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1. Introduction

In the period since the beginning of the financial crisis, the issue of "shadow banking" has received a lot of attention. Shadow banking may be defined as "the system of credit intermediation that involves entities and activities outside the regular banking system".[2] Of particular importance from a financial stability perspective is where shadow banking intersects with regular banking – i.e. where banks are themselves using other financial intermediaries to carry out certain activities (because there are regulatory or other advantages in doing so), or where regular banks are exposed to the risks of the activities of shadow banking counterparties.

The prominence policy-makers have given to the issue of shadow banking is for two main reasons. First, shadow banking activities have played a distinct role in the crisis. Its genesis was in the US sub-prime mortgage market, whose risks were spread to various countries and sectors through the process of securitisation. The extent and complexity of financial intermediation which was happening outside of – but not entirely remote from – the traditional banking sector was an important element in the large credit growth during the boom period, and the loss of confidence between banks as the early stages of the crisis unfolded. Second, in a post-crisis environment of increasing oversight of the traditional banking sector, intermediation activities may instead move to lighter- or unregulated shadow banking entities. Hence, regulations which are intended to mitigate systemic risks may lead to circumvention of oversight and therefore increased risks. This may manifest itself in regulatory arbitrage, where activities are carried out in those jurisdictions where the regulatory burden is lower.

The euro area financial sector has grown considerably in the past two decades, and has become significantly more complex. Total assets of euro area Monetary Financial Institutions (MFIs) – i.e. central banks, credit institutions and money market funds (MMFs)[3] – more than doubled between the beginning of 1999 and the end of 2011, to over € 38 trillion. At the same time, the total assets of euro area other financial intermediaries (OFIs) – which includes *inter alia* investment funds, Financial Vehicle Corporations engaged in securitisation (FVCs),[4] non-securitisation financial vehicles, securities dealers, finance companies – almost tripled, from € 5.7 trillion in Q1 1999 to € 15.3 trillion in 2011 (one-quarter of the euro area financial sector).

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[2] "Shadow Banking: Strengthening Oversight and Regulation. Recommendations of the Financial Stability Board", Financial Stability Board, dated 27.11.2011, p.3.

[3] The MFI sector also includes Electronic Monetary institutions (ELMIs) and a few other institutions, although these are very small in number.

[4] Other common terms for financial vehicle corporations include Special Purpose Vehicles/Entities (SPVs or SPEs).

The Financial Stability Board (FSB), the international body which monitors global financial stability and coordinates national authorities' policy responses to financial stability risks, published recommendations for the oversight and regulation of shadow banking activities in October 2011. The first step in the monitoring process is a so-called "macro-mapping" of the shadow banking system, its scale and its interactions with the regular banking system. It proposes that national authorities conduct an annual mapping exercise using data on non-bank financial intermediaries' balance sheets, as well as banking data and supervisory sources.

This paper attempts a macro-mapping of the euro area shadow banking system with balance sheet statistics on non-bank financial intermediaries in order to demonstrate the usefulness of the data for this purpose, to identify gaps in the data, and perhaps also to aid other users or national authorities who may be wishing to use the data in a national context.[5] ***Section 2*** provides the background to the FSB monitoring exercise. A macro-mapping exercise is carried out in ***Section 3*** from three angles: (i) the size of the system as a whole; (ii) an examination of credit institutions' assets and liabilities vis-à-vis other financial intermediary sub-sectors; and (iii) a snapshot of national distribution of intermediaries. ***Section 4*** discusses key data gaps and how these may be addressed. ***Section 5*** concludes with an assessment of the usefulness of a macro-mapping exercise at the euro area level.

2. Monitoring the shadow banking system – "macro-mapping"

There is no single commonly accepted definition of shadow banking.[6] Definitions usually make reference to the core activities of conventional banking. This may be with regard to the *funding* perspective i.e. taking liquid deposits or issuing deposit-like instruments; or it may be from the *lending* perspective, i.e. extending credit to the non-financial sector. Although entities may themselves be channelling funds between third parties with a surplus on one side and those with a lack of funds on the other, it is more common that non-bank financial intermediaries perform a specialised function within what may be regarded as a "credit intermediation chain".[7]

Among the functions that entities may provide to the shadow banking system include ***maturity transformation*** – the use of short-term liabilities to fund longer-term assets, and ***liquidity transformation*** – the use of liquid instruments to fund illiquid assets. Liquidity mismatches can interact with maturity mismatches to make entities vulnerable to "runs" – i.e. sudden withdrawals of funding. In addition, shadow banking entities often play a role in ***credit risk transfer*** – the process of moving credit risk to another entity through the transfer of assets (in a traditional securitisation), or through a synthetic securitisation, where the risk is transferred through derivatives, guarantees or a similar mechanism.

The G20 requested the FSB to establish a Task Force to clarify what is meant by shadow banking and the role that it plays, to establish approaches for monitoring of the shadow banking system, and to prepare measures to address the systemic risks, and to mitigate potential regulatory arbitrage between jurisdictions with differing regulation of shadow

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5 With only a few exceptions, all of the data used in this note are published on the Statistical Data Warehouse (SDW) database of the ECB (http://sdw.ecb.europa.eu). Data on national contributions to the euro area data are also usually available.

6 For a collection and comparison of definitions, see the report "The Deloitte Shadow Banking Index – shedding light on banking's shadows" released by Deloitte Consulting LLP in May 2012.

7 How OFI entities interacted with each other (and the traditional banking sector) in credit intermediation chains is detailed by Zoltan Poznar, Tobias Adrian, Adam Ashcraft and Hayley Boesky in "Shadow banking", Federal Reserve Bank of New York Staff Report No. 458, July 2010 (revised February 2012).

banking activities. In its recommendations published in October 2011, the FSB advocated national authorities to use a three-step approach for the monitoring of the shadow banking system:

· *Step 1*: macro-mapping of the overall shadow banking system, its scale and trends;

· *Step 2*: identification of the key systemic risks and regulatory arbitrage concerns within the shadow banking system; and

· *Step 3*: assessment of the key systemic risks and regulatory arbitrage concerns.

This monitoring procedure operates on the principle that initially a broad perspective on non-bank credit intermediation should be taken in order to include all shadow banking activities, including also financial innovation which may be taking place. Following this, the policy focus should be concentrated on developments related to systemic risk and regulatory arbitrage. This paper focusses primarily on the broad mapping of the shadow banking system – i.e. *Step 1* of the FSB recommendations – using balance sheet information collected by the European System of Central Banks (ESCB) from credit institutions, MMFs, investment funds, insurance corporations and pension funds (ICPFs) and FVCs.

The FSB recommendations provide a template for the macro-mapping exercise, which should be completed by national authorities on an annual basis and with a time series as far back as possible in order to capture trends. The template aims to establish the relative size of various components of the shadow banking system and also requires the assets and liabilities of the credit institutions with other financial intermediaries in aggregate. National authorities may supplement the listed subcategories of shadow banking entities with additional breakdowns on the basis of what may be available and relevant.

The requirements of the FSB template are summarised in ***Table 1***, with a comparison against the euro area terms and coverage. There are some key differences between the breakdowns of the FSB template and euro area statistics. For example, the term “other financial intermediaries” in the template may be regarded as equivalent to the euro area statistical OFI sector with the addition of MMFs (classified as MFIs in euro area statistics). Therefore, in this paper, the FSB “other financial intermediaries” will be termed “other non-bank financial intermediaries”. The following section presents the results of the macro-mapping exercise, as amended to conform to euro area definitions.

Table 1

Summary of requirements of the FSB *Step 1* Template with euro area equivalents and sources

Items from Template	***Euro area nomenclature***	***Details***	***Source***	***Regulation***	***Availability***
Central Bank	National Central Banks and European Central Bank (part of the MFI sector)	Individual balance sheets as well as consolidated for Eurosystem as a whole. *Monthly.*	MFI statistics	ECB/2008/32	1999
Banks	Credit institutions (part of the MFI sector)	Credit institutions comprise primarily "banks", but also similar types of deposit-taking institutions, e.g. building societies or credit unions. Separate credit institution balance sheet available *Quarterly.*	MFI statistics	ECB/2008/32	1999
*(Other deposit taking institutions to be listed)**	-	No distinction between bank and non-bank credit institutions	MFI statistics	ECB/2008/33	-
Insurance corporations	Insurance corporations	*Quarterly.*	ICPF statistics	Forthcoming	Q1 2008
Pension funds	Pension funds	*Quarterly.*	ICPF statistics	Forthcoming	Q1 2008
Public financial institutions	Public financial corporations	Publicly-owned financial intermediaries are classified in other financial sub-sectors without separate distinction	None	-	-
Money Market Funds (with constant NAV)	Money Market Funds (part of the MFI sector)	Separate aggregated balance sheet for all MMFs *Quarterly.* No distinction for MMFs with constant NAVs, or "other".	MFI statistics	ECB/2008/32	1999
Other Money Market Funds	Money Market Funds (part of the MFI sector)	Separate aggregated balance sheet for all MMFs *Quarterly.* No distinction for MMFs with constant NAVs, or "other".	MFI statistics	ECB/2008/32	1999
Finance companies	Finance companies	No data – included in residual below	-	-	-
Structured finance vehicles	Financial Vehicle Corporations engaged in securitisation (FVCs)	National and euro area aggregated balance sheet data, ISIN identifiers for debt securities issued. *Quarterly.*	FVC statistics	ECB/2008/30	Q4 2009
Hedge Funds	Hedge Funds	Separately identified within investment fund statistics. Includes funds of hedge funds. *Monthly and Quarterly.*	Investment fund statistics	ECB/2007/9	Q4 2008
Other investment funds	Investment funds	*Monthly and Quarterly.*	Investment fund statistics	ECB/2007/9	Q4 2008
*(Other intermediaries to be listed)**	-	Other substantial groups of financial intermediaries which could be listed at the euro area level include: non-securitising SPEs, CCPs, securities lending corporations. Limited data is available Aggregates only are available, from euro area accounts. *Quarterly.*	Euro area accounts	Various sources	1999

Note: The FSB template requests annual data from 1999 to 2008 and quarterly data from 2009 onwards. For the items marked with an asterisk (*), national authorities are to include further subcategories as appropriate. Data availability refers to the starting point of data published by the ECB. In some cases, MFI series go back further than 1999, but more detailed balance sheet information on instruments and counterparties commences only in 2003.

3. Macro-mapping the euro area shadow banking system

For the purposes of a macro-mapping approach to the financial sectors, the ESCB balance sheet data on financial institutions have a number of advantages. Reporting concepts and definitions of financial sub-sectors are harmonised across countries, aiding comparability. In the case of MFIs, investment funds and FVCs, the ECB maintains lists of resident entities for convenient identification of counterparties in the reporting of transactions.

As well as a national focus, the euro area counterparties may generally be split between domestic residents and residents in another euro area country. In some cases a country-by-country breakdown of counterparty residency is possible. As a great deal of the balance sheet data are published, this facilitates information exchange between relevant national authorities. However, a key limitation is that data on interactions with banks and other counterparties not resident in the euro area are often not available. It should also be borne in mind that the balance sheet data are recorded in so-called solo basis, whereby each institution is considered a separate unit, resident in the country where it is established. This means that financial institutions belonging to multinational groups are recorded individually in one country, whereas the ultimate risks may lie with the parent company resident elsewhere.

Data are compiled for the euro area on the basis of the *Step 1* template, amended as necessary. There were two primary sources for the data. First, ***monetary data*** on the financial sector balance sheets of MFIs (available from 1999), investment funds and FVCs (published from Q4 2008 and Q4 2009 respectively). Monetary data provide monthly or quarterly balance sheet stocks and transactions, including some detail on euro area counterparty sectors. In terms of euro area aggregates, monetary data usually operate with a "changing composition" concept – i.e. new countries are included in the euro area aggregate when they join Monetary Union. For OFIs other than investment funds and FVCs, only limited, unpublished information on securities and derivatives dealers and financial corporations engaged in lending is available.

Second, ***euro area financial accounts (EAA) data***, which provide a "flow of funds" for the euro area, give the total financial assets of OFIs. EAA data use the available monetary data as building blocks for the financial sector accounts where available, as well as alternative sources and estimations where monetary data are not available. EAA data for the euro area are generally compiled on a "fixed composition" – i.e. compiled data refer to the 17 Monetary Union Member States for all back data, even if some states were not yet members in those periods.[8]

The results of the macro-mapping exercise are presented below: first, the structure and trends in the financial sector as whole from 1999 to 2011, and the components of the other non-bank financial intermediaries (referred to as "OFIs" in the FSB template). Then the interactions between credit institutions will be examined – although the template covers only the "assets to OFIs" and "liabilities to OFIs", the monetary data also allow further breakdowns by type of intermediary and also by instrument: deposits, loans and debt securities. Finally, a snapshot of the geographical distribution of the other non-bank financial intermediaries will be provided in Section 3.3. The underlying data tables are presented in the Appendix.

3.1 Overall structure and trends in the euro area financial sector

The total assets of credit institutions more than doubled between the beginning of 1999 and the end of 2011 – from € 15.1 trillion to € 32.5 trillion – with a particularly rapid growth from the middle of the last decade to the outbreak of the crisis (***Chart 1***). In the period from 2008,

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8 As the financial sectors of the joining states have been relatively small, the difference between a "fixed composition" (of 17 members) and "changing composition" (of 12 to 17 members over the period) is quite small.

the rate of growth of credit institutions total assets has levelled out somewhat, but has been quite volatile, primarily the result of large shifts in remaining assets (which includes financial derivative positions) and, to a much lesser degree, the result of securitisations.

Part of the increase in lending by banks was facilitated by financial innovation, e.g. the use of securitisation in order to transfer credit risk off-balance sheets using FVCs. The transfer of credit risk enabled banks to gain regulatory capital relief which was freed for further lending. Securitisation seemed to allow banks to manage their exposures to certain counterparties or sectors and it was thought that the spreading of credit risk across investors increased the resilience of the financial system.

Total assets of other non-bank financial intermediaries have grown at a faster rate than the total assets of credit institutions since 1999. This growth continued through the crisis, with only a short interruption in early-2009 due to a sharp downwards revaluation in the equity holdings of investment funds, which was subsequently reversed. Overall, the annualised growth rate between the end-2004 and end-2011 for the total assets of these intermediaries averaged 8.7% per annum, compared with 6.9% per annum for credit institutions.

The largest constituent of the other non-bank financial intermediaries, 37% of total assets, are ***investment funds excluding hedge funds*** at € 6.2 trillion in Q4 2011 (***Chart 2***). ***Hedge funds*** account for only 1% of other non-bank financial intermediaries' assets in the euro area financial sector, with total assets of € 140 billion.

To what extent the operations of investment funds are linked to shadow banking can be debated. Many investment funds are involved in credit intermediation, as they receive funds from investors through issuance of shares or units and use these funds for extending credit, through the purchase of debt securities issued by public or private sector or placing deposits at credit institutions. Such investment funds are engaged in one of the two core activities of the conventional banking sector. Debt securities, deposits and loans made up 47% of investment funds' assets at end-2011. Investment funds may also be vulnerable to "runs", i.e. investors' sudden withdrawal of their investments, as the shares or units can usually be redeemed at a short notice. This forces the investment funds to liquidate their assets on a large scale, thereby potentially contributing to the instability of certain markets. Finally, some investment funds may apply leverage, amplifying any underlying risks.[9] On the other hand, investment funds are often considered by some as not engaging in shadow banking activities, mainly due to the fact that they are generally well regulated and do not seem likely to pose a systemic risk.[10]

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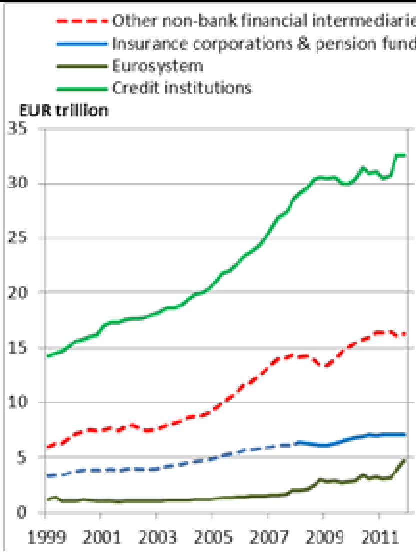
[9] See e.g. European Commission Green Paper on Shadow Banking, dated 19.3.2012.

[10] E.g. "Shadow Banking in the Euro Area", ECB Occasional Paper No 133, dated April 2012 and "Shadow banking: a forward-looking framework for effective policy", Institute of International Finance, dated June 2012.

Chart 1

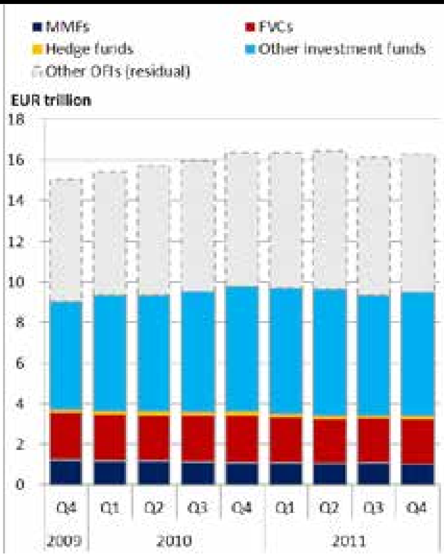
Overview of developments in the euro area financial sector total assets



Note: Data in Chart 1 is based on monetary data, except for dashed lines which indicate data source as EAA data.

Chart 2

Developments in main non-bank financial intermediary sub-sectors



Note: The category "other non-bank financial intermediaries" combines EAA data on total financial assets with monetary data breakdowns of subsectors.

FVCs constitute 14% of euro area other non-bank financial intermediaries, and are a very heterogeneous set of entities. They are generally set up for the purpose of issuing securities which are backed by credit-related assets, such as mortgages, consumer credit, auto loans, trade receivables, or even asset-backed securities issued by other FVCs ("re-securitisations"). FVCs may transfer credit risk through the purchase of a portfolio of assets – i.e. "traditional" securitisation. Of FVC total assets of €2.3 trillion in Q4 2011, two-thirds are loans (€ 1.5 trillion), and a further 10% are debt securities holdings.

Alternatively, credit risk may be transferred through derivatives, guarantees or similar mechanisms ("synthetic" securitisation). This is a particularly difficult to measure from a balance sheet perspective. In general, these FVCs issue securities and place the proceeds on deposit with the originating credit institution, while it enters in a credit default swap with the originator to covers losses on a reference portfolio of loans. Total debt securities issued by synthetic FVCs in the euro area amounted to € 77 billion in Q4 2011 – half of the Q4 2009 amount – but off-balance sheet guarantees are not included. In cases where a guarantee is not fully backed by issued securities, the balance sheet data do not reflect the total extent of the credit risk transferred.

Other shadow banking activities which are evident in the FVC sector relate to ***asset-backed commercial paper (ABCP) conduits*** and ***structured investment vehicles (SIVs)*** which hold longer-term asset-backed or other securities and issued short-term paper. These are not only engaged in credit risk transfer, but also play an important role in maturity and liquidity transformation – holding longer-term asset-backed or other securities and issuing short-term paper to investors. These types of activities were early causalities of the freezing in the markets in the first stages of the financial crisis, which in many cases forced them to call on liquidity lines (usually from the traditional banking sector) and/or to be brought onto credit institution balance sheets. The different roles which the FVC sector may play within the shadow banking system and the risks that they may pose indicates some of the shortcomings of aggregated data on the sector, and highlights the usefulness of granular information on their activities.

MMFs in the euro area amount to approximately € 1 trillion in assets (***Chart 2***), or 6% of euro area other non-bank financial intermediaries total assets. MMFs are commonly considered to form part of the shadow banking system. This follows from the fact that their shares/units issued are close substitutes for bank deposits. As such, they are also equally susceptible to "runs" if the quality of the underlying assets is perceived as questionable, with a potential to further depress the asset prices following the sell-off in such a situation. In addition, MMFs extend credit through the purchase of debt securities and placing deposits – the two instruments make around 94% of euro area MMF assets.

Despite recent advances in collecting data from OFIs, a ***large part of the other non-bank financial intermediaries remains a "residual"*** – over 40% in Q4 2011. The main part of this residual consists of special purpose entities not related to securitisation, such as financing vehicles of non-resident parent companies. These types of entities are relevant in a small number of euro area jurisdictions (Section 3.3). In addition, the residual includes central clearing counterparties (CCPs)[11], holding companies, securities and derivatives dealers and companies engaged in factoring, leasing and mortgage lending. Although information on the balance sheets of these entities is limited, there is at least some information available on their interactions with credit institutions.

3.2 Interactions between credit institutions and other non-bank financial intermediaries

The main relevant asset positions of credit institutions are ***debt securities issued by other non-bank financial intermediaries***, which increased from € 0.5 trillion to € 1.3 trillion between the beginning of the sub-prime crisis in Q3 2007 and end-2011 (***Chart 3***). A large part of this increase was in holdings of FVC securities, € 1.1 trillion in Q4 2011, which are retained by credit institutions for the purposes of central bank refinancing. Retained securitisations account for 57% of euro area FVC debt securities issued in Q4 2011. Although the purpose is to transform illiquid loan assets to a form which may be used to access refinancing operations, i.e. they are engaging in liquidity transformation, these may arguably be excluded from the shadow banking system, as they involve interactions purely within the (consolidated) banking sector.

Loans to other non-bank financial intermediaries have increased from 6.9% of total lending to the non-MFI private sector in January 2003 to 10% at end-2011. Of the € 1.1 trillion outstanding loans in Q4 2011, € 156 billion were to CCPs – i.e. were related to inter-MFI borrowing which was routed through a clearing party in the OFI sector. Some of the loan counterparty data are not collected, including loans to FVCs. Lending to FVCs could include support from sponsoring banks to vehicles which they set up, through drawn-down credit lines for example.

Credit institutions' holdings of ***shares and other equity issued by other non-bank financial intermediaries*** amounted to € 414 billion at Q4 2011. The majority of this seems to be investment fund shares, with around 3% in shares/units issued by MMFs.

