sources of information on the series in order to determine which is the dominant type of securitisation for the MIV.

This high-level qualitiative information greatly enhances the usefulness of quantitative data when the population is as varied as it is in Ireland. The differing profiles of these types of FVCs are apparent in examining the aggregated balance sheets by type (Chart 4). It is expected that the synthetic vehicles – e.g. synthetic CDOs – would have a larger part of their balance sheets made up of deposits, while the ABCP and MIV conduits should have a large proportion of their assets in debt securities. Cash CDOs' assets (which includes CLOs and CBOs) are split between loans and debt securities, although there is the flexibility to seperately identify CLOs and CBOs based on individual balance sheets if desired.

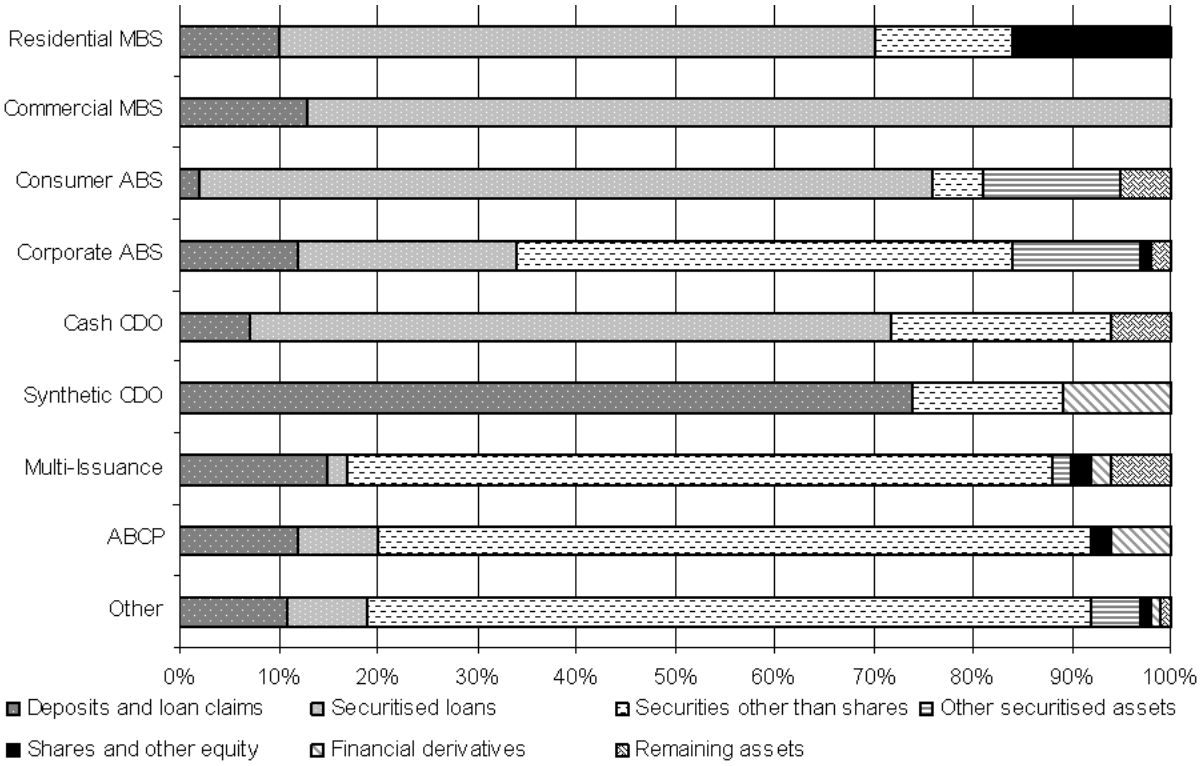
Chart 3: Activities of FVCs



Source: Central Bank of Ireland. Preliminary data for Q4 2009.

6 This is similar to structures in some other jurisdictions which use "compartments".

Chart 4: Aggregated assets of FVCs by activity



Source: Central Bank of Ireland. Preliminary data for Q4 2009.

With such a large population (for which publicly available information is often scarce) it would be difficult to monitor the collateral underlying each transcation in order to ensure that it is being reported appropriately. However, classifications by activity have already proved helpful in determining what types of collateral are typically used by specific categories of vehicles. This in turn, allows the Central Bank to query those vehicles who hold non-standard types of collateral to verify the accuracy of the information reported.

5. Capturing securitisation data from financial vehicle corporations

5.1 Reporting requirements

The reporting requirements of the Central Bank for FVCs are based on Annex I of the FVC Regulation. The return has three elements:

- End-quarter balance sheet data, including on the assets side: deposits/loan claims, securitised loans, debt securities, financial derivatives; and on the liabilities side: deposits/loans received, debt securities issued and financial derivatives. Securitised loans are broken down by originator (euro-area MFI, euro-area non-MFIs and rest of world originators). For most items only total amounts are requested. For loans which were originated by euro area MFIs, the requirements are the same as they would be if the loans were still on the balance sheet of the MFI – i.e. with breakdowns by:
  - sector - Households, Non-Financial Corporations, Other Financial Intermediaries, Insurance Corporation and Pension Funds;
  - geography - Domestic, Other Monetary Union Member State, Rest of World;
  - and maturity - for loans to Non-Financial Corporations only

- Quarterly financial transactions for the same balance sheet items as above
- Write-offs and write-downs of securitised loans during the month

Debt securities held are collected on the basis of ISIN code, if an ISIN has been assigned to the security. This information is combined with the ESCB's Centralised Statistical Database (CSDB) in order to compile the necessary breakdowns by geography and maturity. This level of information is also useful in enhancing the information available on non-resident flows and positions for balance of payments and international investment position purposes. It also provides other valuable information including the type of securities held, and the sectors issuing these securities.