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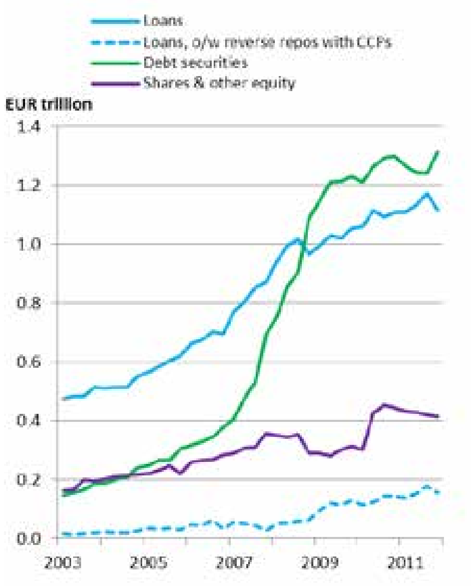
[11] CCPs act as intermediaries in interbank lending, with corresponding loans from and deposits to the MFI sector. (In some cases the CCPs are themselves licensed banks, in which case they are classified as MFIs.)

Chart 3

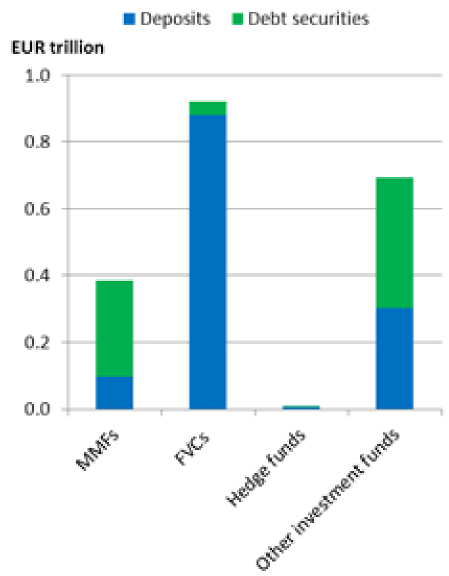
Credit institution asset holdings vis-à-vis other non-bank financial intermediaries



Note: Data on reverse repos of MFIs with CCPs are published from June 2010. Earlier data are estimates.

Chart 4

Holdings of deposits with and holdings of debt securities issued by euro area credit institutions, Q4 2011



On the liabilities side of credit institutions' balance sheets, ***deposits from other non-bank financial intermediaries*** increased from € 0.6 trillion at the beginning of 2003 to € 2.3 trillion at end-2011[12]. Much of this increase is due to deposits from FVCs, € 880 billion in Q4 2011 (***Chart 4***), and relates mostly to securitisations without derecognition of loans from the banks' balance sheets. In these cases the credit institution records a deposit liability to the FVC, which is the counterpart of the non-derecognised loans. A small portion of FVC deposits, € 16 billion, are from synthetic securitisation vehicles, discussed Section 3.2. 13% of deposits from other non-bank financial intermediaries are from investment funds, of which hedge fund deposits are negligible. 11% of other non-bank financial intermediaries' deposits are from CCPs – again, related to inter-MFI repo transactions which are cleared using CCPs.

As well as holding significant amounts of deposits with euro area credit institutions, MMFs and investment funds also hold ***debt securities issued by euro area credit institutions*** (***Chart 4***). MMF holdings of debt securities issued by euro area credit institutions amounted to 38% of the total MMF balance sheet, and a further 31% of MMFs' total assets consist of deposits and debt securities of banks outside the euro area. This demonstrates the extent to which the euro area MMF sector can be seen as a funding source of the traditional banking sector.

[12] See the article "The Interplay of Financial Intermediaries and Its Impact on Monetary Analysis" in the ECB Monthly Bulletin of January 2012.

3.3 Geographical distribution of euro area non-bank financial intermediaries

There is an uneven geographical distribution of non-bank financial intermediaries in the euro area for historical, regulatory and other reasons. Of the € 16.3 trillion total assets of other non-bank financial intermediaries in the euro area, almost half is concentrated in Luxembourg and Netherlands (***Chart 5***), with France, Ireland and Germany making up a further 36% between them.

Chart 5

Relative shares of other non-bank financial intermediaries in the total financial sector, Q4 2011

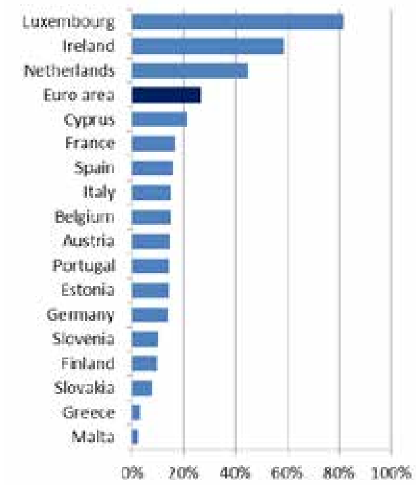
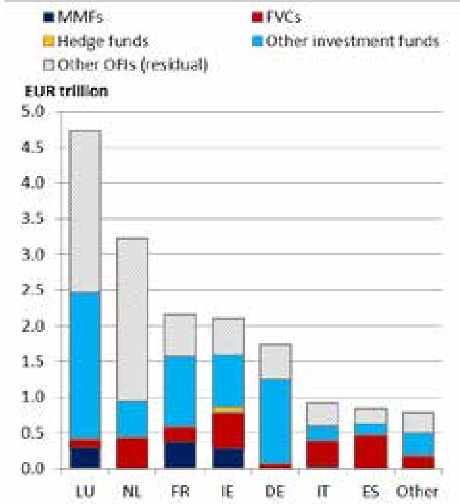


Chart 6

Geographical distribution of other non-bank financial intermediaries, by total assets, Q4 2011



For a large proportion of the non-bank financial intermediaries, the monetary data do not provide much information on activities – almost half of the total balance sheet in Luxembourg and over half in the Netherlands (***Chart 6***), where non-securitisation related special purpose entities are significant. National authorities may have more granular information on these activities than is available or published on a euro area level – of course, a macro-mapping exercise using monetary data at a euro area regional level may only be a complement to similar exercises carried out at the national level. However, the monetary data can help shed light on cross-border activities of the sector, particularly between securitisations which are carried out by banks resident in one country using FVCs resident in another – with Ireland and the Netherlands being the most common jurisdictions for such activity. In addition, some securitisations may use a number of vehicles which may be resident in different countries.

Part of the macro-mapping exercise is to monitor how these patterns may change in response to regulatory developments. The monetary data provide a good basis for the monitoring of developments within the euro area, although a key weakness is that data on activities outside the euro area (the UK being the most relevant) are limited. Data gaps on geographic coverage, as well as other gaps, are assessed in the following section.

4. Identifying and addressing data gaps

The lack of information on this sector was quickly identified after the crisis as an important data gap and urgent attention turned to how this could be addressed. Recent advances in euro area statistics on the non-MFI financial sector have contributed greatly to the understanding of the activities of MFIs, securitisation, non-bank credit intermediation and developments in the money-holding sector[13]. Further amendments of the existing statistical regulations on MFIs, FVCs and investment funds (which are currently underway in response to the necessary changes for ESA 2010) aim to ensure that the euro area statistical requirements remain fit for purpose. Some relevant data gaps remain, however.

The ***institutional coverage within the euro area*** potentially overlooks parts of the financial sector (among them, non-securitising SPEs, securities dealers, factoring and leasing companies). This "residual" part of the OFI sector may include entities or activities which are systemically important in themselves, or are "missing" links in credit intermediation chains. However, as the residual intermediaries may be more nationally-specific and specialised, there are diminishing marginal returns in trying to capture them with harmonised euro area reporting requirements. In those jurisdictions where these types of OFIs are significant, the national authorities and compilers of statistics may already collect some data and are best placed to detect emerging trends.

In terms of ***geographic coverage of counterparties located outside the euro area***, these are usually not allocated to sectors in monetary statistics. Increasing data requirements for counterparty breakdowns of all rest of world counterparties would of course be an unacceptable increase in statistical reporting requirements, however security-by security information can alleviate the burden of reporting agents to allocate counterparties to geographic and counterparty classifications. The ECB has set up a Centralised Securities Database (CSDB) which can be used in conjunction with security-level data by national central banks to identify issuing sectors. (Loan-by-loan level data, through credit registers, for example, may provide similar benefits.) In other cases, it may be better to try to cover key counterparts in terms of risk, for example large exposures of credit institutions to FVCs which they have set up outside the euro area.

The data are not complete with regards to ***counterparties and instruments*** which would allow the full macro-mapping of the interactions between the financial sub-sectors. In particular, there is a lack of information on holdings of securities issued by MFIs and OFIs. Security-by security reporting is a very rich source of information when assessing risks, given that it could reveal exposures to particular institutions and by rating. Gaps in holding sector data may be addressed by the on-going development of securities holdings statistics in the euro area, aided by the CSDB to allocate securities to sectors.

Balance sheet data at the aggregate level often do not take into account ***close links between entities***, or the composition of groups and intra-group positions, which may act as a route for contagion. This may be addressed by improved registers of institutions which better account for relationships between entities.

Crucially, balance sheet data alone are not sufficient for a proper analysis of the ***off-balance sheet risks*** which may be accumulating in the system. These risks are often in the form of contingent claims or guarantees, and hence the usefulness of balance sheet data is constrained. These gaps may be addressed by supervisory requirements – pursued, for example, via the FSB workstreams to develop recommendations on regulatory policy.

5. Conclusion

A large part of the necessary data for a macro-mapping exercise can be sourced from financial sector balance sheet statistics. The regular banking sector, MMF sector, investment fund sector (including hedge funds) and FVC sector are covered by relatively detailed data

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[13] The ECB began publishing data on FVCs, investment funds and ICPFs in June 2011. For an overview, see the article "Keeping the ECB's Monetary and Financial Statistics Fit for Use" in the ECB Monthly Bulletin of August 2011.

collected under ECB regulations in the euro area. Furthermore, non-euro area EU countries in many cases produce the same or very similar statistics, ensuring a high coverage of the EU according to harmonised statistical definitions.

Macro-mapping at the euro area level will naturally only be a complement to the national exercises. National compilers of these statistics may have access to micro-level statistical and supervisory data which would allow risks to be assessed at a more granular level, and they may have more detailed breakdowns of assets and liabilities of entities involved in shadow banking activities which are not covered by ECB regulations. There are, however, potential benefits of carrying out the exercise at the euro area level in addition to national approaches:

- it can help identify data gaps which may be appropriately filled with harmonised, euro area wide reporting requirements;
- it may better leverage the usefulness of available cross-border data;
- it can identify opportunities for sharing of data between national authorities, for example with relation to holdings of securities; and
- it can make regional trends more apparent, due to the cross-border nature of many shadow banking activities.

Finally, as noted in the FSB recommendations, macro-mapping is useful as a starting point for monitoring developments in the financial sector. However, it is not suitable on its own for determining which entities are engaged in shadow banking activities and are potentially posing systemic risks. An attempted measurement of the “size” of the shadow banking system should not become a distraction. Rather than the scale of balance sheets, the relevant risks may be off-balance sheet, or arise through the nature of the complex interactions between other financial intermediaries and banks.

Appendix: Macro-map tables for the euro area using financial sector balance sheet statistics

Table A1

Euro area financial sector by total assets (€ billions)

		Financial institutions													
			Central Bank (Eurosystem)	Credit institutions			ICPFS			Other financial intermediaries and MMFs					
					Assets to OFIs & MMFs	*Liabilities to OFIs & MMFs(*)*		Insurance corporations	Pension funds		MMFs	FVCs	Hedge funds	Other investment funds	Other OFIs (residual)
1999		*26,718*	1,014	15,167	382	556	*3,658*	na	na	*6,879*	331	na	na	na	*6,548*
2000		*28,540*	1,005	16,241	469	597	*3,870*	na	na	*7,424*	421	na	na	na	*7,003*
2001		*30,298*	997	17,561	542	687	*3,971*	na	na	*7,769*	605	na	na	na	*7,164*
2002		*30,633*	1,042	18,069	623	764	*4,008*	na	na	*7,514*	742	na	na	na	*6,772*
2003		*32,772*	1,087	18,890	897	911	*4,399*	na	na	*8,396*	912	na	na	na	*7,484*
2004		*35,541*	1,197	20,430	1,006	989	*4,811*	na	na	*9,103*	926	na	na	na	*8,177*
2005		*40,409*	1,405	22,645	1,143	1,245	*5,427*	na	na	*10,932*	991	na	na	na	*9,941*
2006		*45,230*	1,558	24,907	1,356	1,504	*5,906*	na	na	*12,859*	1,047	na	na	na	*11,812*
2007		*50,907*	2,047	28,340	1,920	1,932	*6,177*	na	na	*14,343*	1,155	na	na	na	*13,188*
2008		*53,092*	2,983	30,556	2,343	2,698	6,160	4,903	1,257	*13,393*	1,274	na	118	4,345	*7,656*
2009	**Q1**	*52,834*	2,784	30,418	2,429	2,777	6,191	4,956	1,235	*13,441*	1,323	na	99	4,224	*7,795*
	Q2	*53,703*	2,893	30,513	2,522	2,868	6,325	5,080	1,246	*13,972*	1,291	na	96	4,608	*7,977*
	Q3	*53,829*	2,747	29,997	2,535	2,869	6,517	5,207	1,310	*14,568*	1,272	na	94	5,093	*8,109*
	Q4	*54,406*	2,830	29,911	2,597	2,912	6,642	5,296	1,346	*15,023*	1,233	2,367	104	5,331	*5,988*
2010	**Q1**	*55,521*	2,881	30,349	2,569	2,932	6,871	5,483	1,389	*15,420*	1,208	2,293	129	5,735	*6,056*
	Q2	*57,402*	3,390	31,381	2,801	3,074	6,890	5,489	1,400	*15,741*	1,197	2,287	137	5,739	*6,381*
	Q3	*56,984*	3,024	30,912	2,841	3,110	7,064	5,603	1,462	*15,984*	1,174	2,286	127	5,950	*6,446*
	Q4	*57,643*	3,212	31,067	2,850	3,129	6,997	5,569	1,428	*16,367*	1,133	2,352	132	6,156	*6,594*
2011	**Q1**	*56,978*	3,039	30,455	2,806	3,126	7,091	5,663	1,429	*16,393*	1,105	2,255	136	6,208	*6,688*
	Q2	*57,352*	3,138	30,665	2,805	3,142	7,103	5,667	1,436	*16,446*	1,071	2,218	137	6,223	*6,797*
	Q3	*59,731*	3,929	32,557	2,831	3,204	7,099	5,625	1,474	*16,146*	1,101	2,202	146	5,935	*6,762*
	Q4	*60,595*	4,700	32,518	2,841	3,088	7,084	5,573	1,511	*16,293*	1,021	2,273	142	6,070	*6,787*

Note: Data comes from the financial balance sheet data on total assets of MFIs, investment funds and FVCs, except *italicised* data which is based (wholly or in part) on euro area accounts estimates of total financial assets. Data which is not available (or not published by the ECB) is denoted "na", data points which are assumed to be nil for conceptual reasons are denoted "..".

(*) Liabilities of credit institutions to OFIs are based on complete data on deposits, plus the holdings reported by MMFs, FVCs and investment funds of credit institutions' debt securities and shares and other equity (see table A3). Therefore, it should be regarded as an indicative lower bound of OFI holdings of credit institution liabilities, rather than a comprehensive total.

Table A2

Assets of euro area credit institutions vis-à-vis Other Financial Intermediaries and Money Market Funds (€ billions)

		Assets to OFIs and MMFs															
			Loans from credit institutions to OFIs and MMFs borrowing sectors							**Debt securities held by credit institutions by OFIs and MMFs issuing sector**							**Shares and other equity**
				MMFs	CCPs	FVCs	Hedge funds	Other investment funds	Other OFIs (residual)		MMFs	CCPs	FVCs	Hedge funds	Other investment funds	Other OFIs (residual)	
1999		**382**	**324**	6	na	na	na	na	318	**41**	..	..	na	..	..	41	**18**
2000		**469**	**399**	4	na	na	na	na	395	**55**	..	..	na	..	..	55	**16**
2001		**542**	**440**	5	na	na	na	na	435	**78**	..	..	na	..	..	78	**24**
2002		**623**	**459**	4	na	na	na	na	455	**116**	..	..	na	..	..	116	**48**
2003		**897**	**515**	4	na	na	na	na	511	**186**	..	..	na	..	..	186	**197**
2004		**1,006**	**551**	5	na	na	na	na	546	**240**	..	..	na	..	..	240	**215**
2005		**1,143**	**619**	5	na	na	na	na	614	**305**	..	..	na	..	..	305	**219**
2006		**1,356**	**695**	6	na	na	na	na	689	**378**	..	..	na	..	..	378	**283**
2007		**1,920**	**871**	9	na	na	na	na	862	**692**	..	..	na	..	..	692	**357**
2008		**2,343**	**966**	5	na	na	8	107	846	**1,087**	..	..	na	..	..	1,087	**290**
2009	**Q1**	**2,429**	**995**	4	na	na	5	101	885	**1,146**	..	..	na	..	..	1,146	**288**
	Q2	**2,522**	**1,029**	3	na	na	4	106	916	**1,212**	..	..	na	..	..	1,212	**281**
	Q3	**2,535**	**1,020**	5	na	na	4	118	893	**1,214**	..	..	na	..	..	1,214	**302**
	Q4	**2,597**	**1,054**	2	na	na	6	120	926	**1,230**	..	..	na	..	..	1,230	**313**
2010	**Q1**	**2,569**	**1,059**	4	na	na	11	115	929	**1,210**	..	..	na	..	..	1,210	**301**
	Q2	**2,801**	**1,113**	4	122	na	11	125	851	**1,263**	..	..	912	..	..	351	**425**
	Q3	**2,841**	**1,093**	7	143	na	9	123	811	**1,294**	..	..	905	..	..	389	**454**
	Q4	**2,850**	**1,108**	2	143	na	7	111	845	**1,298**	..	..	954	..	..	344	**444**
2011	**Q1**	**2,806**	**1,109**	2	138	na	8	122	839	**1,264**	..	..	900	..	..	364	**433**
	Q2	**2,805**	**1,132**	2	153	na	10	113	854	**1,246**	..	..	938	..	..	308	**427**
	Q3	**2,831**	**1,171**	3	178	na	9	117	864	**1,240**	..	..	969	..	..	271	**421**
	Q4	**2,841**	**1,117**	2	156	na	8	109	842	**1,309**	..	..	1,065	..	..	244	**414**

Note: Data come from the financial balance sheet data on total assets of MFIs, investment funds and FVCs. Data which is not available (or not published by the ECB) is denoted “na”, data points which are assumed to be nil are denoted “..”.

Table A3

Liabilities of euro area credit institutions held by Other Financial Intermediaries and Money Market Funds (€ billions)

		Liabilities to OFIs and MMFs														
			Deposits of OFIs and MMFs with credit institutions							Credit institution debt securities by OFIs and MMFs holding sector						Shares and other equity
				MMFs	CCPs	FVCs	Hedge funds	Other investment funds	Other OFIs (residual)		MMFs	CCPs	FVCs	Hedge funds	Other investment funds	
1999		**556**	**445**	46	na	na	na	na	399	**111**	111	na	na	na	na	**na**
2000		**597**	**485**	55	na	na	na	na	430	**112**	112	na	na	na	na	**na**
2001		**687**	**529**	62	na	na	na	na	467	**158**	158	na	na	na	na	**na**
2002		**764**	**560**	66	na	na	na	na	494	**204**	204	na	na	na	na	**na**
2003		**911**	**660**	93	na	na	na	na	567	**251**	251	na	na	na	na	**na**
2004		**989**	**716**	80	na	na	na	na	636	**273**	273	na	na	na	na	**na**
2005		**1,245**	**951**	70	na	na	na	na	881	**294**	294	na	na	na	na	**na**
2006		**1,504**	**1,202**	56	na	na	na	na	1,146	**302**	302	na	na	na	na	**na**
2007		**1,932**	**1,618**	94	na	na	na	na	1,524	**314**	314	na	na	na	na	**na**
2008		**2,698**	**1,954**	152	na	na	9	298	1,496	**676**	335	na	na	2	339	**68**
2009	**Q1**	**2,777**	**1,986**	147	na	na	7	296	1,536	**742**	394	na	na	2	346	**50**
	Q2	**2,868**	**2,039**	142	na	na	6	281	1,610	**759**	396	na	na	2	361	**71**
	Q3	**2,869**	**1,989**	123	na	na	6	274	1,587	**781**	397	na	na	2	383	**98**
	Q4	**2,912**	**1,985**	113	na	na	5	271	1,596	**830**	390	na	52	2	386	**98**
2010	**Q1**	**2,932**	**1,995**	108	na	na	8	290	1,589	**842**	401	na	48	3	390	**95**
	Q2	**3,074**	**2,179**	103	214	758	5	278	821	**821**	390	na	50	3	378	**74**
	Q3	**3,110**	**2,215**	109	226	790	4	268	818	**815**	382	na	47	3	383	**80**
	Q4	**3,129**	**2,262**	94	255	849	4	277	783	**789**	367	na	46	2	373	**78**
2011	**Q1**	**3,126**	**2,253**	87	241	831	5	283	806	**783**	358	na	42	3	381	**89**
	Q2	**3,142**	**2,319**	103	291	832	4	304	785	**738**	311	na	41	3	384	**85**
	Q3	**3,204**	**2,426**	114	339	841	4	284	843	**725**	302	na	42	3	378	**53**
	Q4	**3,088**	**2,320**	99	260	880	5	304	772	**717**	286	na	40	2	389	**51**

Note: Data come from the financial balance sheet data on total assets of MFIs, investment funds and FVCs. Data which is not available (or not published by the ECB) is denoted “na”, data points which are assumed to be nil for conceptual reasons are denoted “..”. Liabilities of credit institutions to OFIs are based on complete data on deposits, plus the holdings reported by MMFs, FVCs and investment funds of credit institutions’ debt securities and shares and other equity. No information is available on the holdings of the residual OFI sub-sectors of credit institutions’ debt securities and shares and other equity issued.

OECD financial statistics for measuring the structure and size of the shadow banking system

Satoru Hagino and Liliana Cavieres[1, 2]

Introduction

OECD financial statistics[3] are useful tools for understanding financial structures of OECD countries and monitoring changes in their financial activities. The OECD financial accounts cover the entire financial sector of the economy and the Institutional Investors' Assets database focus on three main categories of financial corporations: investment funds, insurance companies, and pension funds, and provide data for further sub-classification. The OECD Working Party of Financial Statistics (WPFS) has been discussing the use of existing financial statistics and developing new type of financial statistics. Among various international projects of WPFS, developing data for securitisation as well as special purpose entities, often referred to as shadow banking, is one of the most important subjects in recent years. Thus this paper examines the usefulness of OECD financial statistics and discusses the outcomes of recent works done by WPFS, in particular, in the area of shadow banking.

1. Usefulness of OECD financial statistics

(1) Cross-country comparison of activities of financial corporations

The OECD financial accounts, the financial balance sheets in particular, are very useful in comparing activities of financial corporations of OECD countries. By doing so, the importance of the financial sector as well as characteristics of its financial structure of OECD countries can be identified.

Among OECD countries, the United States has, in absolute terms, by far the largest financial assets and liabilities held by the Total economy, which is followed by Japan, United Kingdom, France and Germany (see Chart 1). In relative terms, i.e., comparing the financial assets as a percent of GDP, Luxembourg has the biggest size of assets (138 times the GDP) followed by Ireland (30 times) and the United Kingdom (18 times). The United States accounts for 9 times.[4]

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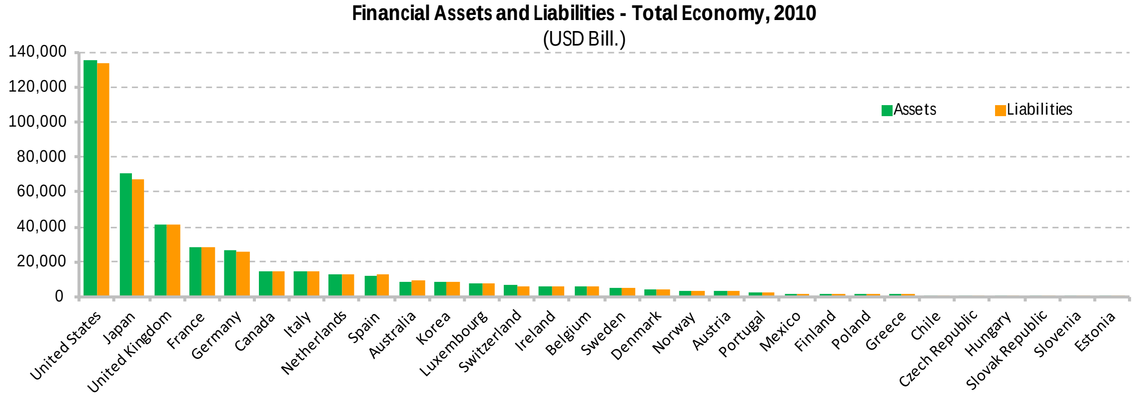
[1] OECD Statistics Directorate

[2] Satoru Hagino and Liliana Cavieres are Secondees from the Bank of Japan and the Central Bank of Chile, respectively. Useful comments from Michèle Chavoix-Mannato are gratefully acknowledged.

[3] Data can be retrieved from the OECD.Stat data browser http://stats.oecd.org/index.aspx. With respect to the dissemination of statistics, the OECD was the first international organisation to offer the full range of its statistical database in combination with analytical publications in a single website, Source OECD. The new version of source OECD, called OECD iLibrary, has been launched in June 2009. The OECD Statistics Portal, redesigned in 2009, provides quick access to a variety of data and methodological publications, including extracts from OECD.Stat, the Organisation's data warehouse. Moreover, through StatLinks, i.e. URLs shown under tables and graphs, users can go straight to spreadsheets providing the underlying data.

[4] Figures are on a non-consolidated basis, except for those of Australia.

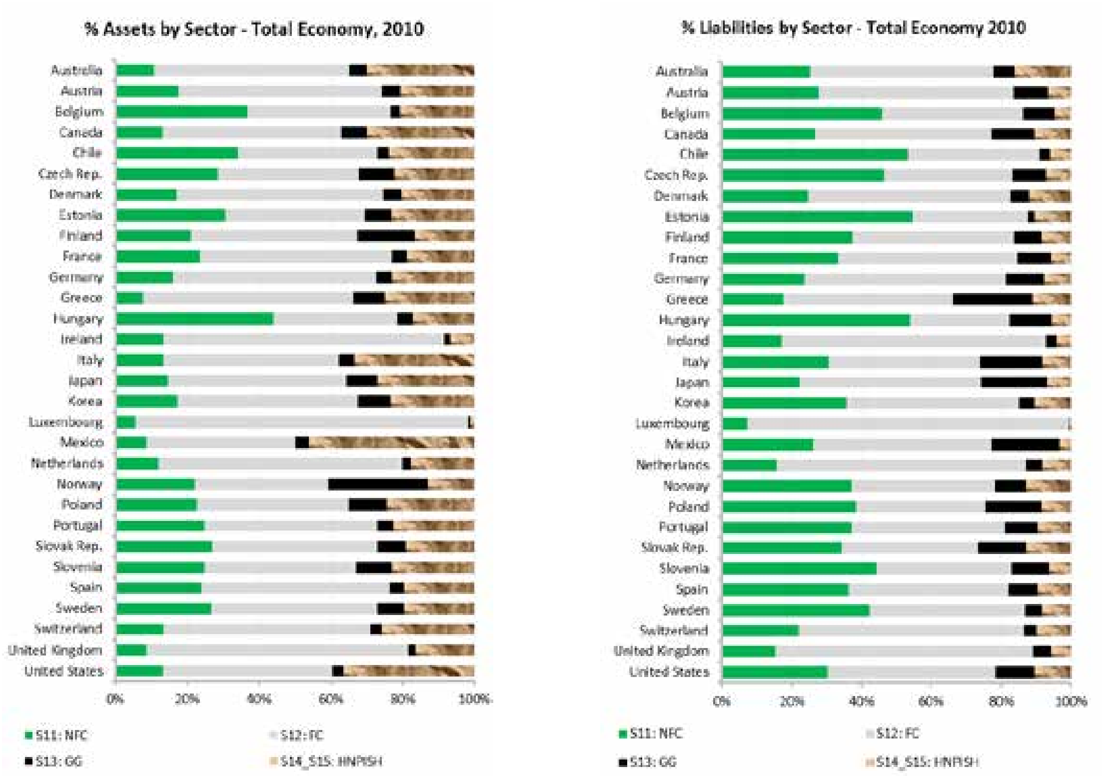
Chart 1



Source: Financial Balance Sheets, OECD.Stat

When the Total economy is divided into four sectors: Non-financial corporations (S11); Financial corporations (S12); General government (S13) and Households and NPISH (S14–S15), the Financial corporations sector holds the largest financial assets and liabilities, representing, on average, the share of slightly more than 50% of total financial assets and liabilities, respectively. In some countries, the Financial corporations sector represents even more important weights, e.g., 93% in Luxembourg, 78% in Ireland and near 70% in the United Kingdom and in the Netherlands. It is to be noted that these countries hold the largest financial assets as a percent of GDP. Households hold, on average, 27% of total financial assets while Non-financial corporations hold 15%. As regards the liabilities, the Non-financial corporations sector has a relatively greater importance, representing 30%, while Households and Government sectors have relatively less importance, both representing around 10% (see Chart 2).

Chart 2



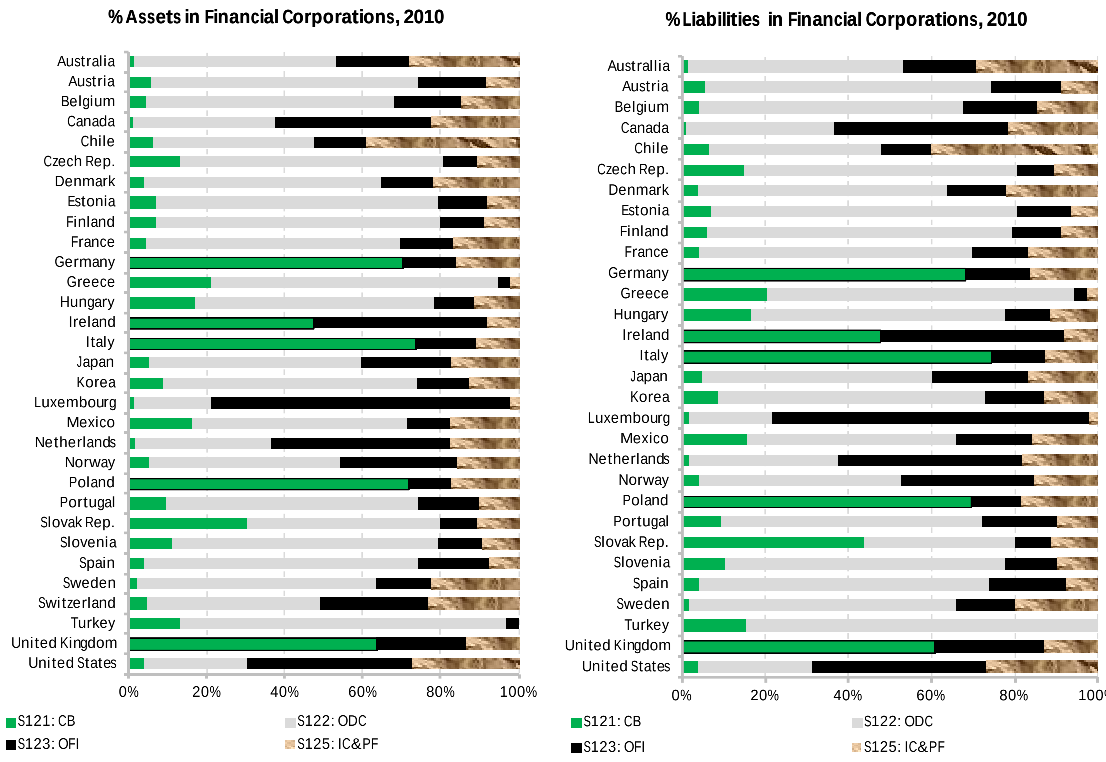
Source: Financial Balance Sheets, OECD.Stat

Within the Financial corporations sector, the most important sector in the size of financial assets and liabilities is the Depository corporations sector, which combines Central bank (S121) and Other depository corporations (S122) sectors. Depository corporations have a weight of slightly more than 50%, Other financial intermediaries (S123) represent approximately 30% and the remaining part corresponds to Insurance corporations and pension funds (S125)[5] (see Chart 3).

Turkey, Greece, Finland, Estonia and Spain have the largest weight of Other depository corporations in the Financial corporations sector. In terms of financial assets, Other depository corporations represent in these countries more than 70% (similar results have been found for liabilities). In contrast, the weight of Other depository corporations is below 30% in Luxembourg and the United States. These two countries, together with the Netherlands, record the largest share of Other financial intermediaries within the Financial corporations sector (77% in Luxembourg, 46% in Netherlands and 42% in the United States).

For Germany, Ireland, Italy, Poland and the United Kingdom, there is no data available for Central bank and Other depository corporations separately. They are considered as a combined sector, the Depository corporations sector. This sector holds more than 70% of assets in Italy, Poland and Germany. On the liability side, the weight of Depository corporations is more than 70% only in Italy.

Chart 3



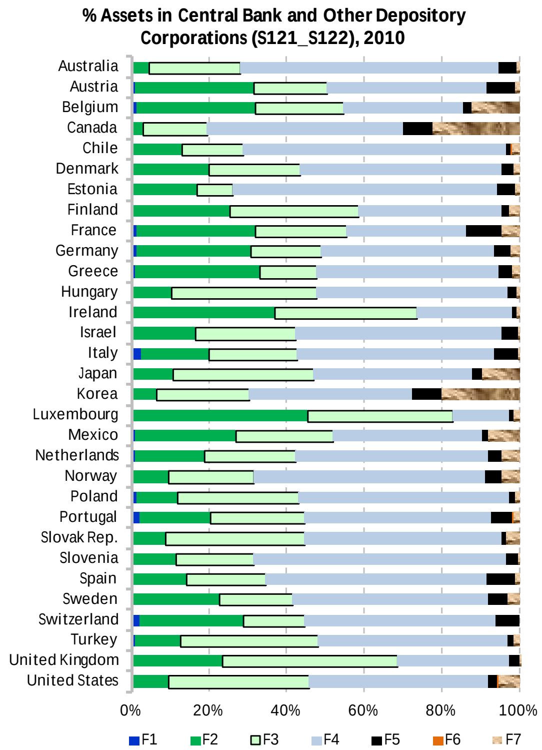
Source: Financial Balance Sheets, OECD.Stat

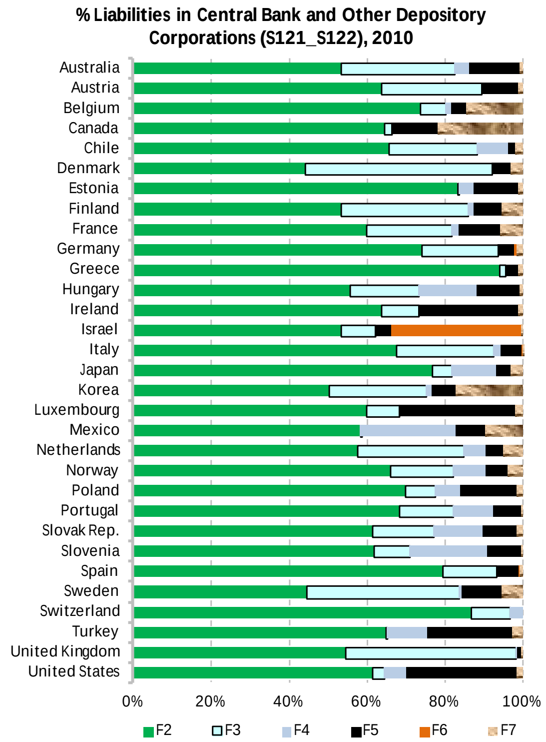
5 Financial auxiliaries (S124) are not included in the calculation since they hold, on average, less than 1% of Financial corporations' assets. On the liability side, Financial auxiliaries represent even less.

Looking at the composition of total assets and liabilities held by Depository corporations by type of instrument, it is evidenced that the majority of assets consists of Loans (F4) and the majority of liabilities consists of Currency and deposits (F2) (see Chart 4). Other important components of financial assets are Securities other than shares (F3) and Currency and deposits (F2). On the liability side, Securities other than shares (F3) as well as Shares and other equity (F5) are the second and third elements in importance.

Estonia, Chile, Australia, Slovenia and Norway are countries where the majority of assets of Depository corporations are Loans (more than 60%). In contrast, in Luxembourg, Ireland and the United Kingdom, Securities or Deposits have more importance in the Depository corporations sector.

Chart 4





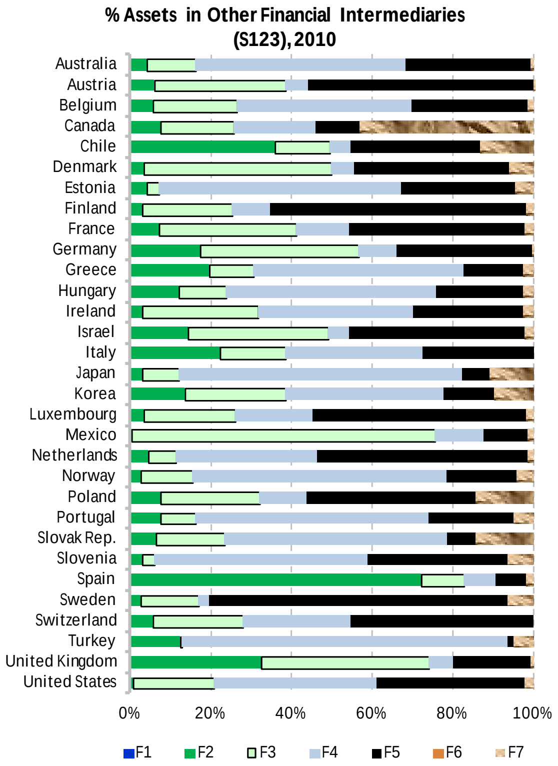
Source: Financial Balance Sheets, OECD.Stat

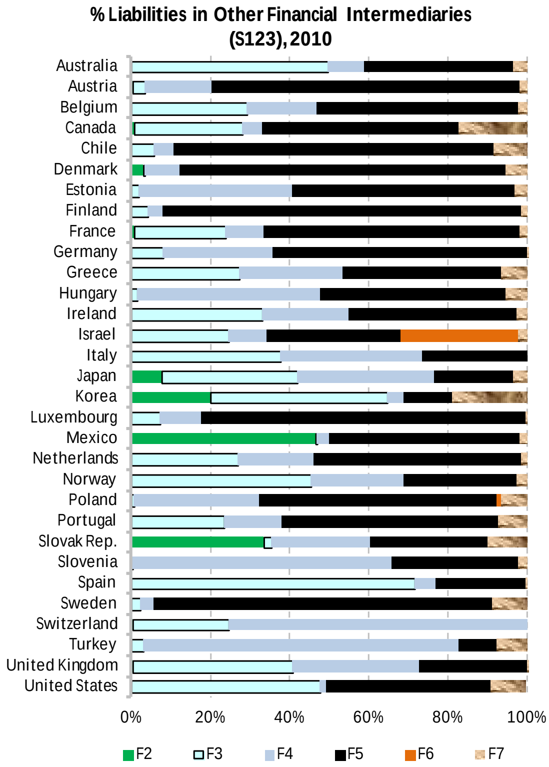
The asset composition of Other financial intermediaries is more diversified than Depository corporations. Other financial intermediaries invest in Loans, Shares and other equity, and Securities other than shares with similar weight (35%, 32% and 22%, respectively).

There are some countries in which Other financial intermediaries invest predominantly in certain assets. For example, Other financial intermediaries of Turkey and Japan invest in Loans, while those of Sweden invest in Shares and other equity and those of Mexico invest in Securities other than shares, in particular. In Spain, Other financial intermediaries hold a large amount of Deposits. Liabilities of Other financial intermediaries mainly consist of Shares and other equity (see Chart 5).

Insurance corporations and pension funds invest primarily in Securities other than shares and secondarily in Shares and other equity (see Chart 6). There are some differences among countries in the composition of assets. In Mexico, Insurance corporations and pension funds invest predominantly in Securities other than shares, while in Australia they invest higher portions in Shares and other equity. On the liability side, Insurance technical reserves (F6) are the most important for all countries except Mexico.

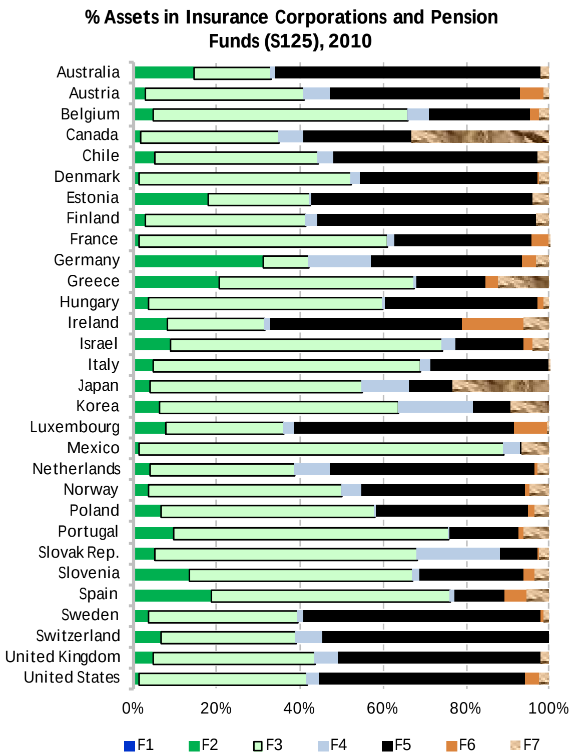
Chart 5

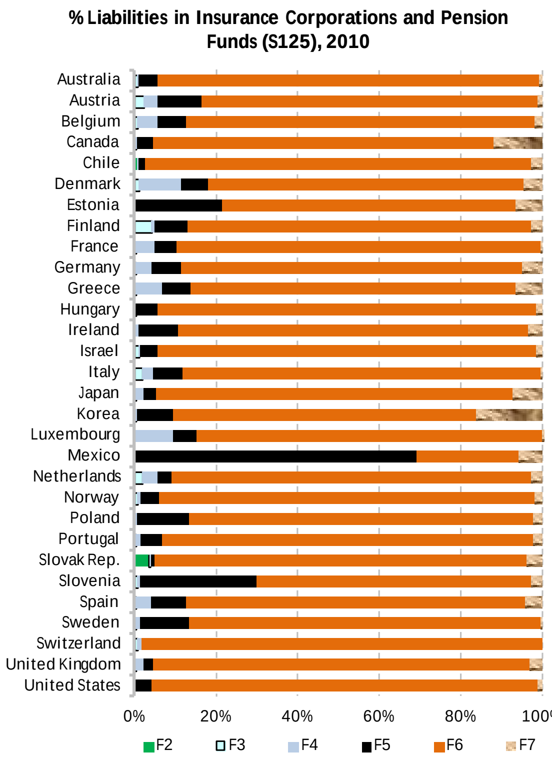




Source: Financial Balance Sheets, OECD.Stat

Chart 6





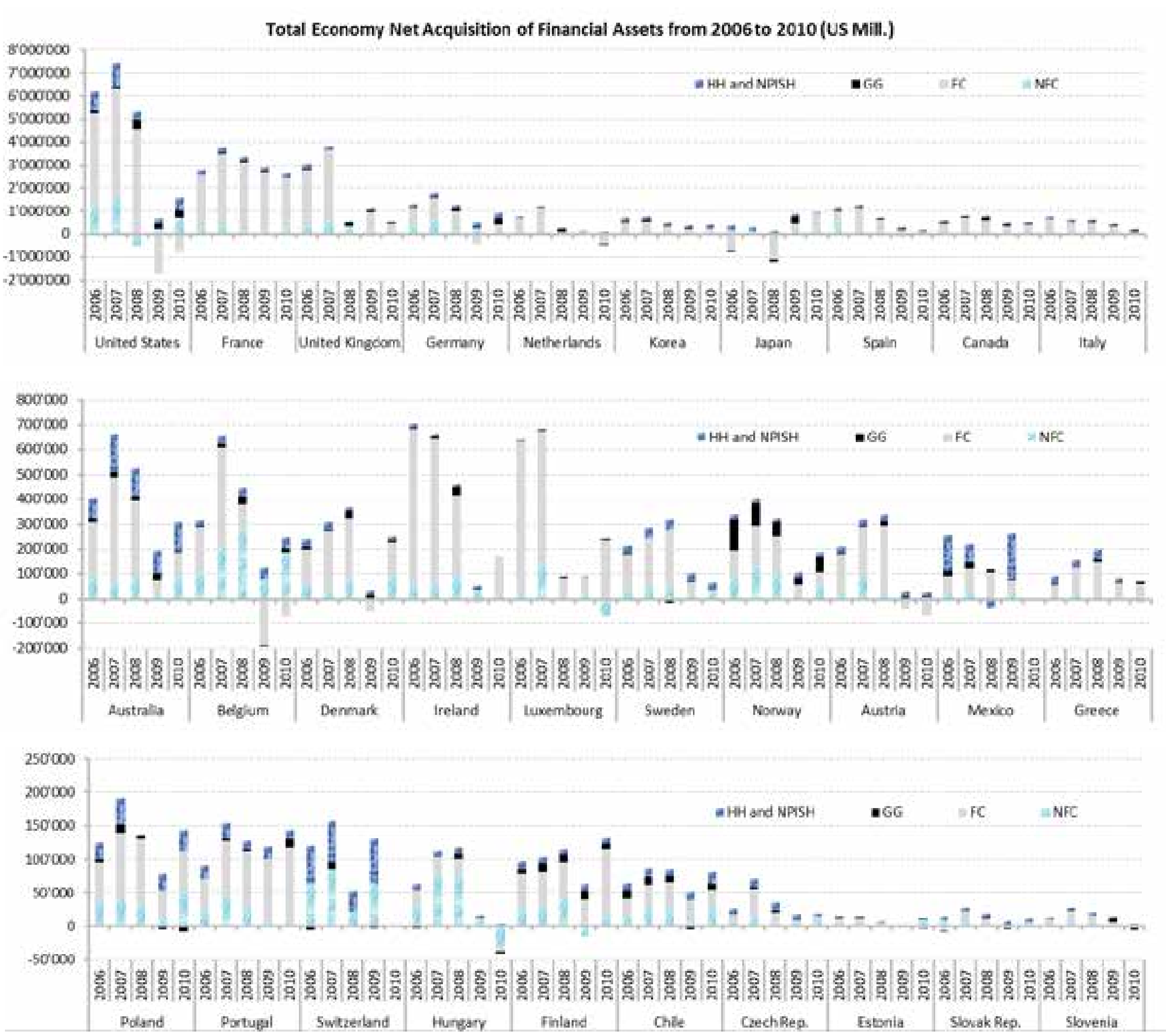
Source: Financial Balance Sheets, OECD.Stat

(2) Identification of structural changes in financial activities

One can observe changes of patterns over the time in the financial transactions as recorded in the OECD financial accounts. For example, net acquisition of financial assets can be positive or negative and the surplus/deficits can increase or decrease.