The FVC is the reporting agent under the Regulation, but due to their "brass plate" nature they must nominate another company to provide the statistical data on their behalf. There are no restrictions regarding whom is nominated, and there is a wide variety of companies acting in this role on behalf of FVCs. In around 90% of cases, the corporate services provider provides the quarterly reporting requirements, although usually the necessary information must be collated from other counterparties, such as the loan servicer, collateral manager, investment manager, etc. Domestic MFIs usually provide returns on behalf of transactions for which they continue to act as loan servicer. The FVC may also nominate a non-resident counterparty to meet its reporting obligations, where this counterparty is best placed to provide the information required.

There are a number of features of the FVC Regulation which seek to minimise the impact of the reporting burden. Although reporting is with regard to the end-quarter reference date, statistical data may be compiled from an investor report (or equivalent) which has a reference date *within* the quarter, as long as any significant differences between the investor report reference date and the end-quarter are taken into account. This has a number of advantages for reporting agents:

- It utilises data that are already being compiled for the FVC which should enhance its accuracy and reduce the burden. However, additional information is often required from some counterparties, especially if the transaction pre-dates the Regulation and the documentation is not sufficient for all requirements.
- Usually the investor and distribution reports are timed to coincide with the payments to noteholders, and so accruals are minimised. Accruing interest between this date and the end-quarter is not necessary.
- As the reference date of the investor report is in often in advance of the end-quarter, it allows additional time for compiling the returns for many vehicles so that the burden on the reporters can be spread over a wider period[7].

Another concern for reporting agents was the difficulty in getting timely information on market prices where it is required under national accounting practices. As many of the assets are illiquid, the process of marking-to-model is particularly difficult (and costly). However, the Regulation allows the valuations used in the investor (or similar) reports to be used for the purposes of statistical reporting, in cases where the national accounting practice would imply marked-to market prices should be reported.

5.2 Combining data on securitised loans from MFIs and FVCs

In many loan securitisations, the originating bank will continue to act as servicer and will be best placed to provide information on the breakdowns of borrowers by sector, residency, etc.

[7] The deadline for FVC returns in Ireland is 19 working days after the end of the quarter.

In order to avoid duplication of reporting requirements, the NCB may allow the breakdowns to be supplied by MFIs in their regular quarterly reporting requirements, rather than from the FVCs themselves.

This is facilitated by a cross-border exchange of data via the ECB. MFIs report the breakdowns for loans which have been securitised using an FVC resident in the euro area on a country-by-country basis. This information is aggregated by country by the NCBs and transmitted to all other euro area NCBs (via the ECB). If the NCB has decided to allow this derogation for resident FVCs, this data exchange will be used to complete the missing data on the breakdowns of securitised loans.

For applicable cases, Irish FVCs should only report total securitised loans which they have on their balance sheets[8] (and total transactions), and no breakdowns of sector, geography or maturity for loans which are serviced by an MFI are requested. These breakdowns should be collected in the data provided by domestic and other euro-area MFIs to their respective central banks.

As it is likely, particularly in the early stages, that the breakdowns provided by MFIs will not match the totals provided by the FVCs exactly, procedures have been put in place to gross up or down the breakdowns in order to match the control totals reported by FVCs. While banks provide balance sheet information for FVC loans that they service, they are not required to provide similar information on transactions. It was determined that it would be counterproductive to request transactions breakdowns on loans from FVCs when they have a derogation on outstanding amounts. The financial transactions are therefore computed from the cross-border exchange of MFI information – i.e. from the quarter-on-quarter movement of stocks, the reclassifications and write-offs/write-downs of loans securitised by banks which they continue to service.

Difficulties are likely to arise from either double-counting of securitised loans volumes (i.e. the FVC reports breakdowns which are also reported by MFIs and both are incorporated) or from cases where neither an FVC nor an MFI reports the necessary breakdowns. This can be reduced by monitoring both the data exchanged and the FVCs utilising the derogation on securitised loans breakdowns. Over fifty of the reporting FVCs are using this derogation on their securitised loans breakdowns in Ireland, but the accuracy of the data can only be assessed when it comes to be combined with the MFI data. Although this is quite straightforward for domestic FVCs and MFIs, it is more difficult for other euro area resident MFIs as the data received is on an aggregate basis. For FVCs using this derogation, the Central Bank has asked for the name and residency of the servicing MFI to help ensure the quality of the data exchanged across borders.

5.3 Reduced reporting for smaller FVCs

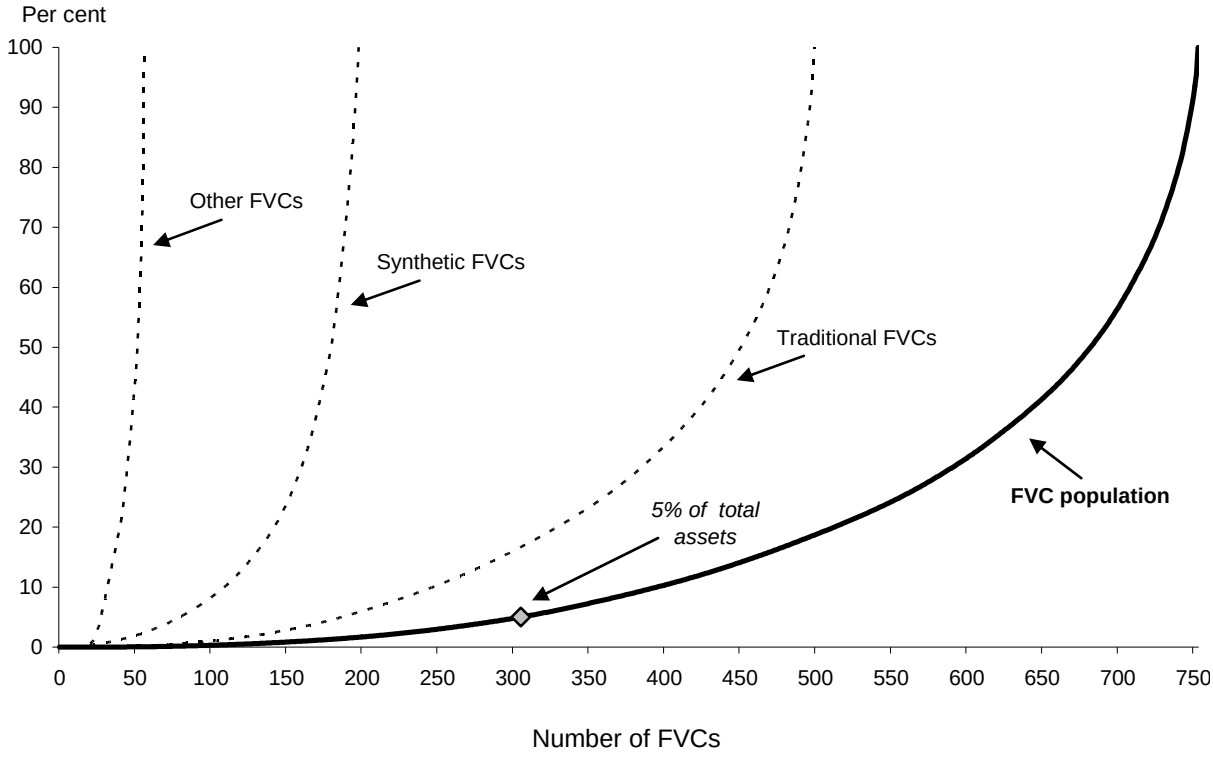
FVCs which have total assets of less than €180 million are subject to a reduced reporting requirement. Rather than the full balance sheet and financial transactions requirements, they provide only total assets on a quarterly basis. Under Article 5.1(b) of the FVC Regulation, this may be granted by an NCB as long as the total assets of all FVCs subject to the derogation is less than 5% of the total assets of the national FVC population as a whole. The threshold is subject to annual review to ensure it is within the limit set in the FVC Regulation.

Due to the profile of FVCs resident in Ireland, this 5% threshold covers a large proportion of vehicles (Chart 5). The current of threshold of €180 million allows some flexibility so that coverage may still meet the 5% criterion, even if there are changes in the profile of the

[8] Although the derogation in the FVC Regulation could apply to *all* outstanding securitised loan data, totals are still requested from resident FVCs because it is necessary for the vehicle's balance sheet to balance.

reporting population. It was determined that this threshold would maximise the number of FVCs which may use the derogation, while ensuring continuity in terms of reporting requirements for the FVCs. Although the 5% threshold of the Regulation must apply to the population as a whole, a further determining factor was its impact for traditional, synthetic and other FVCs to ensure adequate coverage in the three aggregated balance sheets which must be compiled for the ECB.

Chart 5: Cumulative total assets and derogation on full reporting requirements



Source: Central Bank of Ireland.

The derogation on reporting requirements was allowed for FVCs with assets of €180 million or less at end-Q4 2009 with two exceptions: FVCs that had not yet fully taken up business (e.g. were in a ramping-up or warehousing stage) and would exceed this amount at a future date; and FVCs that were using the derogation described in section 5.2 on securitised loans, so that their balance sheet information could be combined with MFI data. Due to difficulties which may arise with FVCs moving in or out of the derogation group from quarter to quarter (not least, administratively) it was decided that FVCs whose assets were above the threshold at Q4 2009 but subsequently fell below €180 million must continue to provide the full reporting requirement until they mature or until the threshold is reviewed.

There are a number of advantages arising from the derogation for both the reporting agents and the NCB. Firstly, it considerably reduces the costs of reporting across the population. As the cost of reporting the FVC return may be thought of as broadly fixed in terms of vehicle size – i.e. the costs of reporting depend largely on the complexity of the vehicle, rather than total assets – it is appropriate that the reduction in burden should be provided particularly for smaller FVCs. Secondly, the derogation allows a greater focus on the accuracy of information provided by reporting agents on behalf of larger FVCs. In this way, although an element of estimation needs to be introduced to account for smaller FVCs with a derogation, there may in fact be a benefit in terms of quality due to the focus on larger and more complex FVCs.

5.4 Consolidating the sector

In many cases, a securitisation transaction may involve a number of vehicles, possibly in more than one jurisdiction. Loans between euro area FVCs involved in a structure are captured through "of which FVCs" positions, as are shareholdings in FVCs and holdings of notes issued by FVCs. This allows a consolidated picture of the sector and avoids double counting transactions involving more than one vehicle. This requires careful monitoring to ensure consistent treatment on both sides of such transactions and is particularly challenging when the vehicles are based in multiple jurisdictions. The register of FVCs currently does not include a facility to identify links between vehicles.

Another important factor in examining credit risk transfer and the ultimate holders of such risk is the level of resecuritisations (where asset backed securities are themselves securitised). This is common in Ireland – as evidenced by the large number of CDOs, MIVs and ABCP conduits – and a high proportion of the non-MFI debt securities held by FVCs were originally issued by euro-area FVCs. Security-by security information on holdings is useful in analysing resecuritisations, especially for securities issued in the rest of the world for which no information on the issuer is requested.

6. Conclusion

The recent advances in the collection of securitisation statistics provides a greater understanding of credit risk transfer and the role of FVCs in financial intermediation. Most importantly, data from FVCs provide an overview of a sector for which little information was previously available. This is particularly useful in Ireland, where in the past few years the sector has come to make up a relatively large proportion of the financial sector, and this data will enhance statistics on balance of payments flows and positions and securities issues statistics. Given the cross-border focus of most FVC activity in Ireland, the development of these statistics can help address some of the statistical gaps identified in terms of cross-border exposures.