When analysing the effects of subprime crisis, it would be appropriate to focus on transactions from 2006 to 2010.[6] Its band of fluctuation appears particularly wide when comparing the transactions before and after the financial crisis of 2007-2008. Net acquisition of financial assets for Total economy showed a decrease in 2008 and reached its lowest level in 2009 in most OECD countries. Transactions recovered in 2010, with the exception of the United Kingdom, Netherlands, Spain, Italy, Sweden, Austria, Greece, Hungary and Slovenia (see Chart 7).

Chart 7



Source: Financial Accounts, OECD.Stat

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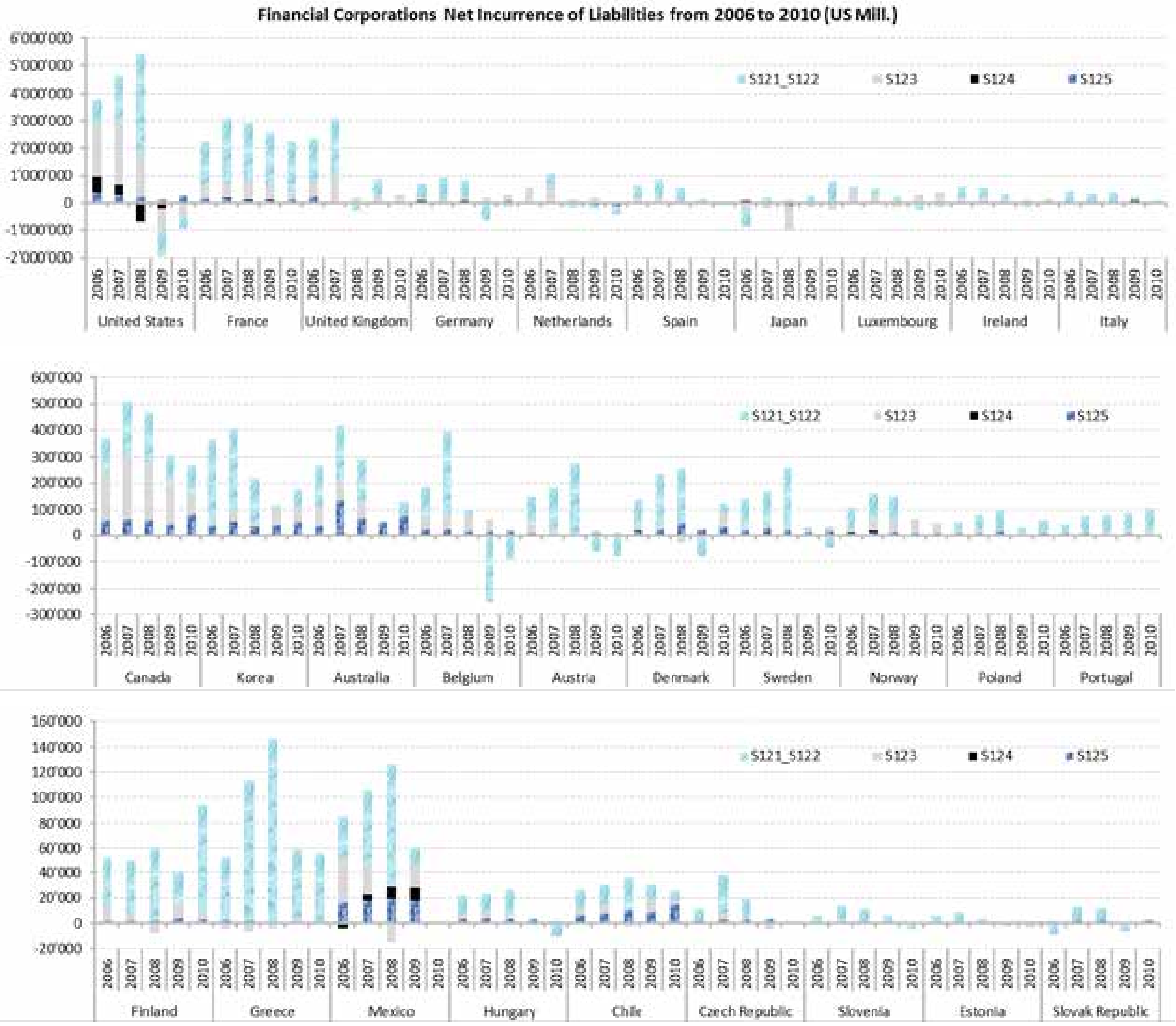
6 The subprime crisis started in 2007 with increasing sub-prime mortgage foreclosures, reached its peak in 2008 with Lehman Brothers' bankruptcy and spread negative effects to real economy during 2009. In 2010, economic recoveries started. As soon as data for 2011 become fully available, it should be further analysed since economies started to incorporate the effects of the following Government debt crisis in several European countries.

When focusing on the Financial corporations sector, similar pattern to the total economy can be observed in the evolution of financial transactions (see Chart 8).

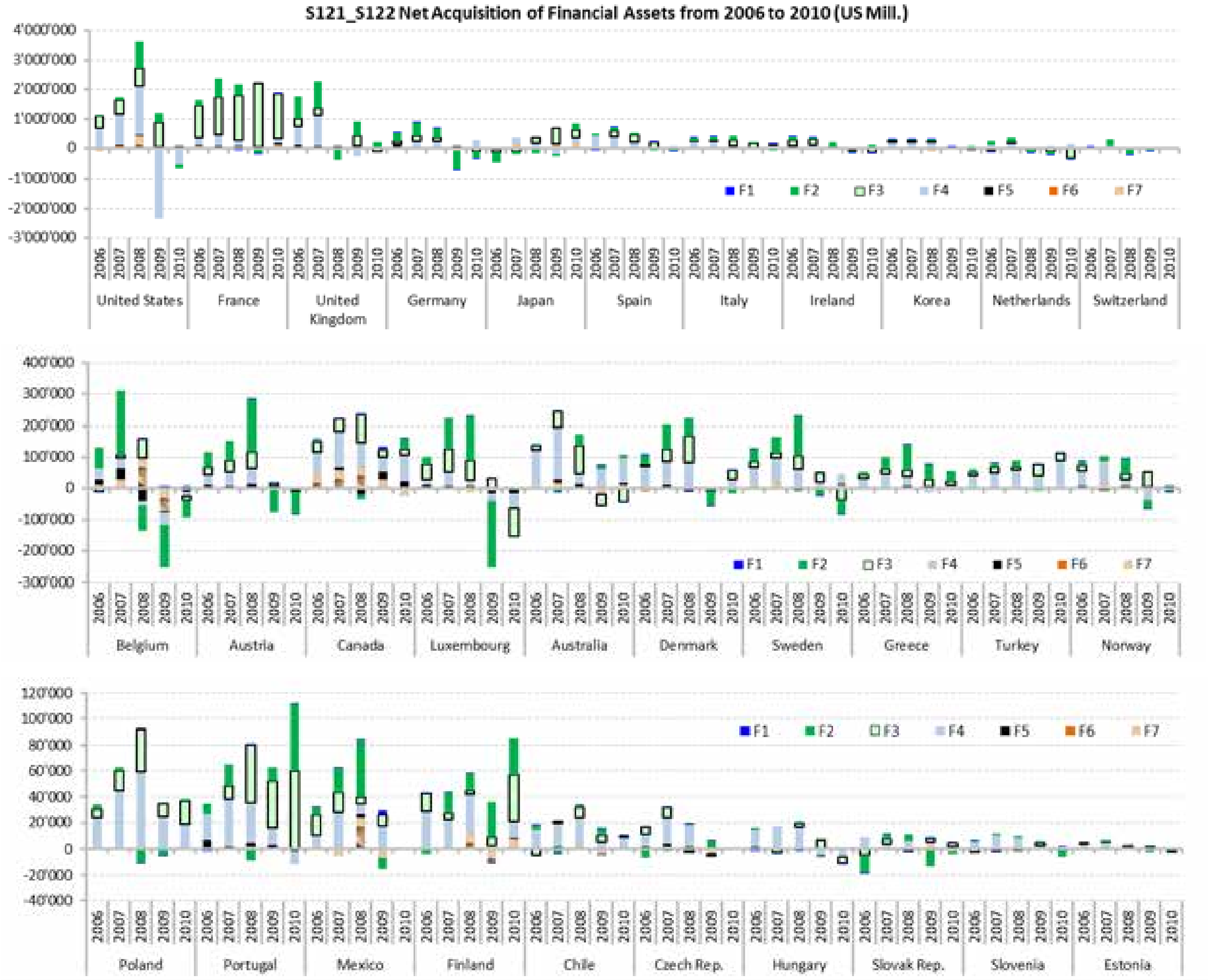
Chart 8



Source: Financial Accounts, OECD.Stat

When breaking down the Financial corporations sector into its sub-sectors and focusing on financial asset categories, it turns out that, for the Depository corporations sector (S121 and S122), the fall in the net acquisition of financial assets in 2009 derives from Loans (F4) and Deposits (F2) in most countries (see Chart 9). Ireland and Estonia showed the biggest decline between 2006 and 2009 (in relation to the stock of financial assets as of 2006, 30% and 25%, respectively). The United States, Germany and the United Kingdom also experienced substantial decline (15%, 12% and 7%, respectively).

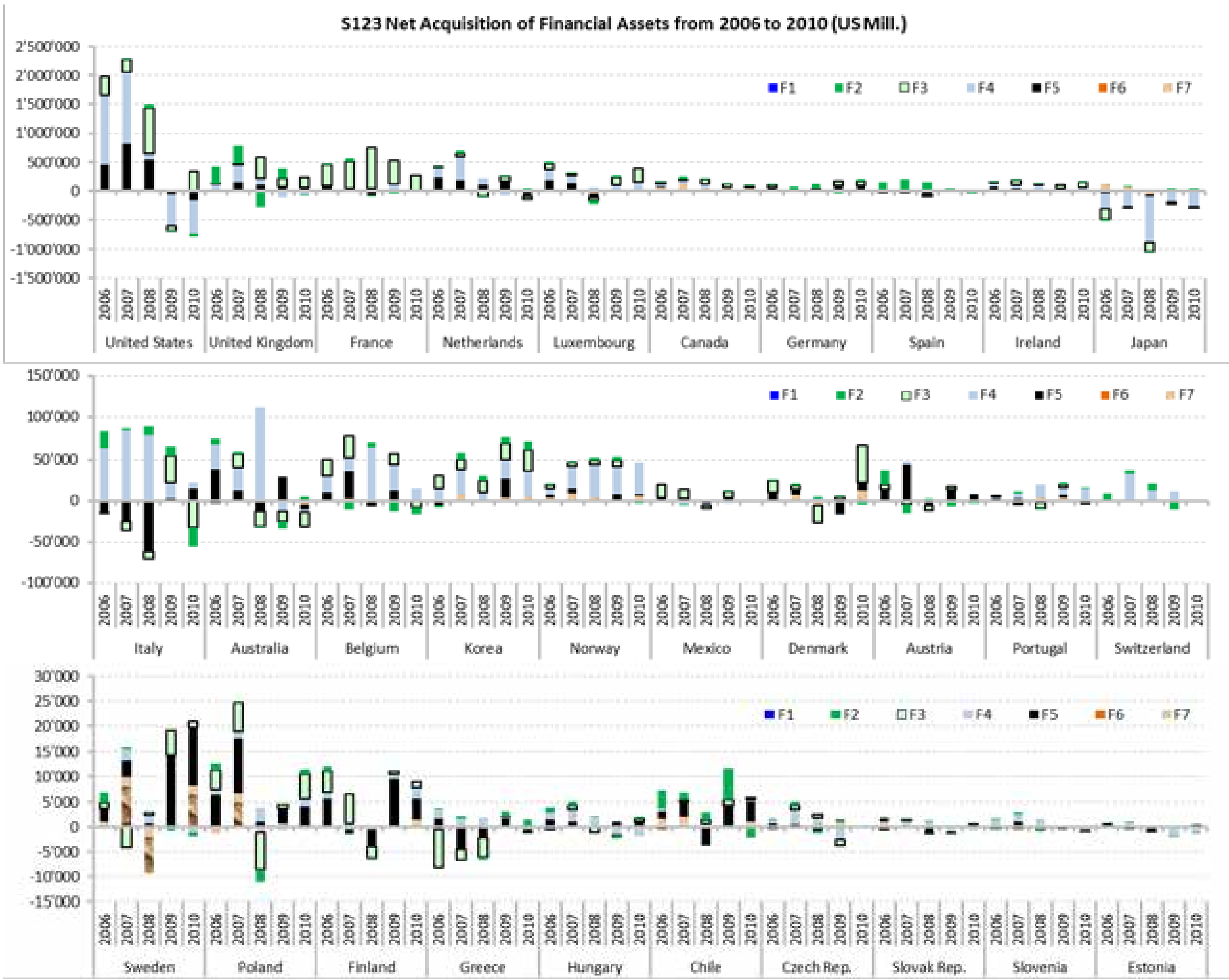
Chart 9



Source: Financial Accounts, OECD.Stat

Regarding Other financial intermediaries (S123), declines in Loans (F4) and Shares and other equity (F5) are mainly responsible for most of the fall in net acquisition of financial assets between 2006 and 2009. At the same period, Estonia showed the largest decline (36%). Slovak Republic and Hungary (22%). Spain (15%) and the United States (11%) also experienced a substantial decline (see Chart 10).

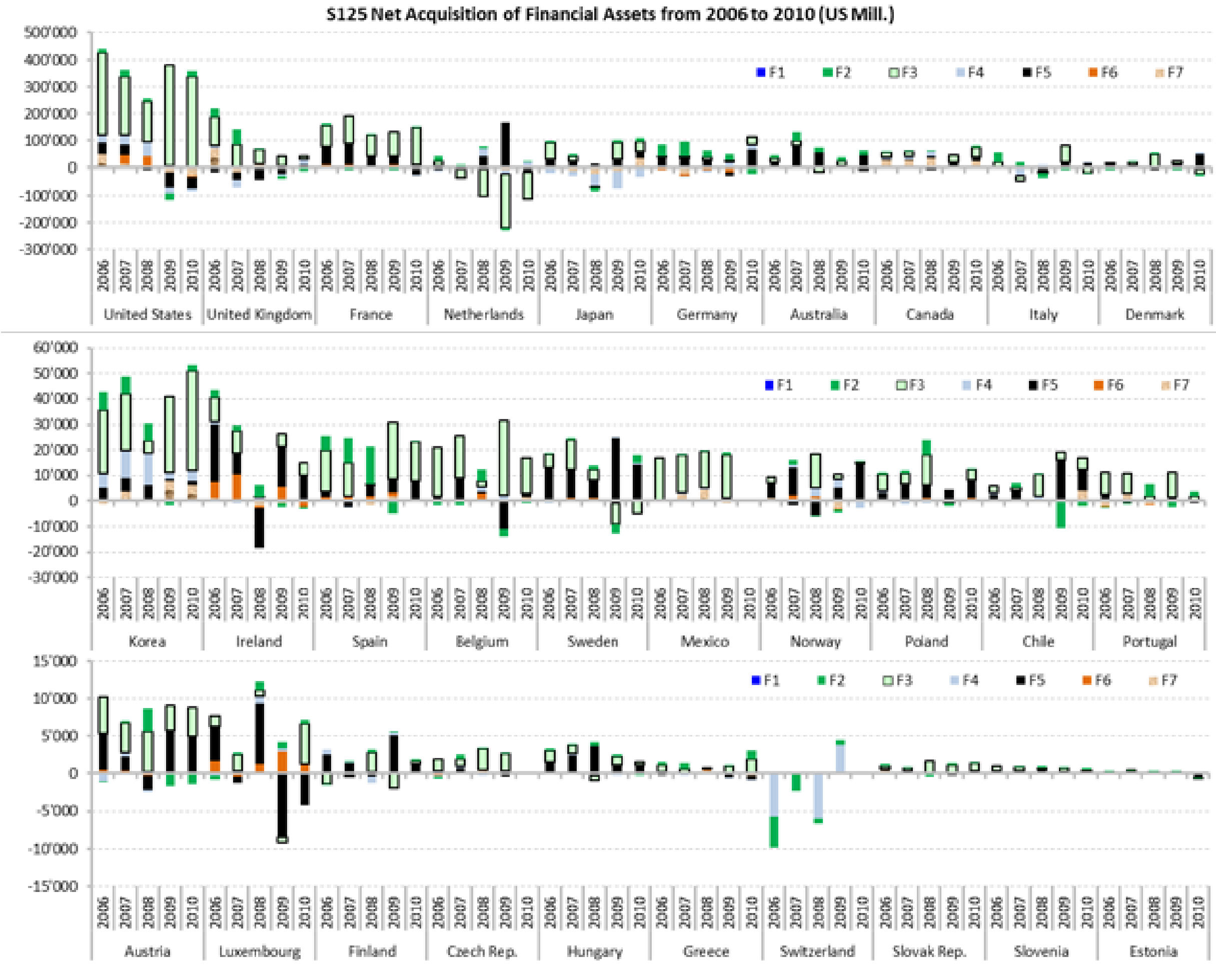
Chart 10



Source: Financial Accounts, OECD.Stat

The fall of net acquisition of financial assets of Insurance corporations and pension funds from 2006 to 2009 derives mostly from Deposits (F2) and Other Accounts Receivable (F7) (see Chart 11). However, the impact of this fall is not as important as that of Depository corporations or Other financial intermediaries. Luxembourg (12%) experienced the largest decline compared to assets as of 2006, followed by Poland (11%).

Chart 11



Source: Financial Accounts, OECD.Stat

(3) Detailed analysis on investment behaviours by institutional investors

The use of the Institutional Investors' Assets database has made it possible to analyze in more detail their investment behaviours. For these three main institutional investors: Investment funds, Insurance corporations and Autonomous pension funds, their investments[7] were mainly concentrated on Securities other than shares except financial derivatives (F33) and on Shares and other equity (F5). Their weights represent 39% of total assets, respectively, at the end of 2010.

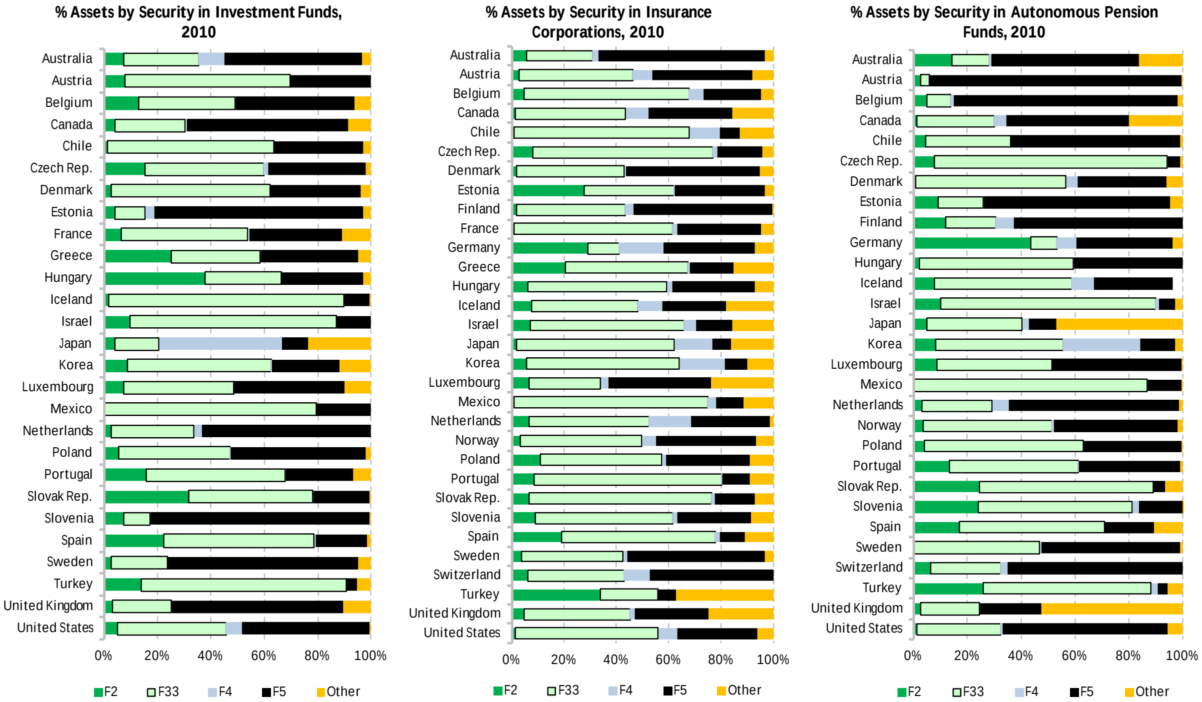
Investment funds invest primarily in Shares and other equity (41%) and secondarily in Securities other than shares except financial derivatives (37%). In Estonia and Slovenia, investment funds have a highest preference for Shares and other equity. In contrast, in Iceland, Mexico, Israel and Turkey, investment funds preferred Securities other than shares except financial derivatives (see Chart 12).