There are a number of developments in the short to medium term which can further enhance the benefit of these statistics within the current framework. Firstly, the collection of security-by-security information from banks, investment funds and FVCs themselves can be used to help determine the holders of FVC securities. Secondly, the benefit of even high-level qualitative information is significant, and could be improved with further information on the links between FVCs and between sponsoring banks and FVCs.

References

Addison-Smyth, D. McQuinn, K. and O'Reilly, G. (2009). *Modelling credit in the Irish mortgage market*, CBFSAI Research Technical Paper.

Doyle, N. (2009). "Housing Finance Developments in Ireland", *Quarterly Bulletin No. 4 2009*, Central Bank and Financial Services Authority of Ireland.

ECB (2007). *The Role of Other Finanical Intermediaries in Monetary and Credit Developments in the Euro Area*, ECB Occasional Paper Series No. 75 October 2007.

Finnegan, B. and Mawdsley, A. (2004). "Credit risk transfer – Significance for the Irish market", *CBFSAI Financial Stability Report 2004*.

Poloni, P. and Reynaud, J. (2009). "How to measure credit risk transfer in the EU", *IFC Bulletin No. 31*.

Developing data and information on Israel's credit market

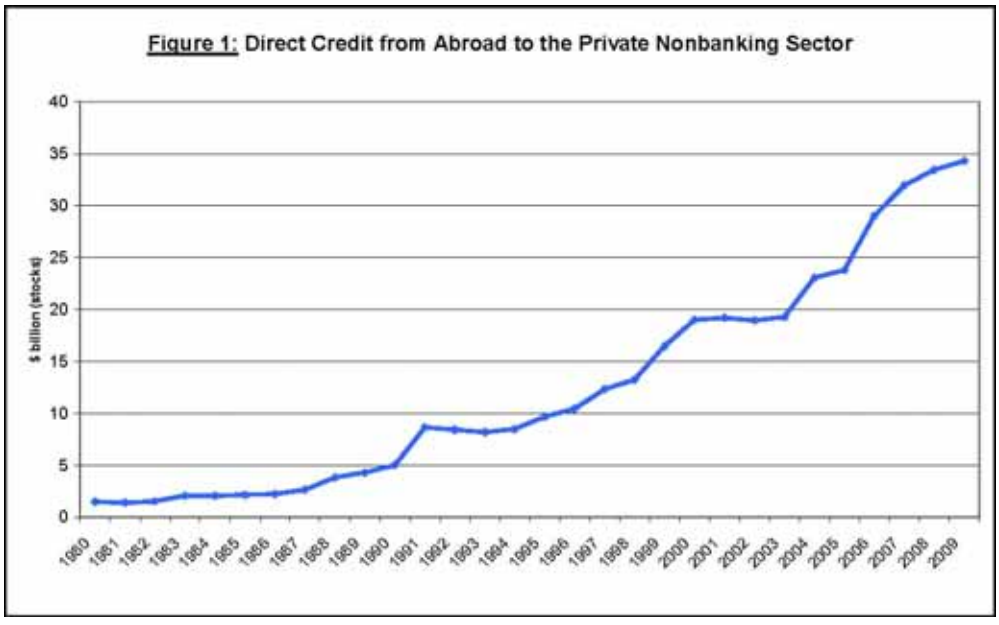
Yair Haim

1. The development of data and information on credit prior to the crisis

In Israel, as in many other countries, the banking system was traditionally the dominant lender in the credit market, which was subject to many restrictions due to the size and involvement of the government in the economy as a whole, and in the credit market in particular. Hence, the basic information on the market was derived from the banks' reports to the Bank of Israel. These covered mainly outstanding bank credit, with a breakdown by industry and by large borrowers. The data and information systems on the credit market developed alongside the developments in the market itself. ***Four main processes*** can be traced in the development of the market, the data and the information in the last three decades.

1. As a result of the reduction of government involvement and the removal of restrictions on banks' activities, the ***bank credit market*** became more sophisticated. At the same time, the coverage of banks' reports was widened to include details on credit, such as data on the flows of credit granted during the month or the quarter, and the interest the banks received on them. These reports helped the Banking Supervision Department in the Bank of Israel to monitor credit risks, and also helped in the calculation of the money and credit aggregates for monetary policy purposes.

2. In the next stage, following the foreign currency liberalization in the 1990s, ***direct credit from abroad*** increased (Figure 1). This led to the establishment of a broad infrastructure of reports, data and processing relating to foreign currency activity and to activity vis-à-vis nonresidents. This included data on the amounts and interest rates on borrowings by the government and Israeli companies from financial entities and other lenders abroad. The infrastructure was used mainly to monitor and analyze the foreign currency market and capital flows.



3. A nonbank credit market, and in particular ***a corporate bonds market***, started to develop about ten years ago, as a result of reforms in the nonbank financial system, changes in tax regulations, and reduction of government deficit and public debt. This market developed rapidly (Figure 2), and at the same time new data were collated on bond issues and balances, and on prices and yields in the secondary market. These data enabled the monitoring of the development of the market.

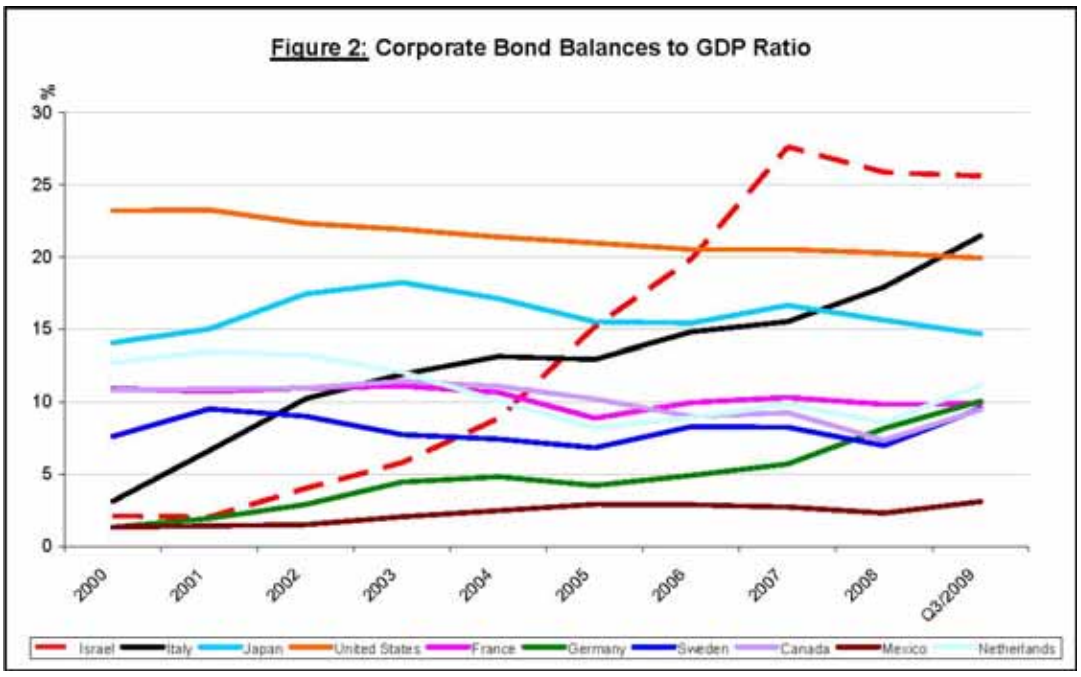


Table 1

Distribution of total outstanding debt in the economy by borrowing and lending sectors

(end of April 2010, NIS billion*)

Lender/Borrower	Banks	Institutional investors	Nonresidents	Households and others**	Total debt
Business sector	**395**	**135**	**127**	**82**	**740**
Loans	392	15	100	5	**512**
Tradable bonds	3	74	26	78	**180**
Nontradable bonds		47			**47**
Households	**264**	**6**	**0**	**45**	**314**
Loans	264	6		45	**314**
Government	**63**	**291**	**114**	**148**	**616**
Loans	15	6	12		**32**
Tradable bonds	48	143	71	148	**410**
Nontradable bonds		142	31		**173**
Total debt	**722**	**432**	**240**	**275**	**1670**

* Dollar rate April 2010: 1$ = 3.7 NIS.

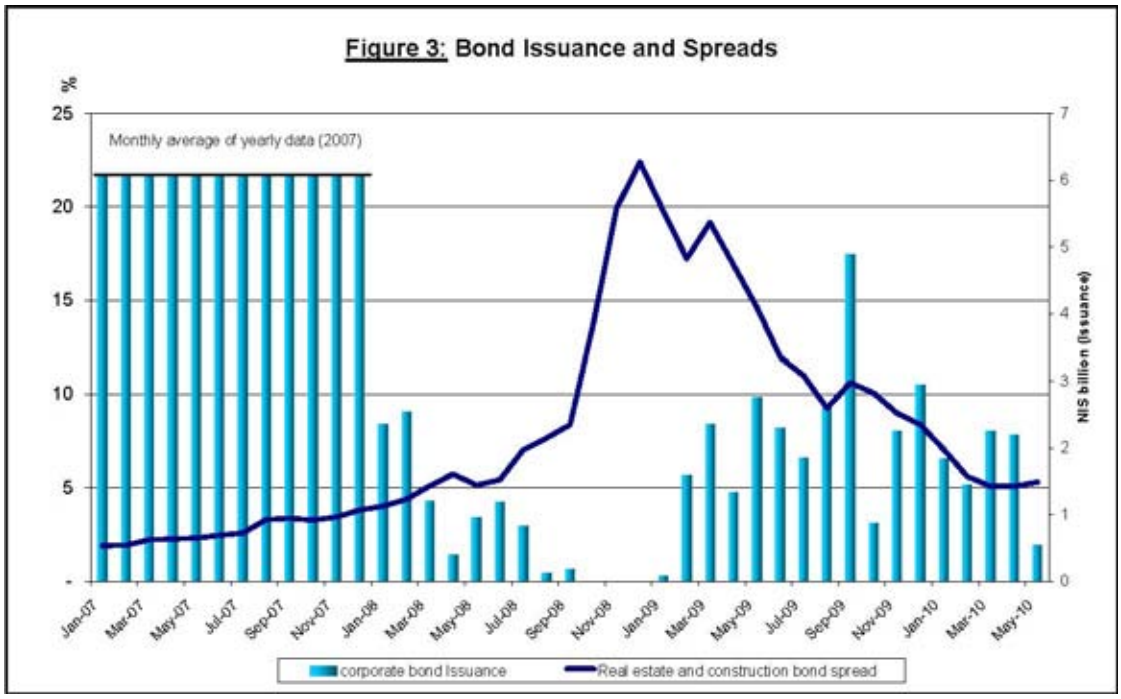
** "Others" includes credit card companies, government-backed credit, and business and financial corporations.