The most important financial assets for Insurance corporations are Securities other than shares except financial derivatives. These instruments represented, on average, around 50% of their total assets. In Mexico and Portugal, the share of Securities other than shares except financial derivatives exceeds 70%.

[7] Following definitions described above in point 1. (2).

Autonomous pension funds are, on average, more share-oriented. The weight of Shares and other equity is 51%, while that of Securities other than shares except financial derivatives is no more than 30%. This is typically the cases for Austria, Belgium, Estonia, Switzerland, Chile, Finland, the Netherlands and the United States.

Chart 12



Source: Institutional Investors' Assets, OECD.Stat

By using Institutional investors' Assets database, one can distinguish investments to residents and those to non-residents.[8] As of 2010, three institutional sectors invested, on average, a slightly bigger portion of their assets in instruments issued by residents (52%). There were however some differences among sectors: Insurance corporations (62%) and Autonomous pension funds (61%) invest more portions in instruments issued by residents than Investment funds (33%).

Among OECD countries for the three institutional sector together, Poland (94%), Korea (92%) and Israel (88%) invests the largest portion in instruments issued by residents. In contrast, Luxembourg (9%) invests the smallest portion. Estonia (28%) and Portugal (36%) invest relatively smaller portion in such instruments.

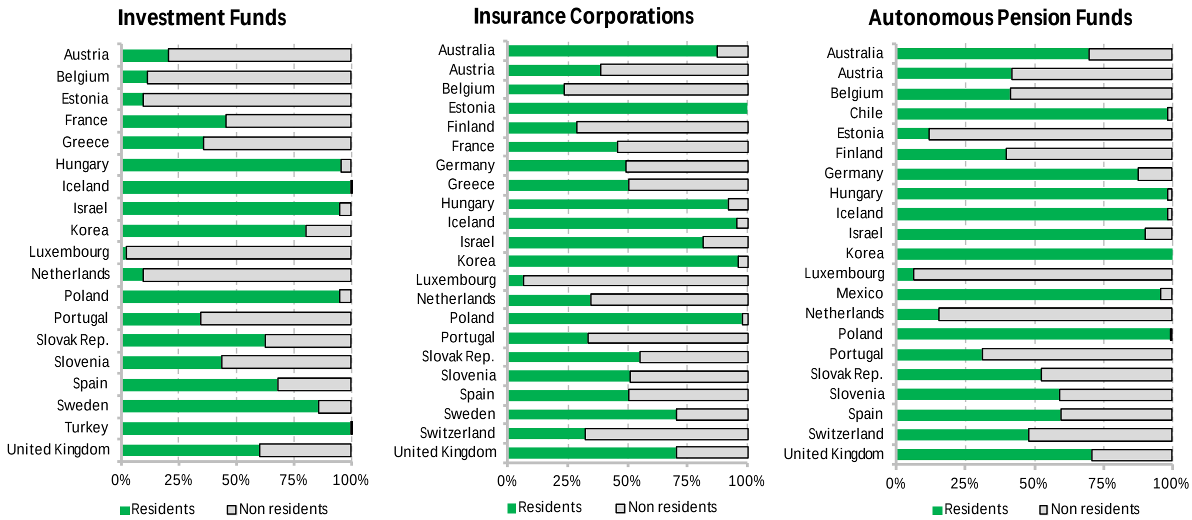
Regarding Securities other than shares except financial derivatives, in which institutional investors invest the largest proportion of their assets, they, on average, invest 48% in such instruments issued by residents. In relative terms, Autonomous pension funds and Insurance corporations invest more portions in such instruments issued by residents (63% and 54%, respectively) than Investment funds (31%) (see Charts 13).

[8] Such distinction is possible for Securities, Loans and Shares, which represented 85% of total assets.

Chart 13

Breakdown According to the Residency of Issuer

Securities Other than Shares Except Financial Derivatives, 2010



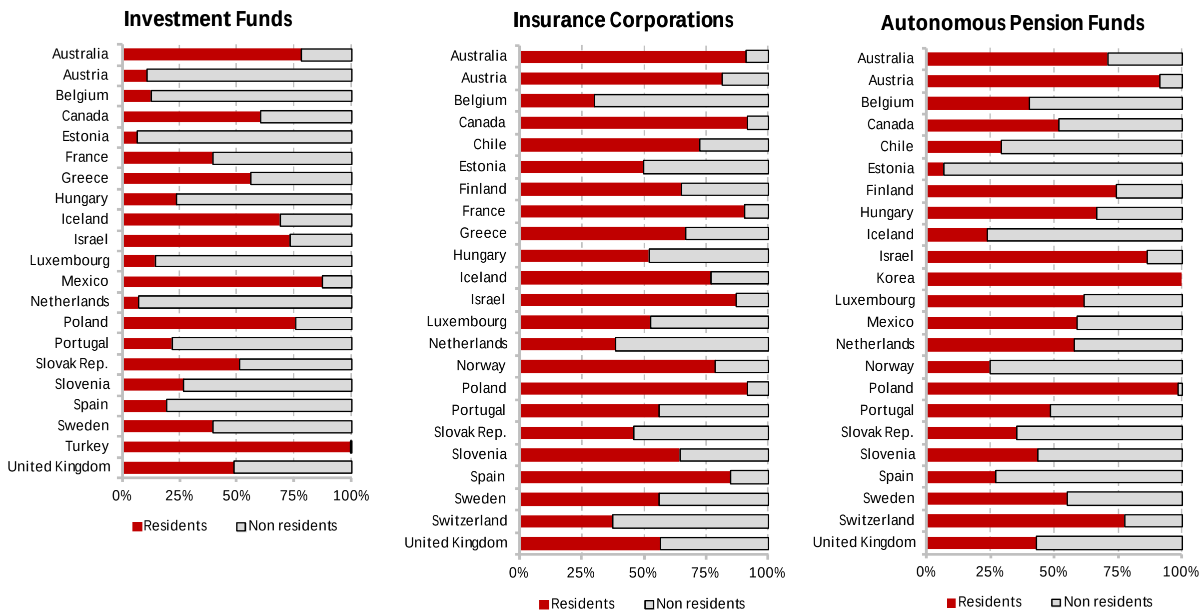
Source: Institutional Investors' Assets, OECD.Stat

Regarding Shares and other equity, in which institutional investors invest the second largest portion of assets, they, on average, invest 53% in such instruments issued by residents. In relative terms, Insurance corporations and Autonomous pension funds invest more portions in Shares and other equity issued by residents (70% and 60%, respectively) than Investment funds (34%).

Chart 14

Breakdown According to the Residency of Issuer

Shares and Other Equity, 2010



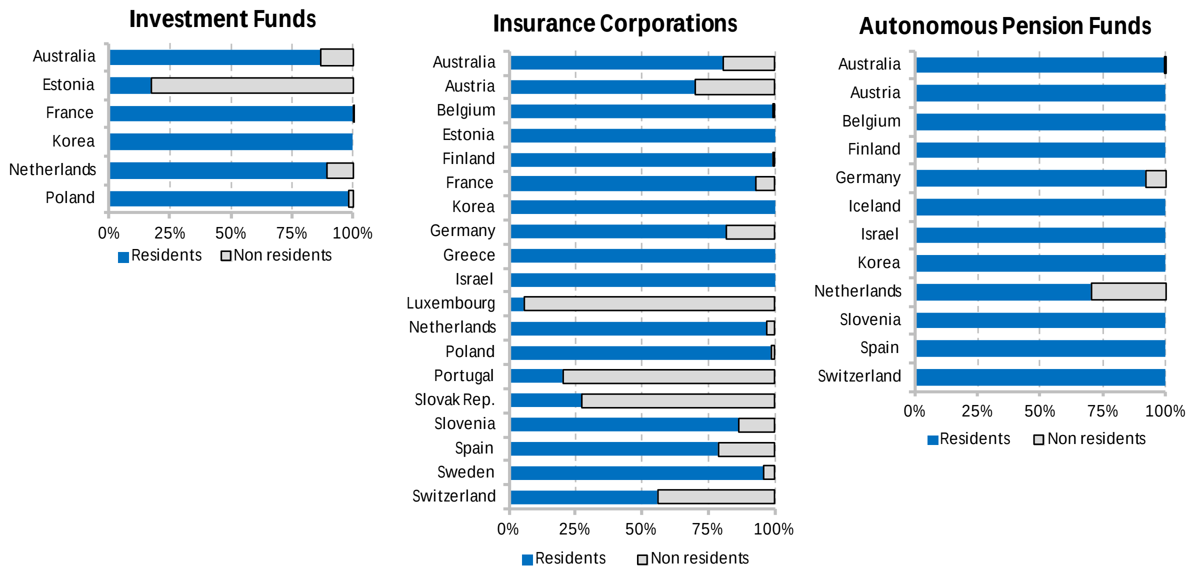
Source: Institutional Investors' Assets, OECD.Stat

Institutional investors invest very small portion of assets in Loans and they extend 87% of loans to residents. In this respect, there is only a small difference in the weights of loans to residents among insurance corporations, pension funds (85% for each one) and investment funds (89%) (see Charts 15).

Chart 15

Breakdown According to the Residency of Issuer

Loans, 2010



Source: Institutional Investors' Assets, OECD.Stat

2. Development of financial accounts and shadow banking data

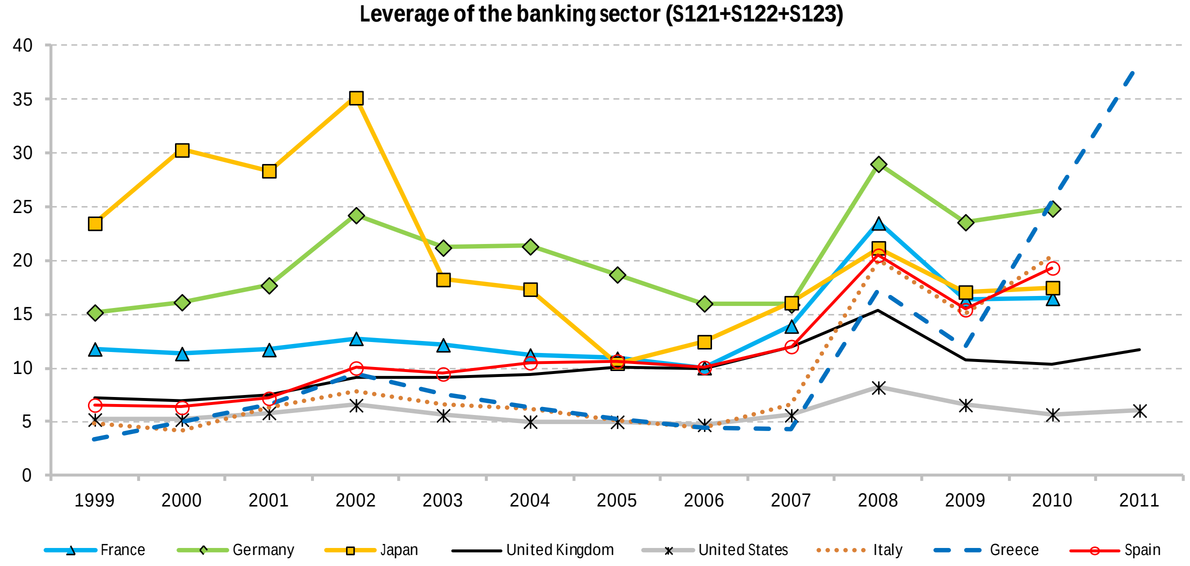
(1) Development of OECD Financial Dashboards

The OECD Financial Dashboard presents financial indicators derived from OECD countries' annual financial accounts (transactions) and annual financial balance sheets (stocks). Its purpose is to analyse the behaviour and performance of the institutional sectors and to carry out cross-country comparisons. Such indicators are useful in monitoring the financial activity and positions of various institutional sectors of OECD economies.

For the Financial corporations sector, the ratios included in the Dashboards are the following: on one hand, Net financial transactions as a percent of GDP derived from the financial accounts (transactions); on the other hand, Financial net worth as a percentage of GDP; Debt as a percent of GDP; short-term financial assets to short-term liabilities ratio; debt to equity ratio; Leverage of the banking sector; Loans assets of the banking sector as a percentage of its currency and deposits liabilities; Financial intermediation ratio; Credit intermediation ratio, all of them derived from the financial balance sheets (stocks).

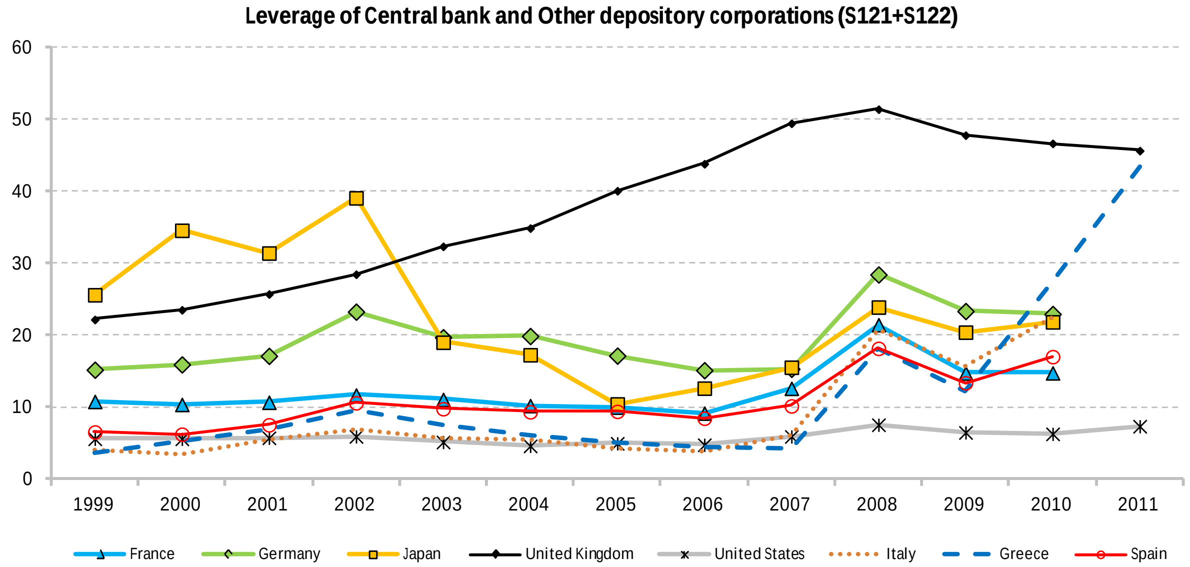
Among these ratios, leverage of the banking sector is quite useful to identify risky behaviours of this sector. Leverage is computed as the ratio of selected financial assets to total equity. Financial assets include currency and deposits, securities other than shares except financial derivatives, and loans. Total equity relates to liabilities in Shares and other equities, except mutual fund shares. This ratio is a measure of financial leverage and long-term solvency. It can be used to ascertain the overall financial stability of the banking sector. Banks engage in leverage by borrowing to acquire more assets, with the aim of increasing their return on equity. But a high leverage ratio may show an increased financial institution's exposure to risks and cyclical downturns. For example, one can observe a sharp rise in the leverage of the Greek banking sector after 2010 (see Chart 16).

Chart 16



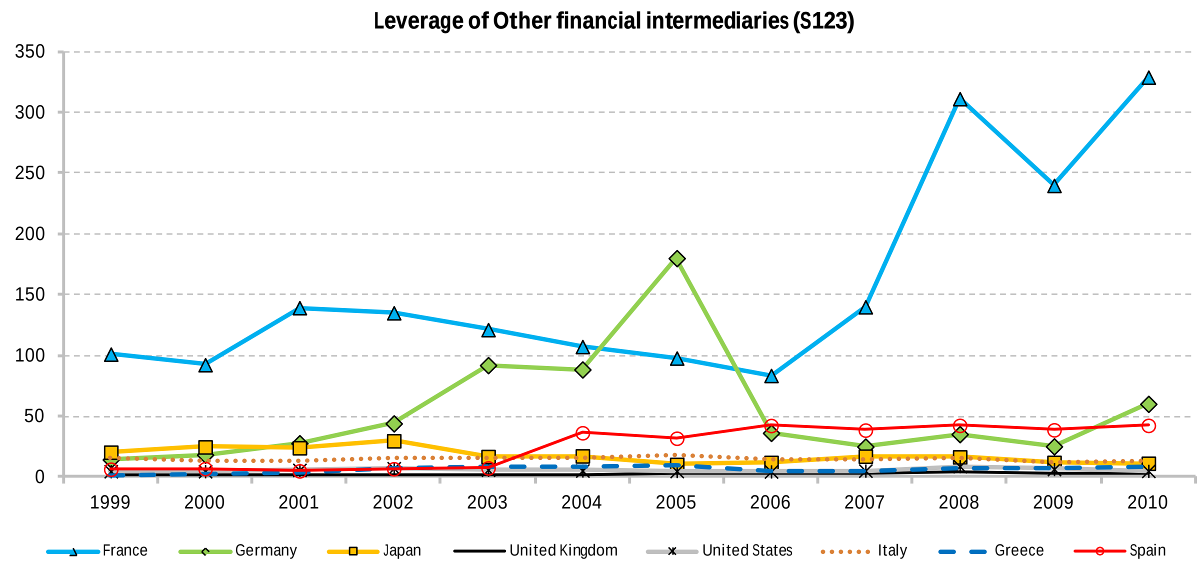
It is to be noted that, for the calculation of these ratio, the banking sector includes not only Central bank and Other depository corporations but also Other financial intermediaries. In order to understand the behaviour of shadow banking, Other financial intermediaries have to be separated from Depository corporations. By doing so, it becomes evident that the sharp rise of the Greek banking sector is due to that of Depository corporations (see Chart 17).

Chart 17



Also, one can identify a sharp rise of the leverage of French Other financial intermediaries from 2007 (see Chart 18).

Chart 18



For the future, it is envisaged to expand the coverage of this dashboard by including mixed indicators such as gross debt to operating surplus, return on equity, households' total wealth as a percentage of their gross disposable income, in order to focus on the behaviour of specific sectors, and to calculate financial indicators on a quarterly basis.

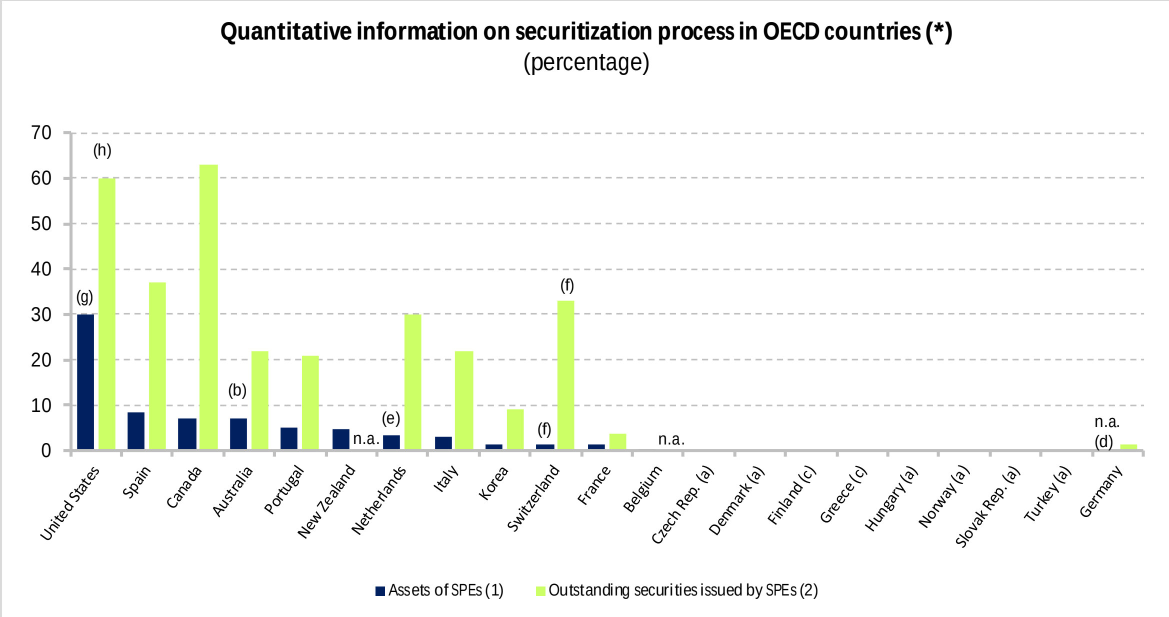
(2) OECD WPFS Work on SPEs

In 2006, the OECD WPFS began to work on securitisation. This work was motivated by the increasing significance of this phenomenon, its growing impact on financial credit and monetary analysis, and the lack of systemic information with some degree of homogeneity. Since 2006, the WPFS has always included this topic on the agenda of its meetings in an attempt to better understand the different features of the securitisation process, its development in the various OECD countries and the best means to collect information on it.

The information on securitisation in OECD countries was collected through subsequent questionnaires. The first questionnaire was launched after the October 2006 WPFS meeting and included questions regarding the existence of securitisation process in OECD countries, the type of securitisation carried out through special purpose entities (SPE) or financial vehicle corporations (FVC), as well as questions related to the sources of information and available data.

In the 2007 WPFS meeting, the responses to the first questionnaire were summarised in a document from the OECD. It was concluded that, giving the implication of some securitisation operations for monetary and financial analysis, there was a clear demand for more information, both quantitative and qualitative, on the business of SPEs or FVCs. Therefore, an agreement on a new questionnaire to further understand the process in the different countries was reached. One of the most important results of the discussions was to get some quantitative information. The information included the assets of SPEs as a percentage of the total assets of financial corporations in the respective countries as well as outstanding securitisation amounts issued by SPEs as a proportion of all securities issued by financial corporations. This provided an idea of the importance of the securitisation process in OECD countries (see Chart 19).