4. Against the background of Israel's advanced financial system and the increased activity in the financial markets, and in line with steps taken in other countries, a ***Financial Stability Area*** was established in the Bank of Israel in 2003. This function dealt with the analysis of the activity and risks in the financial system, and developed analytical frameworks to analyze and process the great amount of data already existing in the Bank. With regard to the credit market and credit risks, the Financial

Stability Area developed methods for processing, presenting and analyzing (1) the distribution of total credit in the economy by borrowing and lending sectors and their changes over time (Table 1), (2) indices of financial strength of the borrowing sectors, i.e., the government, companies, and households, and (3) national balance sheet data, and in particular the balance sheet of the financial sector and its various components (in cooperation with the Central Bureau of Statistics).

2. Adjustments to the data and information on credit during the crisis

During the global crisis, and especially from September 2008, the Bank of Israel took several steps to extend its data and information systems and to adjust them so that they could be used in decision-making during the crisis. The extension and adjustment of the data and information on the credit market was of great importance, as the global crisis had an immediate effect on that market, in particular on the corporate bond market: companies stopped issuing bonds, and bond prices in the secondary market slumped (Figure 3). The global crisis highlighted the need to identify in real time the damage to the credit market, to enable the Bank of Israel and the Ministry of Finance to make the appropriate decisions regarding the intervention required to minimize its implications on the real economy. More specifically, the need for data on the availability of credit to companies and its price and for data on companies' need for credit became more urgent.



The ***main steps taken*** in the area of data and information on the credit market during the crisis are shown below:

1. The ***frequency of banks' reports*** to the Bank of Israel on the amount of new credit they had granted to the public and on interest rates was increased from once a month to once every two weeks.

2. A distinction was made between data on ***credit*** from the lenders' viewpoint and data on ***debt*** from the borrowers' viewpoint. In light of the significant effect of the fall in the market prices of bonds and the loan loss provisions on credit balances reported

in the lenders' books (the institutional investors and the banks), it was important to distinguish between these balances and the value of borrower companies' debts in their books.

3. A method of calculating ***quantitative changes*** in outstanding debt was developed and applied. Following on from the above distinction between credit and debt, and in light of the growing importance of identifying the flow of new credit advanced to borrowers, a new method was used to deduct the effect of prices and indexation changes from the changes in outstanding debt.

4. The division between the different ***borrowing sectors*** in total outstanding credit was made sharper, i.e., between the nonfinancial business sector, the households, the government and the municipalities.

5. The ***frequency of publication*** of the data on outstanding credit and debt and on the corporate bond market was increased from quarterly to monthly.

6. The Bank started ***monitoring large companies***. A special team gathered and analyzed data and information on concerns' financial strength, and focused on analyzing the debt of companies regarding which there was growing concern that they would be unable to repay their debts.

7. New ***management reports*** were formulated. The new monthly report to the Governor and to the management of the Bank included credit market indicators, and data on quantitative changes (new credit) and prices (interest rates and margins) relating to credit and its components.

8. The new data were ***published***. The Bank put on its website the new data that it had on distribution of total credit and debt by borrowing and lending sectors as soon as possible, together with detailed explanations (http://boi.org.il/deptdata/datastat/itrote.htm).

9. The Bank started issuing a ***press release*** on credit. The monthly release focuses on business sector debt, and includes the most important data and a short analysis of their changes (http://boi.org.il/press/eng/100621/100621v.htm).

3. Looking forward and conclusions

The Bank of Israel intends to continue improving the data and information on the credit market, mainly in the following areas:

1. ***The coverage of reports*** on credit: extending the reports on credit also to financial entities which grant credit and which do not currently report to the Bank of Israel, so that the Bank will obtain a fuller picture of credit in the economy. The new Bank of Israel Law authorizes the Bank to obtain the information it needs from all financial entities.

2. Data on the ***inter-industry distribution*** of credit: dividing nonbank credit by principal industry similar to that of bank credit, so that a by-industry distribution of total debt and credit can be presented.

3. ***Publication:*** among other things, adding the data on quantitative changes in credit to the website and extending the press releases so that they also cover credit to households.

The recent global crisis and the description above underline several aspects of the management of data and information on the credit market, and in fact on total economic activity. Some insights follow.

1. The importance of holding ***complete, detailed and coherent data*** on the credit market, and in fact on the financial sector and the whole financial activity. The data must be at the micro and macro levels, so that the detailed data can be integrated to obtain financial aggregates at the level of the financial system and the economy as a whole, as well as the breakdown of the aggregates into the detailed data.

2. The importance of real-time ***ongoing adjustment*** of the data systems to the developments in economic and financial activity. Moreover, it is important to anticipate ***future needs*** for data and information, for example, those deriving from market reforms, from new analytical approaches and from crisis and policy response scenarios.

3. The special importance of ***flexibility*** in processing the data in line with changes in information needs in normal times, and even more so in times of crisis. This flexibility requires the development of tools that provide flexibility in investigating the data and of analytical frameworks relevant to various needs.

4. The importance of ***making data and information available*** to decision-makers, to economists who monitor and analyze the economy—both in public offices (the central bank, the Ministry of Finance, the supervisory authorities, etc.) and in domestic and foreign economic entities, and to the public. Making data and information available must continue during a crisis—and in certain areas should even be boosted.

Summary of the conference

Paul Van den Bergh

More than 140 participants from around 70 central banks participated in the conference. About 50 papers were discussed in plenary and breakout sessions. The conference illustrated specific initiatives that central banks have taken to address data gaps, in particular with respect to data on and from banks, external statistics, financial accounts, housing statistics, and debt securities markets and securitisation. Moreover, a number of more general approaches seem to have been taken, including reliance on micro data to complement the more traditional macro statistics, the use of surveys to remedy data gaps, and marrying analytical methods and frameworks with existing data sources.

There was a large consensus that the financial crisis was not caused directly by a lack of information, though some data were not sufficiently available or existing data showed weaknesses. To a large extent the financial crisis showed the importance of tracking the impact of rapid innovations and of globalisation. The dynamics of highly integrated economies and markets and how their stability could be rapidly undermined was perplexing to many analysts and policy makers.

Reliance on micro data

Compilation of data on and from banks is still at the core of monetary and financial statistics – despite the growing importance of non-bank financial institutions. The crisis has underlined the need to increase cooperation between central banks and supervisory authorities in compiling such data. Given the sometimes diverging needs of these institutions, novel approaches to collecting information may have to be found.

In principle, at least, the collection of publicly available balance sheet data from individual financial institutions may be a promising route, and various central banks and international organisations have explored this. Indeed, a significant amount of micro data from banks and other financial institutions is publicly available. However, finding the data can be cumbersome and their quality and user-friendliness is surprisingly poor. This hampers the use of such data and increases the perceived data gaps. Standardising and harmonising the availability of publicly disclosed data by individual institutions could thus – at relatively low marginal costs – offer large benefits to users.

The compilation of relevant banking data, at the micro as well as macro level, is complicated by the lack of uniform standards across accounting, supervisory and statistical areas. One advantage of international accounting and reporting standards like IFRS is that they provide extensive guidelines which facilitate international comparability. Accounting standards and disclosure requirements are, however, not always well suited for monetary and financial stability analysis (globally consolidated accounts are less useful for economic and monetary analysis while accounting and supervisory information may not always provide the breakdowns that facilitate the identification of systemic risks).

Another example of useful micro data is security-by-security databases. The ECB and national central banks of the euro area have developed such a database and are now taking steps to also populate it with data on the holdings of individual securities (making it, in effect, a from-whom-to-whom database). Including the holding information on securities is still in an early phase. However, a step-by-step approach is inevitable given the relatively large cost of developing and maintaining the database.

Some central banks operate the national balance sheet office where publicly disclosed balance sheets of corporations are reported. This detailed information has proven useful for the elaboration of the financial or flow-of-funds accounts, in particular to measure intersectoral linkages. It also facilitates the analysis of gaps in total balance sheets of financial and non-financial corporations.

One drawback of micro databases with huge amounts of detailed information is that they introduce additional noise into the analysis. Examples were given, however, showing that the problem can be handled with appropriate statistical tools. Another drawback has to do with the timeliness of compilation based on a very large dataset. Here it was shown that it may be possible to approximate the total population with a smaller subset of the data (eg large listed companies to represent the non-financial corporate sector).

The use of surveys

Surveys are very useful tools, widely and increasingly used by central banks to gather information for different purposes. During the financial crisis, surveys were used to gather data at short notice in order to understand the impact of the crisis on the economy, for instance through its effect on economic agents' expectations and sentiments. In some cases central banks used targeted qualitative surveys to understand developments at non-regulated financial institutions as well as in derivative markets.

In emerging markets, surveys play a key role in supporting monetary policy analysis. They are used to get information on key macroeconomic variables that are either not officially compiled indicators or that become available only with a considerable time lag.

Discussions confirmed the findings of the earlier regional seminars on the conduct of surveys by central banks, organised by the IFC in 2007-2008. These included the need to properly organise them, to apply appropriate statistical survey methodologies, to develop good questionnaires, and to make serious efforts to ensure a satisfactory response rate.

Marrying analytical methods and frameworks with existing data sources

One approach taken during the financial crisis has been to better apply analytical methods, including econometrics, to the use of existing data sources. This has allowed the available data to be exploited more actively. It has also made it possible to estimate indirectly a number of unobserved variables of interest to financial stability analysis.

The following are examples of similar approaches:

- using index methodology to measure the degree of banking fragility;
- analysing the contribution of various groups of financial institutions to systemic market risk;
- developing measures for illustrating credit risk assessments: heat maps, risk matrices and cubes;
- identifying an indicator for liquidity pressures based on measures of trading liquidity, counterparty risk and variables capturing the microstructure of markets;
- measuring the impact of CDS and government bond spreads on interest rates that banks charge companies;

- measuring carry trade activity using data on investments in exchange-traded funds, exchange-traded futures, bank lending in funding currency, and deposits in target currencies;
- estimating the link between the availability of housing credit and the duration of the vacancy of new homes, and between lending to first-time buyers and loan-to-value ratios;
- using longitudinal data and data analysis (ie tracking of cohorts) in order to understand the flow dynamics in the housing market.

General discussions

The different sessions organised at the conference left some time for a general discussion, at which some recurring themes emerged. Also, at the end of the conference a panel was organised to discuss the future international and national initiatives to close data gaps revealed by the financial crisis.

During these discussions it was noted that central banks did not await international initiatives to address specific data gaps. This has shown that it is possible to exploit existing data sources to satisfy additional user requirements. Efforts should be made in future to ensure that data collections can continue to adapt flexibly to changing requirements, for instance with respect to monitoring ongoing financial innovations such as new instruments, institutions and vehicles. Collection systems should be able to respond to ad hoc needs, as well.

The compilation of relevant banking data, at the micro as well as macro level, is complicated by the lack of uniform standards across accounting, supervisory and statistical areas. One advantage of international accounting and reporting standards like IFRS is that they provide extensive guidelines which facilitate international comparability. Accounting standards and disclosure requirements are, however, not always well suited for monetary and financial stability analysis (globally consolidated accounts are less useful for economic and monetary analysis while accounting and supervisory information may not always provide the breakdowns that facilitate the identification of systemic risks).

Another example of useful micro data is security-by-security databases. The ECB and national central banks of the euro area have developed such a database and are now taking steps to also populate it with data on the holdings of individual securities (making it, in effect, a from-whom-to-whom database). Including the holding information on securities is still in an early phase. However, a step-by-step approach is inevitable given the relatively large cost of developing and maintaining the database.