Chart 19



(*) Information received until Sept. 2008

(1) Assets of SPEs as a proportion of the total assets of financial corporations
(2) Outstanding securities issued by SPEs as a proportion of all securities issued by financial corporations

(a) Countries that currently do not have any securitization processes
(b) Of the total consolidated assets of financial institutions
(c) Finland and Greece have securitization processes carried out by non-residents SPEs
(d) Only preliminary data available
(e) Excluding resident SPEs that securitize assets of non-residents originators
(f) Secured loans extended by Mortgage Bond Institutions to originators / covered bonds issued by Mortgage Bond Institutions; no data on other SPE available
(g) Assets of SPEs as a proportion of assets of sub-sector S123
(h) Outstanding securities of SPEs as a proportion of outstanding securities of sub-sector S123.

In the 2008 WPFS meeting, a second questionnaire was proposed for approval by the group to better understand the phenomenon. Its main points referred to accounting issues, main counterparties and problems of double counting; references to the synthetic securitisation; details of the structure of SPE-liabilities and questions related to the role that international organisations should play in trying to use homogeneous terminology, and to define involved entities, transactions and instruments. It also included some questions related to the valuation of assets and liabilities linked to securitisation, the treatment of write-downs and write-offs and more detailed quantitative information than that obtained from the first questionnaire which mainly included the SPE balance sheets for the period 2004 to 2008.

In the 2009 WPFS meeting, the results of the second questionnaire were summarized. The main conclusions were as follows: i) studies and reports on how securitisation was being developed in each country should be one of the avenues to be pursued; ii) as the WPFS meets only once a year, a workshop devoted to this phenomenon should be held in 2010; iii) in the future, the WPFS should work on a following-up of the securitisation process in the OECD countries, taking note of the new ECB regulations; and iv) the cooperation with all the international organisations should be strengthened and countries should encourage them to write guidance notes, manuals and practical examples.

The Workshop on securitisation took place at the Bank of Spain in May 2010. It brought together regular members of the WPFS, statisticians, analysts, supervisors, experts from accounting standard-setting institutions and from international organisations, and representatives from the industry and from international associations. It aimed at exchanging views so as to better understand securitisation from various angles and to help improve the completeness and the usefulness of future statistics.

The issues discussed in the workshop were the following: i) the securitisation process from the standpoint of analysts, regulators and the industry; ii) the role of statisticians in the process, trying to delimit the securitisation phenomenon: definitions, agents who intervene (originators, SPVs or FVCs, administrators) and kinds of operation, trying to collect information and integrating the information collected into the financial accounts and other statistics. More specific questions were addressed for further discussions in a roundtable: i) the need to harmonise terms regarding operations, agents and practices; ii) the need to have harmonised legislation or at least a certain common methodology and uniform dissemination of statistics; iii) the need to exchange experience regarding difficulties met to collect information; iv) the need for OECD to collect/disseminate securitisation data for a selected group of countries, in line with the ECB request and v) thoughts about the securitisation after the crisis.

Among issues discussed above, the integration of available information on securitisation into the financial accounts is directly related to the statistics development. In some countries, SPEs have already been incorporated in the financial accounts but SPEs have not necessarily been separately identified. In this respect, it was suggested that either the OECD creates some subsectors for securitisation-related entities in the OECD financial accounts or it adds a new subsector in the Institutional Investors' Assets database, or it develops supplementary tables for other financial corporations. The rationale was that the OECD should focus on the collection of data for securitisation as an extension of the methodological surveys conducted in cooperation with the Bank of Spain. At the same time, there was an indication that coordination between international organisations is preferable rather than one organisation taking the lead, given that several international organisations are interested in data collection in this field.

Data collection issue is closely related to the implementation of SNA 2008 or ESA 2010. In these manuals, an additional subsector has been created for financial corporations: Captive financial institutions and money lenders, in which holding companies, SPEs, and corporations engaged in lending from own funds and/or to limited partners. Therefore, countries implementing the 2008 SNA or 2010 ESA may have to strengthen source data for SPEs. The OECD is willing to help those countries by providing more concrete guidelines on the scope and definition of such subsectors.

At this stage, it is not envisaged by the OECD to collect data on securitisation but rather to use the ECB data for EU countries and the new BIS data for non-EU OECD countries to avoid duplication. However, supplementary data for SPEs might be collected in the framework of the Institutional Investors' Assets database if the WPFS reaches an agreement to do so.

3. Conclusion

As demonstrated in Chapter 3, OECD financial statistics, which include shadow banking in the scope, are useful tools for identifying the activities of financial corporations as collectors of savings and suppliers of funds to financial markets.

By using OECD financial accounts, financial structure of countries can easily be understood. Although Depository corporations accounts for more than 50% in total financial assets on average, Other financial intermediaries are more significant than Depository corporations in some countries.

Regarding the asset composition, the majority of the Depository corporations' assets are Loans in general. Insurance corporations and pension funds mainly invest in Securities other than shares except financial derivatives or in Shares and other equities. The assets composition of Other financial intermediaries is more diversified than Depository corporations as well as Insurance corporations and pension funds. Peculiarities of specific countries can be demonstrated by means of cross-country comparisons.

By using Institutional Investors' Assets database, their investment behaviours can be analysed in more detail. Institutional investors have a more than half of their assets in domestic-issued instruments. In particular, Insurance corporations and pension funds have more than 60% of their exposure to resident-issued assets. In some countries, however, institutional investors have a relatively large exposure to non-resident-issued assets.

OECD financial statistics could be useful not only in the analysis of past crises but also in the detection of future crises. For the detection of future crises, it appears useful to identify structural changes in financial flows by sector, based on the analysis of the 2007–2008 financial crisis. Also, leverages of financial corporations should be a useful indicator for understanding their behaviors. It is especially the case when the leverages are calculated for sub-sectors of financial corporations.

Immediately after the financial crisis, in 2009, the Financial Crisis and Information Gaps Report to the G-20 Financial Ministers and Central Bank Governors (G-20 Data Gap Initiative <DGI> report) was published. This report highlighted a number of areas in which statistics should be developed. Among them, the development of sectoral accounts is prescribed as one of the most important challenges. In this context, special emphasis has been put in three points.

The first emphasis is the data compilation of non-financial assets by sector. In the G-20 DGI report, the recommendation 15 states that the Inter Agency Group, which includes all agencies represented in the Inter-Secretariat Working Group on National Accounts, should develop a strategy to promote the compilation and dissemination of the balance sheet approach, flow of funds, and sectoral data more generally, starting with the G-20 economies. The sectoral data refers to integrated current and accumulation accounts as well as financial and non-financial balance sheets for institutional sectors and is termed as sectoral accounts. This framework covers both financial and non-financial assets. Data on non-financial assets such as dwellings are important because, by representing them in sectoral non-financial balance sheets, their stocks are identified and vulnerabilities of each sector can be better captured.

The second emphasis is the compilation of quarterly data. Based on the G20 report, countries are expected to report quarterly sectoral accounts in addition to annual sectoral accounts to the OECD. Although most OECD countries compile quarterly financial accounts and financial balance sheets, quarterly sectoral accounts including non-financial assets need to be further developed, overcoming the lack of detailed breakdown and improving the quality of data estimation.

The third emphasis is the identification of from-whom-to-whom information. Traditional financial accounts and financial balance sheets have been presented in two dimensional matrices; sectors in columns and categories of financial instruments in rows. Such presentation does not necessarily answer the questions of who is financing whom in what categories of financial instrument, due to the absence of the information of counterparty sectors. In order to answer this question, financial accounts and financial balance sheets have to be presented in three dimensional from-whom-to-whom matrices, covering the debtor sector and the creditor sector as well as categories of financial instruments. In this respect, the 2008 SNA describes that detailed flow of funds accounts are based on three dimensional tables. Similar tables are also proposed in the IMF Monetary and Financial Statistics Manual. As mentioned in Chapter 2 and 3, the Institutional Investors' Assets database have adopted partly the form of three dimensional matrices by distinguishing issuers of financial instruments into residents and non-residents. It is expected that the development of financial accounts and financial balance sheets will be advanced further in this direction.

The OECD is working on the improvement of statistics regarding institutional investors, which include insurance corporations and pension funds, as well as SPEs. Such work, which is carried out by central banks as well as national statistical offices and other government agencies, will also respond to the requests of G-20 and other parties for the development of statistics on shadow banking. In some countries, central banks might not have official mandates to collect data for other financial corporations. Nevertheless, the involvement of central banks and their cooperation with national statistical offices and other government agencies is indispensable for filling the existing data gap in these areas.

Annex:
Methodology of OECD financial statistics and reporting institutions

(1) OECD financial accounts

The financial accounts (flows) together with financial balance sheets (stocks) compose the OECD financial accounts, which belong to the System of National Accounts (SNA). In particular, the financial accounts are part of the accumulation accounts; they record, by type of financial instrument, the financial transactions between institutional sectors. The financial balance sheets, corresponding to the final sets of information of the accounts, record the stocks of financial assets and liabilities held by the institutional sectors, and give their net worth at the end of the accounting period. The OECD financial accounts permit analysts and policy makers to have a better understanding of the interactions between the real economy and the financial activities in OECD countries.

Institutional sectors are composed of those institutional units capable of engaging in transactions with other units, following the definitions of the SNA 1993. These are grouped together into five main categories, some of which are divided into sub-sectors:

- Non-financial corporations (S11): all resident non-financial corporations (that make up most of the sector) and non-profit institutions (NPIs) engaged in the market production of goods and non-financial services (hospitals, schools or colleges that charge fees that enable them to recover their current production costs, or trade associations financed by subscriptions from non-financial corporate or unincorporated enterprises whose role is to promote and serve the interests of those enterprises).
- Financial corporations (S12): all resident corporations that are principally engaged in providing financial services, including financial intermediation and auxiliary services, to other institutional units. The sector also includes NPIs engaged in market production of a financial nature such as those financed by subscriptions from financial enterprises whose role is to promote and serve the interests of those enterprises. There are five sub-sectors:
- Central bank (S121): the Central bank is the national financial institution that exercises control over key aspects of the financial system.
- Other depository corporations (S122): these corporations have financial intermediation as their principal activity. To this end, they have liabilities in the form of deposits or financial instruments (such as short-term certificates of deposit) that are close substitutes for deposits.
- Other financial intermediaries (S123): other financial intermediaries except insurance corporations and pension funds consist of financial corporations that are engaged in providing financial services by incurring liabilities, in forms other than currency, deposits or close substitutes for deposits, on their own account for the purpose of acquiring financial assets by engaging in financial transactions on the market.
- Financial auxiliaries (S124): they correspond to institutional units principally engaged in serving financial markets, but which do not take ownership of the financial assets and liabilities they handle.
- Insurance corporations and pension funds (S125). Insurance corporations: they consist of incorporated, mutual and other entities whose principal function is to provide life, accident, sickness, fire or other forms of insurance to individual institutional units or groups of units or reinsurance services to other insurance

corporations. Pension funds: they consist of only those social insurance pension funds that are institutional units separate from the units that create them. Pension liabilities arise when an employer or government obliges or encourages members of households to participate in a social insurance scheme that will provide income in retirement. The social insurance schemes may be organized by employers or by government, they may be organized by insurance corporations on behalf of employees or separate institutional units may be established to hold and manage the assets to be used to meet the pensions and to distribute the pensions.

- General government (S13): this sector consists mainly of central, state and local government units together with social security funds imposed and controlled by those units. It includes NPIs engaged in non-market production that are controlled by government units or social security funds. There are four sub-sectors: central government (S1311); state government (S1312); local government (S1313) and social security funds (S1314).
- Households (S14): the household sector consists of all resident households. These include institutional households made up of persons staying in hospitals, retirement homes, convents, prisons, etc. for long periods of time. An unincorporated enterprise owned by a household is treated as an integral part of the latter and not as a separate institutional unit unless the accounts are sufficiently detailed to treat the activity as that of a quasi-corporation.
- Non-profit institutions serving households – NPISH (S15): this sector consists of all resident non-profit institutions, except those controlled by government, that provide non-market goods or services to households or to the community at large, free or at prices that are not economically significant.

To these five sectors, which together comprise the total economy sector, is added the rest of the world sector, which reflects transactions and assets/liabilities vis-à-vis non-residents.

Assets and liabilities are grouped into seven categories of financial instruments, most of them divided into sub-items, which are ordered according to their liquidity:

- Monetary gold and SDRs (F1): Monetary gold (F11) is gold to which the monetary authorities (or others who are subject to the effective control of the monetary authorities) have title and is held as a reserve asset. Special Drawing Rights (SDRs) (F12) are international reserve assets created by the International Monetary Fund (IMF) and allocated to its members to supplement existing reserve assets.
- Currency and deposits (F2): Currency (F21) consists of notes and coins that are of fixed nominal values and are issued or authorized by the central bank or government. Transferable deposits (F22) comprise all deposits that: a) are exchangeable for bank notes and coins on demand at par and without penalty or restriction; and b) are directly usable for making payments by cheque, draft, giro order, direct debit/credit, or other direct payment facility. Other deposits (F29) comprise all claims, other than transferable deposits, that are represented by evidence of deposit.
- Securities other than shares (F3): debt securities are negotiable instruments serving as evidence of a debt. They include bills, bonds, negotiable certificates of deposit, commercial paper, debentures, asset backed securities, and similar instruments normally traded in the financial markets. Sub-instruments: Securities other than shares except financial derivatives (F33) and Financial derivatives (F34).
- Loans (F4): Loans are financial assets that: a) are created when a creditor lends funds directly to a debtor, and b) are evidenced by documents that are not negotiable.

- Shares and other equities (F5): Equity and investment fund shares have the distinguishing feature that the holders own a residual claim on the assets of the institutional unit that issued the instrument. Equity represents the owner's funds in the institutional unit. In contrast to debt, equity does not generally provide the owner with a right to a predetermined amount or an amount determined according to a fixed formula. Equity comprises all instruments and records acknowledging claims on the residual value of a corporation or quasi corporation after the claims of all creditors have been met. Investment funds are collective investment undertakings through which investors pool funds for investment in financial or non-financial assets. Those units acquiring shares in the funds thus spread their risk across all the instruments in the fund. Sub-instruments: Shares and other equity, except mutual fund shares (F51) and Mutual fund shares (F52).
- Insurance technical reserves (F6): This category reflects the difference between net contributions or net premiums paid to the schemes (insurance, pension and standardized guarantee schemes) less benefits and claims paid out. Significant other additions to the reserves of the schemes come via other changes in the volume of assets and especially holding gains. There are five sorts of reserves applicable to insurance, pension and standardized guarantee schemes: non-life insurance technical reserves, life insurance and annuities entitlements, pension entitlements, claims of pension funds on the pension manager and provisions for calls under standardized guarantees. Sub-instruments: Net equity of households in life insurance and pension funds reserves (F61) and Prepayments of premiums and reserves against outstanding claims (F62).
- Other accounts receivable/payable (F7): Trade credit and advances (F71) comprise trade credit for goods and services extended to corporations, government, NPISHs, households and the rest of the world, and advances for work that is in progress (if classified as such under inventories) or is to be undertaken. Trade credits and advances do not include loans to finance trade credit, which are classified as loans. Other accounts receivable, except trade credits and advances (F79) include accounts receivable and payable, other than those described previously, which are not related to the provision of goods and services. This item covers amounts related to taxes, dividends, purchases and sales of securities, rent, wages and salaries, and social contributions. Interest that accrues but is not paid is included in this item only if the accrued interest is not added to the value of the asset on which the interest is payable (as is usually the case).

All above-mentioned assets categories have a counterpart liability, except for monetary gold and SDRs.

While, as a general rule, the OECD financial accounts are to be recorded on a non-consolidated basis, consolidated accounts are also useful for certain types of analyses, such as deriving a better account of the financial position of the various economy players, in particular for financial corporations and for general government. Thus, in consolidated accounts, all transactions and stock positions between sub-sectors of the same sector, as well as between institutional units if the same sub-sector, are eliminated.

Flow and stock data are reported to the OECD on an annual and quarterly basis, mostly by central banks or national statistics offices.

(2) Institutional Investors' Assets database

In the framework of a quality review of the Institutional Investors data collected by the OECD, and in order to ensure a better comparability between countries and a better consistency in data provided to users, in particular to policy-makers, the OECD carried comparisons between data provided for the Financial Accounts database (as part of the National Accounts database) and data provided for the Institutional Investors database.

This provoked discussions on the institutional investors' statistics in the OECD Working Party on Financial Statistics (WPFS) meeting in October 2004. It was then decided that, because of the increasing importance of institutional investors, the OECD pursues this activity and adds to the data collection on Financial Accounts a yearly table on institutional investors' financial and non-financial assets, to replace the previous questionnaire on Institutional investors.

The dataset includes a detailed breakdown of Investment funds, Insurance companies and Pension funds, and Other forms of institutional savings, as institutional sectors. This finer breakdown by type of investors has been established with reference to the SNA 1993, when possible. Within Investment funds, one distinguishes Open-end companies, further broken down into Money market funds and Other mutual funds, and Closed-end companies, of which Real estate funds. Within Insurance companies and pension funds, one distinguishes Insurance companies, further broken down into Life insurance companies and Non-life insurance companies, as well as Autonomous pension funds.

Financial assets included in Institutional investors statistics correspond to the assets requested in the previous database on Institutional Investors, i.e., Currency and deposits (F2), Securities other than shares except financial derivatives (F33) broken down by maturity, Loans (F4) broken down by maturity, Shares and other equities (F5) and Other financial assets. While the sub-classification of the above financial assets corresponds to 1993 SNA, a further split between resident and non-residents is requested. Securities other than shares except financial derivatives are subdivided into Securities issued by residents and Securities issued by non-residents; loans are subdivided into Loans to residents and Loans to non-residents; Shares are subdivided into Shares issued by residents and Shares issued by non-residents. In addition, information of Total non-financial assets is also included.

Stock data are reported to the OECD on an annual and quarterly basis, mostly by central banks, national statistical offices, or regulatory authorities.

(3) Institutional arrangements

Institutional arrangements for compiling OECD financial accounts and Institutional Investors' Assets database vary among OECD countries. In some countries, responsible bodies are central banks. In other countries, national statistical offices are entirely or partly involved in the compilation of these statistics. For example, in the United States and many EU member countries such as France and Germany, central banks compile OECD financial accounts. In Korea and Belgium, central banks compile the entire system of national accounts, which comprise the production, distribution of income, and accumulation accounts, and they are responsible for OECD financial accounts. These central banks convert OECD financial accounts data into Institutional Investors' Assets database with some additional data sources (see the Table below).

In Australia, Canada, and the United Kingdom as well as Finland, and Norway, the national statistical office is responsible for the entire system of national accounts (financial as well as non-financial accounts) and, as a consequence, is also responsible for OECD financial accounts and Institutional Investors' Assets database. In Japan, annual OECD financial accounts as well as Institutional Investors' Assets database are compiled by government's national accounts department,[9] using central bank's quarterly financial accounts. In Denmark, annual financial accounts and annual institutional investors' data are under the responsibility of the national statistical office, whereas quarterly financial accounts and quarterly institutional investors' data are under the responsibility of the central bank. In Chile and in Mexico, financial accounts are compiled by the central bank while supervisory authorities are

[9] Japan's national accounts division belongs to the Economic and Social Research Institute.

involved in compiling Institutional Investors' Assets database according to their scope of competencies.[10]

The field of financial accounts and financial balance sheets appears to be the border between the scope of central bank statistics and that of government official statistics. Historically, the pioneering work in this field, known as money flows in the United States, was conducted by Morris A. Copeland, a Cornell University economist, in 1952 and was then continued by the U.S. Federal Reserve in the name of flow of funds accounts. This was followed in the 1950's by central banks in Europe such as Bundesbank and the Bank of Japan. Main objectives of the compilation was to describe processes of intersectoral finance, i.e., to present numerous financial transactions taking place and financial stocks connecting among the various sectors of the whole economy. As a next step, financial accounts and financial balance sheets were incorporated in the System of National Accounts. The interconnection with the real economy became emphasized and the role of national statistical offices emerged. Thus, in some countries, such as Canada, the financial accounts were developed as an extension of the already established sectoral income and expenditure accounts.

Also, the variation in institutional arrangements among countries appears to have been related to the limitation of data collection by central banks. When the central bank of a country has difficulties in collecting data on other financial corporations, it may rather focus on the data collection from other depository corporations and leave the data collection from other financial corporations to the national statistics office of its country. For specific financial institutions such as insurance corporations and pension funds, regulatory authorities might be in a better position for collecting data. Thus, the involvement of regulatory authorities can be observed especially in the area of Institutional Investors' Assets database.

[10] In Chile, "Superintendencia de Valores y Seguros" prepares data for Investment Funds and Insurance Corporations and "Superintendencia de Pensiones" does for Pension Funds. In Mexico, "Comisión Nacional Bancaria y de Valores (CNBV)" prepares data for Investment funds, "Comisión Nacional de Seguros and Fianzas (CNSF)" for Insurance corporations and "Comisión Nacional del Sistema de Ahorro para el Retiro (CONSAR)" for Pension funds.