There was general agreement on the need to build a bridge between aggregate macro statistics and more granular, and perhaps also more frequent, micro data. This could include information on exposures of financial institutions, both individually and in aggregate. These exposures could be captured by appropriate breakdowns in balance sheets by type of instrument, currency, maturity, counterparty sector and counterparty country. Data from trade repositories, central counterparties and clearing and settlement systems could potentially be used to have almost instantaneous information. This would allow analysts to measure and monitor common exposures, risk concentrations, and networks.

It was clear that statistical functions at central banks faced a number of specific challenges during the crisis. One had to do with the lack of clear concepts and definitions, both at the national and international level. This complicated the already difficult reconciliation of different statistics (eg information on issues and holdings of debt securities). The difficulties in reconciling amounts outstanding and changes in positions related to loans, securities and

derivatives were particularly severe at times of large valuation changes for real and financial assets.

Another challenge was the trade-off between supporting the development and analysis of historical data (for instance for the financial accounts, in order to understand longer-term trends in savings and investments of major institutional sectors) versus work on collecting high-frequency data at short notice. In principle, different statistical instruments can be used to respond to such diverging requirements, but resources in statistical functions were not always that fungible.

The launching of various international initiatives to address data gaps or to improve statistics for the conduct of financial stability analysis was to be expected. However, it is putting considerable strain on resources (both in terms of number of staff and skill mix). For instance, the IMF and FSB made a number of recommendations for the international statistical community which were endorsed by the G20. This includes the possibility to collect specific detailed micro information on positions and exposures of systemically important financial institutions, as well as aggregate financial accounts, on a globally consolidated basis (including exposures related to derivative transactions and off-balance sheet transactions). In Europe, the European System of Central Banks is developing statistics for financial stability analysis, including those required by the European Systemic Risk Board. Here too the focus is on consolidated balance sheets for large banking and insurance groups. These will be the major new datasets post-crisis that will inform macro-prudential decisions in other countries, as well.

The question was raised whether the business model of central bank statistical departments/functions is still adequate. It is their responsibility to mediate between users and compilers of statistics (demand and supply) since there is no direct price mechanism to achieve equilibrium. One had to keep in mind that central bank statistics (and other statistics from national and international statistical agencies) are public goods. This means that costs and benefits of different statistical activities need to be traded off carefully – after the crisis, the benefits from a public-good perspective have definitely increased. It also means that resources made available should be used carefully and efficiently and that central bank statistics should conform to internationally agreed data quality principles.

What are the solutions to achieve a better reconciliation of demand and supply and a better trade-off between costs and benefits? Starting on the demand side, it would be important to set priorities more carefully. IT might help if the focus of users were not on all of the information that they do not have (which is endless) but rather on key variables that they need better information on. So far it has not transpired that massive new data initiatives are needed, and it is not necessary to reinvent the wheel in most areas. A top-down approach to arbitrage between different needs would allow a better prioritisation than a bottom-up one. A particular caveat was formulated on changing the reporting boundary of central bank statistics. Indeed, the reporting burden and cost-benefit trade-off is seen to be very different between banks and other institutional sectors/units.

Better use of IT can help manage costs in statistical departments. Experience has proven the advantage of integrated information systems rather than fully decentralised or centralised databases or warehouses. The use of international standards such as XBRL (for accounting information) and SDMX (for statistical information) can bring potential benefits. Standardised reporting by systemically significant banking and insurance groups, through a common register and, to the extent possible, with common definitions and concepts, might help. Almost everywhere, more and better human resources are needed in the statistical areas of the central bank.

An important theme was the need to improve the communication of central banks' statistics, both internally and externally. Perhaps surprisingly, even sophisticated users were not always aware of the availability of published statistics and how these conform to, or deviate from, international statistical standards. Less surprising to some extent is the lack of financial

and statistical literacy in the population as a whole, even on simple concepts. Various central banks have programmes to improve the communication of their statistics. An interesting question that arose was how to communicate the discontinuation of special statistical initiatives implemented during the crisis. What signal might this give? How would it be interpreted by the market? These questions, of course, related to the broader communication of central bank policies in the areas of monetary and financial stability.

Finally, the issue of coordination and cooperation was raised repeatedly. There was general agreement that this was crucial, within the central bank itself and at the national and international level. Within central banks, close interaction is needed between the various areas interested and involved in statistical issues (research, economics, monetary policy, financial stability, and, lastly, market operations, where there is an in-depth knowledge of markets and where much intelligence is often collected at a daily and even intra-day frequency). Irrespective of the institutional arrangements, cooperation with the bank regulators and supervisors is of key importance and needs to be strengthened. Limitations on data sharing between the two organisations need to be reduced or removed, partly in order to be able to respond to some international statistical initiatives (eg BIS international banking statistics).

Financial systems have now become truly global, and comparable statistics are important in a globalised world in which decision-makers and the public at large need to interpret not only the statistics related to their own economy and financial system, but also those of other countries and of the global economy and financial system as a whole. In this context, lack of coherence and duplication of data requests, in data collection exercises by international organisations, is frustrating in areas involving central bank statistics. More cooperation and coordination between organisations would help, with respect to both the content of data compilations and the statistical and technical standards used.

The conference agreed that whatever improvements are made to address data gaps, they are unlikely, by themselves, to limit the risk of another financial crisis occurring in the future. It will continue to be inherently difficult to measure, analyse and base policy decisions on variables capturing risk appetite, market sentiment and interconnectedness at the micro and macro level.

Special award

The conference introduced an award for the best paper presented by a young statistician at the biennial IFC conferences in Basel. More than 20 entries were received on this occasion. Mr Petr Jakubik, currently on secondment from the Czech National Bank to the European Central Bank, received the first such award for his paper “Household Response to the Economic Crisis using Micro-Simulation for the Czech Economy”.