Table

Source of Information for Institutional Investors' Assets database

Country	Institution	Department	Survey / National Accounts (Financial Accounts)	Institutional Investors
Australia	Statistical Office (Australian Bureau of Statistics (ABS))	Financial Statistics Section	Primarily based on quarterly survey data	**Investment funds**: Based on quarterly ABS survey data **Insurance companies**: Based on quarterly Australian Prudential Regulation Authority (APRA) and ABS survey data **Pension funds**: the large funds which are sourced from the regulator APRA are based on quarterly survey data; and the small self-managed funds data is sourced from the Australian Tax Office (ATO) which generates estimates based on annual census data of funds. **Other forms of institutional savings**: is based on quarterly ABS survey data
Austria	Central Bank (Oesterreichische Nationalbank)	Statistics Department, External Statistics and Financial Accounts Division (supported by the Supervisory and Monetary Statistics Division)	Financial Accounts	**Investment funds**: Investment fund statistics, securities statistics **Insurance companies**: quarterly reports, balance sheets data, securities statistics **Pension funds**: quarterly reports, balance sheets data, securities statistics **Other forms of institutional savings**: MFI statistics, securities statistics, residual calculation

Country	Institution	Department	Survey / National Accounts (Financial Accounts)	Institutional Investors
Belgium	Central Bank (Banque Nationale de Belgique)	General Statistics	Financial Accounts (compiled in Financial Accounts Division)	**Investment funds + Insurance companies + Pension funds**: The data sent are extracted from the National Accounts which are based on exhaustive figures sent by the Belgian Banking, Finance and Insurance Commission (CBFA) (compilation based on information given directly by companies) **Other forms of institutional savings**: Our figures are based on balance sheets data
Canada	Statistical Office (Statistics Canada)	Income and Expenditure Accounts Division, Finance and Wealth Accounts Section	Data are drawn from surveys, integrated into the national accounts and then extracted from the National Accounts (financial accounts).	**Investment funds**: Quarterly Survey of Financial Statements – Investment Funds compiled in our Business and Trade Statistics Branch **Life Insurers**: Quarterly Survey of Financial Statements – compiled in our Business and Trade Statistics Branch Segregated Funds of Life Insurers Quarterly Survey of Financial Statements – compiled in our Business and Trade Statistics Branch. Property and Casualty Insurers Quarterly Survey of Financial Statements – compiled in our Business and Trade Statistics Branch. **Pension funds**: Survey of Trusteed Pension Plans compiled in our Social, Health and Labour Statistics Branch **Other forms of institutional savings**: N/A

Country	Institution	Department	Survey / National Accounts (Financial Accounts)	Institutional Investors
Chile	Superintendencia de Valores y seguros (SVS)	International Affairs Department	Information directly provided by companies	**Insurance**: data are based on the information directly provided by companies that report to the regulatory authority – SVS – their financial statements (in FECUs – Ficha Estadística Codificada Uniforme-) **Investment funds and Other forms of institutional savings**: The source used for compiling the financial data was the SVS web page, which contains information on investment funds, required by the SVS rules to them, specifically, their financial statements
	Superintendence of Pensions	Research	Data are compiled from information given directly by Pension Funds.	**Pension Funds**: Data are compiled from information given directly by Pension Fund Administrators (AFPs)
Czech Republic	Statistical Office (Czech Statistical Office)	Financial accounts section	Both	**Investment funds**: statistical questionnaires **Insurance companies**: statistical questionnaires, administrative data sources (supervisor) **Pension funds**: statistical questionnaires, administrative data sources (supervisor) **Other forms of institutional savings**: statistical questionnaires, administrative data sources (supervisor)
Denmark	Statistical Office (Statistics Denmark)	Government Finances	National Accounts	**Investment funds**: National Accounts-Annual Reports **Insurance companies**: National Accounts-Annual Reports **Pension funds**: National Accounts-Annual Reports **Other forms of institutional savings**: N/A

Country	Institution	Department	Survey / National Accounts (Financial Accounts)	Institutional Investors
Finland	Statistical Office (Statistics Finland)	Economic Statistics	Most of the data is based on financial accounts. The division of insurance companies to life and non-life insurance is based on survey data. Starting from 2008 this survey data is not yet available and thus the breakdown cannot be provided.	**Investment funds**: Mutual fund statistics compiled by Statistics Finland **Insurance companies**: Investment Portfolio Inquiry for Insurance Companies produced by the Federation of Finnish Financial Services **Pension funds**: Investment Portfolio Inquiry for Pension Institutions produced by the Finnish Pension Alliance **Other forms of institutional savings**: Investment Portfolio Inquiry for Pension Institutions produced by the Finnish Pension Alliance
France	Central Bank (Banque de France)	DGS-DSMF-SESOF	Données extraites des Comptes financiers	**Investment funds**: sources internes, Rapport annuel de l'Autorité des Marchés Financiers (AMF) **Insurance companies**: Autorité de Contrôle des Assurances et des Mutuelles (ACAM) **Pension funds**: Non disponible **Other forms of institutional savings**: Non disponible
Germany	Central Bank (Deutsche Bundesbank)	Economics	Financial Accounts	**Investment funds**: Main data sources are capital market statistics and banking supervision **Insurance companies**: Data from Federal Financial Supervisory Authority **Pension funds**: Data from occupational pension funds **Other forms of institutional savings**: There are no important other forms of institutional savings that is why this is not covered

Country	Institution	Department	Survey / National Accounts (Financial Accounts)	Institutional Investors
Greece	Central Bank (Bank of Greece)	Statistics	Financial Accounts	**Investment funds**: **Insurance companies**: **Pension funds**: N/A. Some retirement schemes of this kind are included in life insurance companies. **Other forms of institutional savings**: N/A
Hungary	Central Bank (Magyar Nemzeti Bank)	Statistics	The data are based on financial accounts and surveys collected to compile financial accounts	**Investment funds**: Survey on investment funds, security statistics **Insurance companies**: Financial account, on residual basis **Pension funds**: Survey on pension funds, security statistics **Other forms of institutional savings**: Survey on voluntary health fund and income replacement fund
Ireland	Statistical Office (Central Statistics Office)	Financial Accounts(Income Division), National Accounts	Data are based primarily on surveys and, in the case of money market funds data, regulatory returns to the central bank	**Investment funds**: Balance of Payments survey data and regulatory returns to the central bank **Insurance companies**: Balance of Payments survey data **Pension funds**: Balance of Payments survey data **Other forms of institutional savings**: Balance of Payments survey data

Country	Institution	Department	Survey / National Accounts (Financial Accounts)	Institutional Investors
Italy	Central Bank (Banca d'Italia)	Economic and Financial Statistics Department	Both sources are used	**Investment funds**: supervisory statistics **Insurance companies**: data provided by the supervisory Authority on insurance companies **Pension funds**: data provided by the supervisory Authority on pension funds **Other forms of institutional savings**: supervisory statistics
Japan	Economic and Social Research Institute (ESRI)		Quarterly data are compiled by the Bank of Japan	
Korea	Central Bank (Bank of Korea)	Flow of Funds team, Economic Statistics Department	Data are extracted from the flow of funds statistics (financial accounts)	**Investment funds + Insurance companies + Pension funds + Other forms of institutional savings**: Financial statement reports, flow of funds statistics survey reports and monetary financial statistics survey reports.
Luxembourg	Central Bank (Banque Centrale du Luxembourg (BCL))	Statistics	Data are calculated on the basis of surveys or supervisory authorities data. National Accounts are also used as source.	**Investment funds**: BCL data (quasi exhaustive survey) from 2008Q4 on. Before 2008Q4, data are calculated on the basis of Supervisory authorities data **Insurance companies**: Supervisory Authorities (Commissariat aux assurances (CAA)) **Pension funds**: Supervisory Authorities (Commission de surveillance du secteur financier (CSSF))

Country	Institution	Department	Survey / National Accounts (Financial Accounts)	Institutional Investors
Mexico	Comisión Nacional Bancaria y de Valores	Análisis de Información	From National Accounts	**Investment funds**: They send the information to the regulatory organism
	National Insurance and Surety Commission (Comisión Nacional de Seguros y Fianzas)	Research and Development General Direction	The insurance information is compiled from information given by companies.	**Insurance companies**: The insurance data correspond to the information given by insurance companies. We reported this information in the CNSF Statistical Yearbook and in the E-zine: Current Situation of the Insurance and Surety Sectors.
Netherlands	Statistical Office (Statistics Netherlands)	Financial institutions and Government	They are extracted from a Dutch statistic called Institutional investors. This statistic is almost fully consistent with the methodology of the National Accounts.	The supervisor on financial institutions, the Dutch Central Bank (DNB), delivers the greater part of data on the financial accounts of financial institutions. Relevant for Institutional investors are quarterly data on investment funds and on pension funds and insurance companies from the statistical department of DNB and yearly data on pension funds and insurance companies from the supervision department. **Investment funds**: Quarterly enquiry **Insurance companies**: Yearly data from supervision **Pension funds**: Yearly data from supervision **Other forms of institutional savings**: Annual accounts

Country	Institution	Department	Survey / National Accounts (Financial Accounts)	Institutional Investors
Norway	Statistical Office (Statistics Norway)	Financial market statistics – 940	The data are based on accounting statistics reported quarterly to Statistics Norway and, when possible extracted from financial accounts.	**Investment funds**: Investment funds accounting statistics and securities depository **Insurance companies**: Insurance companies accounting statistics and securities depository **Pension funds**: Pension funds accounting statistics, securities depositories and estimates based on insurance companies accounting statistics. **Other forms of institutional savings**: N/A
Portugal	Central Bank (Banco de Portugal)	Statistics Department	The same raw data as the one incorporated in Financial Accounts. Furthermore on Insurance Companies and Pension Funds it's considered the balance sheet data from Monetary and Financial Institutions, Balance of Payments and International Investment Position data and data from the Portuguese centralised securities database, sources that are used on Financial Accounts as well.	**Investment funds**: Raw data are compiled at the Banco de Portugal' Statistics Department as the result of a cooperation agreement with the corresponding supervisory body (Comissão do Mercado de Valores Mobiliários / Portuguese Securities Market Commission) **Insurance companies**: Data provided by the national supervisory body of this sector (Instituto de Seguros de Portugal / Portuguese Insurance and Pension Funds Supervisory Authority), which compiles it through direct inquires **Pension Funds**: Data provided by the national supervisory body of this sector (Instituto de Seguros de Portugal / Portuguese Insurance and Pension Funds Supervisory Authority), which compiles it through direct inquires **Other forms of institutional savings**: N/A

Country	Institution	Department	Survey / National Accounts (Financial Accounts)	Institutional Investors
Russia	Central Bank (Bank of Russia)	General Economic	Data are based on a survey. Data on insurance companies on quarterly data are produced from a sample survey using summing-up procedure.	**Investment funds** **Insurance companies**: Survey **Pension funds**: Survey **Other forms of institutional savings**
Slovenia	Central Bank (Banka Slovenije)	Financial Statistics	Both, survey and National Accounts	**Investment funds**: information given directly by companies from Dec. 2008, before 2008 from the National Accounts **Insurance companies**: information from the National Accounts **Pension funds**: information from the National Accounts **Other forms of institutional savings**: information from the National Accounts
Spain	Central Bank (Banco de Espana)	Statistics Department	Data are extracted from the National Accounts.	**Investment funds**: balance sheet, profit and losses account and other complementary information they report to their National Supervisory Authority (NSA) for supervisory and statistical purposes. **Insurance companies**: balance sheet, profit and losses account and other complementary information they report to their National Supervisory Authority (NSA) for supervisory purposes. **Pension funds**: balance sheet, profit and losses account and other complementary information they report to their NSA for supervisory purposes. **Other forms of institutional savings**

Country	Institution	Department	Survey / National Accounts (Financial Accounts)	Institutional Investors
Switzerland	Central Bank (Swiss National Bank)	Statistics	Financial assets: financial accounts. Nonfinancial assets: survey	**Investment funds**: Collective capital investment statistics **Insurance companies**: Bank balance sheets, securities statistics, direct investment statistics, insurance statistics **Pension funds**: Pension fund statistics **Other forms of institutional savings**: N/A
Turkey	Capital Markets Board of Turkey	Institutional Investors	The data sent are based on a survey.	**Investment funds**: survey
	The Undersecretariat of Turkish Treasury	General Directorate of Insurance	The data sent are based on a survey (data are compiled from information given directly by companies). The data reported are stock data.	**Insurance companies + Pension funds**: The main sources used for compiling the different categories of Institutional investors' financial data are insurance and occupational pension companies.
United States	Central Bank (Board of Governors of the Federal Reserve System)	Division of Research and Statistics Flow of Funds Section	Data are from the *Flow of Funds Accounts of the United States* (Z.1) produced by the Federal Reserve Board.	**Investment funds**: Investment Company Institute (ICI) data **Insurance companies**: A.M. Best (rating company) and SNL Financial **Pension funds**: IRS/DOL/PBGC form 5500 (private pension funds), Census Bureau (state and local governments), Federal Retirement Thrift Investment Board and National Railroad Retirement Investment Trust (federal government) **Other forms of institutional savings**: SNL Financial (REITs)

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Measuring shadow banking in Ireland using granular data[1]

Brian Godfrey and Brian Golden[2]

1. Introduction

Over the past few decades, financial intermediation and leverage have broadened from the traditional realm of regulated commercial banks towards an array of other financial institutions. Collectively, these other intermediaries have become known as the shadow banking system (McCulley, 2007). These entities provide alternative sources of funding and investment options for market participants and increase the liquidity of asset markets. Financial innovation hastened the shift to shadow banking and was, in turn, stimulated by it (Cecchetti and Schoenholtz, 2010). The shadow banking system has become a critical part of the infrastructure of the modern financial system but has not been subject to the same levels of oversight and regulation as banks. It has become a significant focus of attention in both official and academic circles as it emerged as one of the main reasons for the financial crisis. Highly leveraged shadow banks with illiquid assets suffered from the loss spiral effect forcing them to deleverage due to higher margin requirements and falling asset prices. At the onset of the financial crisis the future for the shadow banking system appeared uncertain. However, the FSB has reported that it has recovered it pre-crises peak, rising to $60 trillion worth of assets in 2010 (FSB 2011a).

Much of the recent debate has focused on the definition of shadow banking and the types of activities undertaken by entities classified as part of this sector. The FSB provides a wide-ranging definition that can be narrowed to a focus on:

- leverage;
- credit risk transfer;
- maturity transformation;
- liquidity transformation;
- deposit-gathering.

This paper applies this definition of shadow banking data to the Irish financial sector. It employs granular data on financial vehicle corporations (FVCs), money market funds (MMFs) and investment funds (IFs) available to the Central Bank of Ireland. This bottom-up approach facilitates the classification of entities engaged in shadow banking activities – any top-down definition inevitably excludes entities that engage in shadow banking and/or includes some that do not. The use of granular data sheds light on categories, such as hedge funds and exchange-traded funds (ETFs), where there is some debate as to whether they undertake these activities. However, there are also a number of data gaps that mean a complete assessment is not possible.

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[1] This paper was presented at the Irving Fisher Conference on "Statistical Issues and Activities in a Changing Environment" at the Bank of International Settlements in Basel, Switzerland, 28–29 August 2012.

[2] The authors are economists in the Statistics Division of the Central Bank of Ireland (email: brian.godfrey@centralbank.ie and brian.golden@centralbank.ie). The views in the paper are those of the authors and do not necessarily reflect the views of the Central Bank of Ireland. The authors are very grateful for the help and support provided by Joe McNeill and Gillian Phelan.

The paper focuses on measurement and definitional issues related to shadow banking and provides a framework for analysis. It seeks to classify entities within the shadow banking sector, and does not make an assessment of risk or address other financial stability implications. The paper is structured as follows: Section 2 looks at definitions of shadow banking. Section 3 provides an overview of data sources, while Section 4 analyses the shadow banking behaviours of the financial sub-sectors covered. Section 5 provides results of the analysis, while Section 6 looks at interconnectedness between shadow banking and banks. Section 7 identifies data gaps and potential improvements while Section 8 concludes.

2. Defining shadow banking

2.1 Literature review

The FSB took a lead last year in directing official efforts in the area of shadow banking. A task force was formed, fulfilling a mandate provided by G20 leaders at their Seoul summit of November 2010,[3] which defined shadow banking as "*the system of credit intermediation that involves entities and activities outside the regular banking system*" (FSB 2011a). The task force saw it as "*essential to cast the net wide*" but that the focus of attention should narrow to "*risks created by maturity/liquidity transformation, flawed credit risk transfer and leverage*". The European Commission tightened the definition in their Green Paper of March 2012,[4] with shadow banking defined as those entities that "*operate outside of the banking system and engage in one of the following: accepting funding with deposit-like characteristics, performing maturity and/or liquidity transformation, undergoing credit risk transfer and using direct or indirect financial leverage*" and/or engage in activities that "could act as important sources of funds for non-bank entities", including "*securitisation, securitised lending and repurchase transactions (repos)*". Various speeches by central banking and regulatory officials support the FSB definition, including Bernanke (2012), Constancio (2012), Macklem (2012) and Tucker (2012).

The focus of academic literature following the onset of the financial crisis has tended towards securitisation activities and money market funds. This has fed definitions that confine shadow banking to instruments that essentially substitute for money. Prominent among these is Gorton and Metrick (2010), who define shadow banking in the broadest sense as including "*investment banks, money market mutual funds, and mortgage brokers.....repos, and more esoteric instruments such as asset backed securities (ABSs), collateralised debt obligations (CDOs), and asset-backed commercial paper (ABCP)*". Morgan Ricks (2010) also focuses on these instruments when he defines shadow banking as "*maturity transformation that takes place outside of the social contract*". Gennaiolli et al (2010) define shadow banking more narrowly as "*securitised banking" which "refers to origination and acquisition of loans by financial intermediaries, the assembly of these loans into diversified pools, and the financing of these pools with external debt*". Poznar et al (2010) also concentrate on securitisation and money market funds, but include credit hedge funds under their definition of "*financial intermediaries that conduct maturity, credit, and liquidity transformation without explicit access to central bank liquidity or public sector credit guarantees*".

There remains considerable debate over the definition of shadow banking, for example, whether maturity mismatch is a concern where longer-term assets are liquid. Some literature restricts analysis to particular instruments or factors such as "run risk" or the existence of credit support. Nevertheless, the FSB definition, which was published in late 2011, has

[3] The G20 communique requested that the FSB develop, in collaboration with other international bodies, recommendations to strengthen the oversight and regulation of shadow banking.

[4] European Commission (2012).

garnered a degree of consensus. For the purposes of this paper, the FSB definition of shadow banking behaviour is applied.

2.2 Applying the definition to aggregated data

The FSB definition, though intuitive, poses operational challenges as the behaviours do not readily fit with common statistical classifications. As Table 1 shows, FVCs and MMFs tend to be seen as shadow banks but funds are classified into categories that are, for the most part, not readily associated with shadow banking activity, i.e. equity funds, bond funds, real estate funds, hedge funds, mixed funds and other (a residual category),[5] broken down by open- and closed-funds.[6] There is some debate surrounding hedge funds and ETFs in particular, as the former could be seen as highly leveraged, and the latter are seen to attract investors that put a premium on instant redemption while investing in longer-term and less liquid assets. The extent to which these categories can be regarded as shadow banking is not clear from aggregate data sources. Real estate funds and private equity funds would be expected to engage in maturity and liquidity transformation, investing liquid funds from investors into longer-term less liquid assets. Like ETFs, private equity funds straddle a number of the statistical classifications, outlined above. Meanwhile, fund types not readily identified with shadow banking, such as equity and bond funds, may include a minority of entities that engage in leverage or maturity and/or liquidity transformation.

Table 1 also highlights that common statistical classifications within aggregate data may not be appropriate for identifying shadow banking activity. A move to granular data significantly improves analysis of the behaviour of individual entities within these statistical classifications.

Table 1

Statistical Classifications and Defining Shadow Banking Behaviours

	Leverage	Credit Risk Transfer	Maturity Transformation	Liquidity Transformation	Deposit Gathering
FVCs	√	√	?	√	X
MMFs	?	X	?	?	√
Exchange traded funds	?	?	?	?	X
Equity funds	?	?	?	?	X
Bond funds	?	?	?	?	?
Hedge funds	?	?	?	?	X
Mixed funds	?	?	?	?	X
Real Estate funds	X	X	X	X	X
Private Equity funds	X	X	X	X	X

5 These fund types are defined according to Regulation (EC) No. 958/2007 of the ECB, 27 July 2007.

6 Open-end funds allow the fund to issue and redeem shares / units, allowing investors to withdraw funds. Closed-end funds have a fixed number of shares / units which means that investors must sell shares / units to another investor.

In addition, entities themselves choose what category they report under and there can be classification issues for entities on the borderline of fund types. Firstly, deposit-type funding is identified with money market funds rather than bond funds. Where bond funds invest primarily at the lower end of the yield curve, the classification depends on judgement calls as to the quality and liquidity of money market holdings. Secondly, hedge funds are not defined by holdings, unlike other categories, but less precisely by an unconstrained investment strategy and performance fees. Hedge fund holdings overlap with other fund types meaning that some may be classified as mixed funds in particular, and vice-versa. Thirdly, the "other" fund category, as a residual, may inevitably cover funds where classification is not straightforward. For FVCs, there is some scope for borderline entities to fall outside the definition, but investigations to date suggest that these would not significantly distort the data. Real estate and private equity funds may engage in one or more of these behaviours but are not part of a credit intermediation process, as is required under the FSB definition.

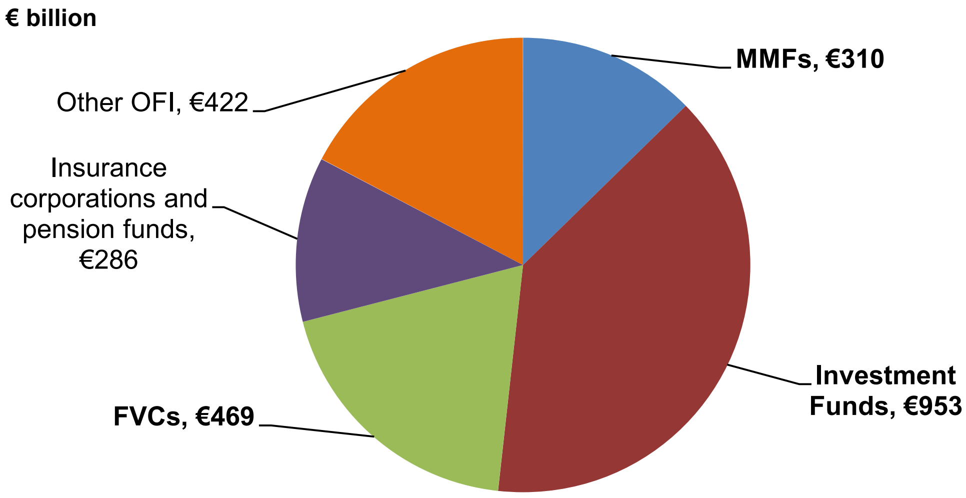
3. Data sources

3.1 Granular data

Total assets of financial sector amounted to €3.5 trillion in Q1 2012, a large multiple of Irish GDP (€129 billion in 2011).[7] Within this, credit institutions accounted for €1.1 trillion, which means that 69 per cent of activity took place outside of the regular banking system. Granular data are available within the Central Bank of Ireland for investment funds, financial vehicle corporations and money market funds. These entities account for €1.7 trillion of total assets or 72 per cent of non-bank activity,[8] as seen in Chart 1.

Chart 1

Breakdown of Non-Bank Intermediaries in Ireland for Q1/2 2012



Notes: IF , MMF and FVC data ref. Q2, 2012.

[7] Quarterly Financial Accounts, Central Bank of Ireland: http://www.centralbank.ie/polstats/stats/qfaccounts/Pages/Data.aspx

[8] Of the remainder, insurance corporations and pension funds account for €286 billion and can carry out banking-type activities but this cannot be quantified at this time. Other miscellaneous intermediaries account for the rest, comprising mostly leasing corporations and treasury management operations, both likely to engage in shadow banking activity, which again cannot be quantified at this time.

Stocks, transactions and revaluations are reported on a quarterly basis for IFs and MMFs, alongside standard profit and loss data. Individual securities are reported for equities and bonds. FVC data are provided on a somewhat less comprehensive basis. Bond and equity securities are mostly reported by ISIN codes and so can be cross-referenced against an ECB database – the centralised securities database (CSDB), which has detailed attribute information for each security. However, derivative securities tend not to be ISIN coded. Derivatives are reported according to their mark-to-market value rather than nominal or notional amounts outstanding, which means that only gains and losses at a point in time are measured, rather than underlying exposures.

3.2 Survey additions

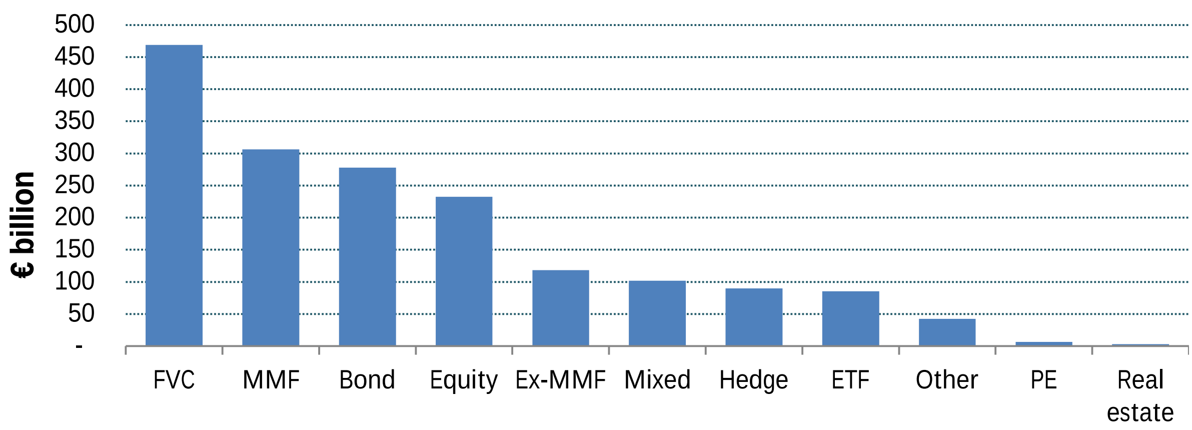
Some data gaps have been filled by a number of one-off surveys in Q1 2012, focusing on a more targeted categorisation of instruments and entities through the identification of repurchase agreements, reverse repos, ETFs and private equity funds.[9] Not all private equity funds are covered in statistical reporting requirements however, with industry contacts suggesting that at least as many are outside the reporting population.

3.3 Framework for analysis

For the purposes of this paper, shadow banking behaviours are sub-divided into an MMF category and nine IF sub-categories. This facilities better classification of the granular data. A separate category is included for bond funds that reclassified from MMFs in November 2011 ("ex-MMF"). The new data categories are shown in Chart 2 below, as measured by total assets. This provides a comprehensive framework for analysis.

Chart 2

Total Assets by Fund Types and FVCs in Q2 2012



4. Shadow banking behaviours

4.1 Leverage

Leverage plays a role in the credit intermediation process in two ways.

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9 The Q1 2012 survey on repos and reverse repos should be seen as tentative, as holdings vary significantly between points in time.

Firstly, an entity can take on leverage and pass this on as credit to other entities. This reflects the extension of credit though purchases of debt securities and derivatives on the asset side, financed on the liability side by debt security issuance, short and long term loans,[10] and various types of derivatives. This type of leverage is prevalent across all the financial sub-sectors examined. For financial vehicle corporations, such leverage largely arises from the issuance of debt securities under securitisation activities. The vast majority of these entities are over 90 per cent leveraged.

For investment funds, leverage on the liability side is linked to credit extension as follows: it is defined as the difference between the gross and net asset value of an entity, adjusted to exclude other accounts payable.[11] Derivatives are included as mark-to-market losses represent debt due in the short term. Leveraged IFs are split between those involved in credit intermediation and others. Credit intermediation is deemed to have taken place, where leverage is used to fund debt security and derivative assets. It is assumed that where leverage is used, it funds these assets in proportion to overall balance sheet holdings. Derivative positions on the liabilities side may be linked to similar positions on the asset side, but a firm relationship could not be established. In table 2 below, leverage is divided into two categories for IFs and MMFs, i.e. entities with leverage on the liability side of between 20 per cent and 100 per cent of net asset value, and those leveraged over 100 per cent. The leverage figures are adjusted to reflect the portion of assets involved in credit intermediation.

From the analysis in Tables 2a and 2b, all IF categories contain leveraged entities. Hedge funds, ETFs and mixed funds all feature prominently, though most of the funds in these categories are not leveraged(even when no thresholds are applied). The relatively large number of leveraged ETF entities is consistent with a “leveraged ETFs” investment strategy, which employs derivative and debt instruments to magnify the returns from the index being tracked. This leverage is almost entirely driven by derivative mark-to-market losses on swaps.[12] A relatively smaller number of hedge funds account for most of the leverage in both categories, however. Derivatives play a large role in driving this leverage, but short-term loans are more prominent at leverage rates of above 100 per cent. Reverse repurchase agreements (reverse repos) account for much of these short-term loans, however, and these can be used to accumulate leverage rapidly.[13] A number of mixed funds are highly leveraged, and use reverse repos, indicating largely unconstrained investment strategies similar to hedge funds. Overall, long-term loans only play a very small role in leverage. Finally, the analysis shows that a small number of leveraged funds exist in categories not normally associated with leverage (e.g. bond and equity funds), with derivatives playing a significant role.

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[10] Short-term loans are defined as loans expiring within one year.

[11] These are mostly accounted for by unsettled trades and margins (i.e. collateral) on derivatives.

[12] These tend to be offset to a greater or lesser extent by mark-to-market gains on swaps on the asset side but the balance is more volatile than for most debt-funded asset purchases.

[13] The main motivation behind their use is to turn securities assets into cash for a short period so as to purchase more assets. Of the €9.6 billion of reverse repos in the industry, over half are accounted for by hedge funds and most of the remainder by mixed funds. In both cases, these reverse repos account for around 40% of total leverage. A small number of equity, bond and other funds also employ reverse repos.

Table 2a

20 to 100% Leverage by Fund Type in Q2 2012

€ bn	20–100%						
	No of funds	**Leverage amount**	**Total assets**	**Average leverage**	**Short Term Loans**	**Derivatives**	**of which Swaps**
Hedge	35	4.8	19.0	36%	1.9	2.8	2.7
Mixed	27	3.5	9.5	62%	2.9	0.6	0.3
ETF	61	2.2	9.1	51%	0.0	2.2	2.2
Bond	19	0.8	2.5	57%	0.2	0.6	0.2
Equity	8	0.3	1.0	36%	0.1	0.1	0.1
Residual[1]	3	0.7	2.0	50%	0.2	0.5	0.5

1 Includes Ex-MMF, Other & Real Estate funds

Table 2b

>100 per cent Leverage by Fund Type in Q2 2012

€ bn	>100%						
	No of funds	**Leverage amount**	**Total assets**	**Average leverage**	**Short Term Loans**	**Derivatives**	**of which Swaps**
Hedge	7	4.5	7.4	162%	3.3	1.2	1.0
Mixed	9	0.8	1.4	138%	0.8	–	–
Equity	2	0.7	1.4	114%	0.6	0.1	0.1
Other	3	0.2	0.3	184%	0.2	–	–
Residual[1]	3	0.2	0.3	194%	–	0.2	0.2

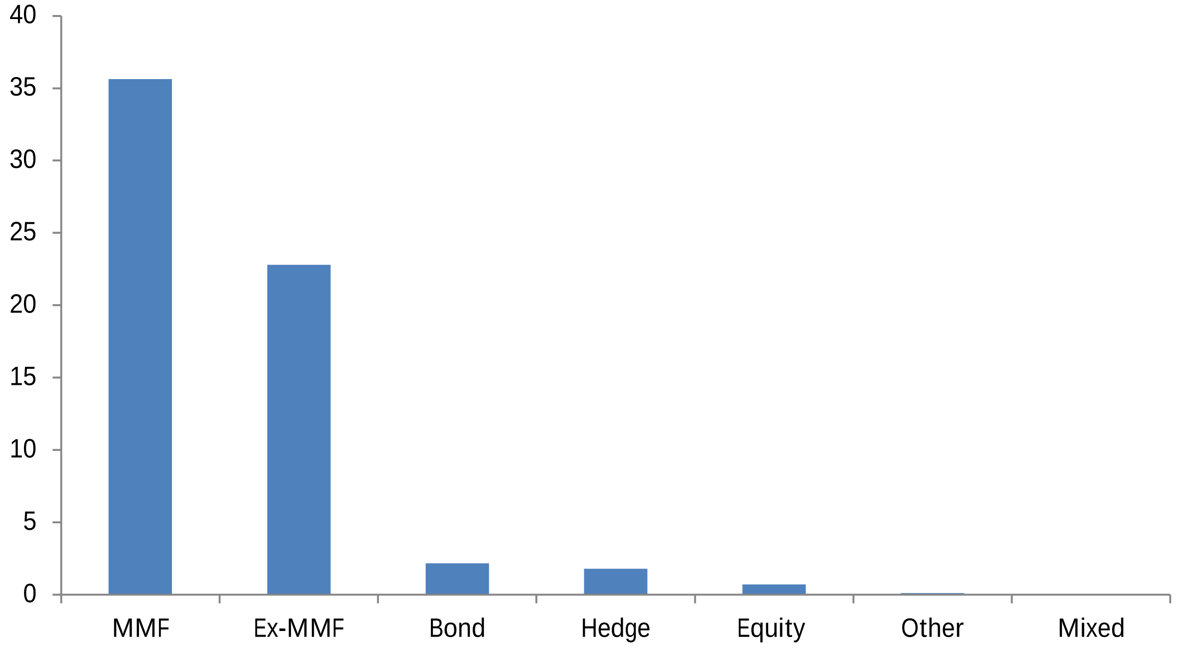
1 Includes Ex-MMF, Bond & Real Estate funds

The leverage ratios chosen here are for illustrative purposes only. In terms of sensitivity of results to alternative ratios, if a leverage ratio of above 10 per cent were chosen, an additional 25 funds would be included while a ratio of 30 per cent would see the number of significantly leveraged funds decline by 27.

The second way that an entity can take on leverage is by lending funds to other entities without taking debt onto its balance sheet. This takes place almost exclusively through repurchase agreements (repos),[14] whereby the credit intermediation takes place through the lending of cash balances. These instruments fit the behaviour of deposit gathering entities, explored in section 4.5, since the principal of the investment is protected while a fixed return is earned. These entities, as lenders, have a distinctly different profile to leveraged entities outlined below, with MMFs and ex-MMFs featuring prominently (Chart 3).

Chart 3

Repurchase agreements in Q1 2012



4.2 Credit risk transfer

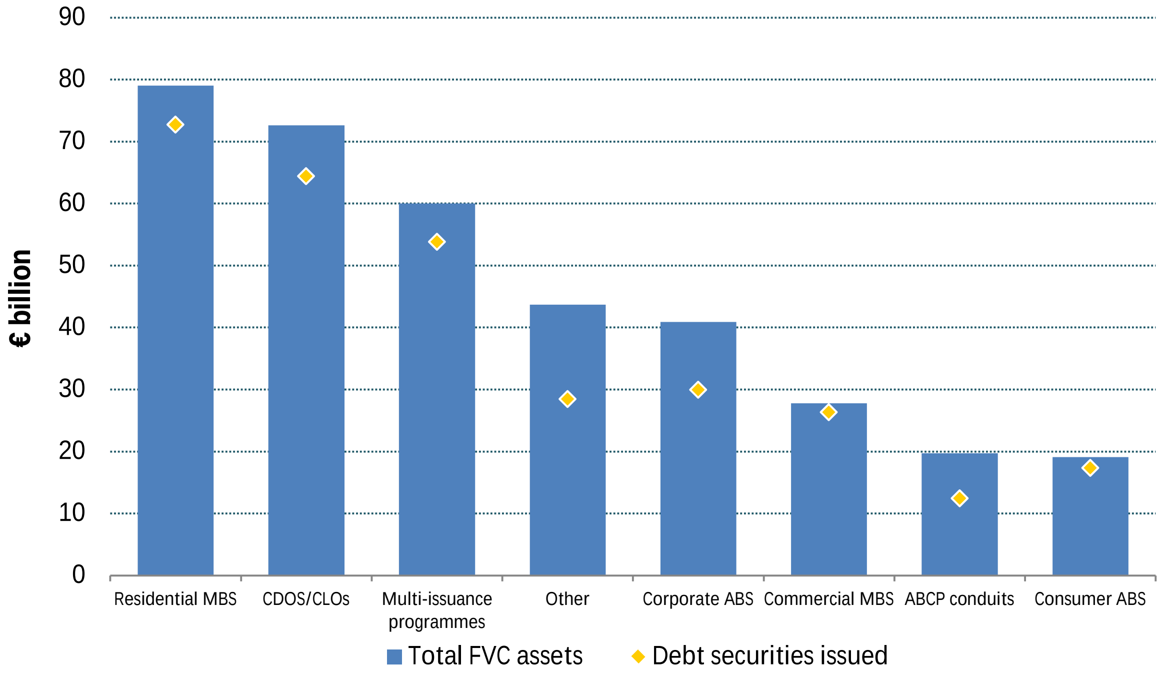
Securitisation is a financial innovation where the credit risk of an asset is transferred from the balance sheets of institutions to investors in asset-backed securities via securitisation vehicles known as FVCs.[15] This allows originators, including banks, to turn illiquid assets into funding. These entities are almost entirely financed by the issuance of short and long term debt securities but their asset profiles are very heterogeneous. As Chart 4 shows, credit risk has been transferred, and new credit generated, across a range of economic sectors and activities, including residential and commercial mortgages, consumer and corporate debt, asset backed commercial paper and different types of bond and loan obligations.

[14] A repo is essentially a collateralised short-term loan, where debt securities are received by the seller in return for cash subject to a repo agreement to reverse the transaction at a set price in the future, irrespective of fluctuations in the value of the debt securities. These are recorded according to the party exposed to the risk.

[15] See Godfrey & Jackson (2011).

Chart 4

Total Assets of FVCs by Activity and Debt Securities Issued in Q2 2012



Note: excludes NAMA (Irish Government SPV)

Credit risk transfer for IFs is difficult to pinpoint due to the lack of data on nominal positions of derivatives. Nevertheless, credit derivatives, used to transfer risk from one party to another, are separately recorded, which provides some very tentative evidence. This activity appears to be quite limited in that mark-to-market positions in these derivatives were just €152 million on the asset side and €15 million on the liability side in Q2 2012, and used by just 174 funds. Overall, there is not much evidence to support the perception that hedge funds in particular are, as a category, aggressively engaging in large positions vis-à-vis governments and corporates. However, changes in the market value of these derivatives tend to be small relative to nominal derivative positions and, therefore, firm conclusions cannot be drawn.

4.3 Maturity transformation[16]

Maturity transformation turns short term funding into asset holdings of longer term maturities. Mismatches can pose systemic run risks during times of financial stress. Of all FSB defined behaviours examined, maturity transformation encompasses the highest number of entities, at 662.

[16] While liquidity and maturity transformations often co-exist, the FSB definition allows maturity transformation to occur separately from liquidity transformation. This differs from classic banking theory, which emphasises the liquidity transformation function of banks. Moreover, in the literature, maturity and liquidity transformation are often intertwined. The FSB focuses specifically on systemic risk, however, which includes the risks of markets turning illiquid during a financial crisis and intensifying investor flight as assets are sold at distressed prices.

4.3.1 FVCs

Maturity transformation can be inferred to a limited extent for financial vehicle corporations. On the liability side a full maturity profile is available, as debt securities issued by FVCs can be matched against the centralised securities database. Less detail exists on the assets side, as a maturity profile is not available for securitised loans, which comprise around half of all assets. These are generally considered to be long term, however. Securities other than shares account for one quarter of assets and their maturity profile is available through matching against the CSDB. Deposit and loan claims, around one-sixth of assets, are not broken down by maturity but these are predominately short term. The funding profile of FVCs based on available CSDB data indicates significant redemptions in the next 5 years. Most of the funding for commercial mortgage backed securities vehicles and a large portion of asset backed commercial paper conduit funding is due within 5 years. For other FVC types, consumer and corporate asset backed securities have most funding due within 5 years but these are backed by debt such as credit cards, car loans and non-financial corporation loans. For vehicles based on longer-term securitised loans, such as residential mortgage backed securities, most of their funding is also long-term.

4.3.2 Investment funds

Coverage of maturity transformation in investment funds is more comprehensive with maturity information available for almost all debt securities held. For these funds, maturity transformation is defined as the extent to which longer-term assets (debt securities of over one year and long term loans) are funded by short-term liabilities (shares/units in issue for open-end funds, short-term loans and derivatives).[17] Closed-end funds are excluded as investors do not have the right to redeem their share/units directly from the fund. A minimum threshold is applied, that at least 20 per cent of long-term assets are funded by short-term liabilities, so as to exclude funds for which maturity transformation is not a defining characteristic.

Table 3

Maturity Transformation by Fund Type in Q2 2012

	>20%			
	Number of funds	**Long term debt held (€ bn)**	**Total assets (€ bn)**	**Average %**
Bond	342	84.2	103.7	81.2%
Mixed	120	26.5	35.9	73.7%
ETF	49	21.5	22.7	94.7%
Hedge	63	20.6	29.4	70.1%
Other	21	9.4	18.4	51.1%
Equity	60	8.8	12.3	71.6%
Ex-MMF	6	2.0	4.1	48.9%

[17] Where long-term assets exceed long-term liabilities, the difference is covered by short-term funding. Results are sensitive to the definition of long-term assets, which we define as a maturity of over one year.

Maturity transformation activity, according to the definition above, is substantial and takes place across a wide range of fund categories, as shown in Table 3. Bond funds account for the majority of this activity, reflecting the very limited amount of longer-term loans on the liability side. At the same time, most bond funds remain outside the measure. Hedge funds, mixed funds and, surprisingly, equity funds are also prominent, with the latter possibly reflecting funds at the borderline of the equity and mixed funds classifications. Interestingly, some hedge funds, not classified as shadow banking under the leverage behaviour, are included here.

The results are not markedly sensitive to the choice of threshold, since most of these funds are substantially invested in longer term debt. For example, if the threshold is reduced to 10 per cent, 60 funds are excluded and, if increased to 30 per cent, 51 extra funds are included.

4.4 Liquidity transformation

The available data provides very limited information on this type of activity and only limited inferences can be drawn. Liquidity transformation occurs when liquid assets are pooled together and invested in illiquid assets. The FVC sector engages in liquidity transformation by definition, funding securitised loans that are not traded in financial markets with the issuance of debt securities that are. For IFs and MMFs, indicators such as the ratio of transactions flows to stocks, issuance/redemption dates, ratings and bid-ask spreads were examined but no inferences could be drawn.

4.5 Deposit gathering

Deposit gathering activity brings a sizeable and distinct set of entities into shadow banking, most notably money market funds, but also some bond funds. The rationale for including this activity is that these entities are financed by short-term funding with the aim of providing investors with higher returns than would be available from ordinary bank deposit accounts. The expectation among investors is that access to their funds is similar to that of bank deposits and that the underlying capital investment is not at risk. The entities undertaking this activity are, however, lightly regulated compared to banks. They invest mostly in what are generally considered to be safe and liquid short-term assets, such as money market instruments and repos. Bond funds generally invest along the spectrum of the yield curve and would not generally be considered deposit gatherers. Some, however, invest predominantly in short-term instruments similar to those of MMFs. The composition of assets held by a fund is the key criterion for identifying deposit gathering activity, given investor expectations that their investment can be redeemed at short notice. Deposit gathering behaviour is defined for the purposes of this paper as occurring where over half of the assets of a fund are short-term.[18]

A change in the statistical definition of MMFs last year had a significant impact on what would be seen as shadow banking from a top-down approach. This change was implemented in the Irish data in November 2011, removing funds to the value of €104 billion from MMFs, almost exclusively to bond funds. The rationale was to bring the statistical definition into line with the supervisory definition at a euro area level. The new MMF definition is more focused in that it includes an investment strategy of maintaining the principal and earning a return in line with money market rates, and states that MMFs can only invest in

[18] Debt securities with residual maturity of less than one year, money market instruments, bank deposits or short term loan assets, including repos.

high-quality money market instruments.[19] For the purposes of measuring shadow banking, however, the new definition is problematic. A fund mostly, but not exclusively, invested in high-quality, highly-liquid money market instruments could be a deposit gatherer but not an MMF. Furthermore, an entity could behave as a deposit gatherer but would not be classified as an MMF because the investment strategy allows a broader range of activities.

Table 4

MMF, Ex-MMF & Bond Fund in Q2 2012

MMF

Type of security	Asset
Bond & Notes	11.2%
Deposit & Loans	27.1%
MMIs	61.0%
Other	0.8%

Ex-MMF

Type of security	Asset
Bond & Notes	17.0%
Deposit & Loans	32.7%
MMIs	48.5%
Other	1.7%

Bond

Type of security	Asset
Bond & Notes	73.3%
Deposit & Loans	3.6%
MMIs	2.9%
Other	20.3%

The ex-MMFs behave more like current MMFs relative to the rest of the bond fund category, to which they are now classified. A typical bond fund would not generally be expected to invest in money market instruments. Indeed for those bond funds that are not ex-MMFs, this type of investment is tiny, as shown in Table 4. Current MMFs are mostly invested in money market instruments, as expected, but the ratio is also high for ex-MMFs. A similar pattern is evident in the use of repos, which is actually higher for ex-MMFs than for MMFs, but negligible for bond funds. When the definition of deposit gathering behaviour is applied, the entities identified straddle funds across the MMF, ex-MMF and bond categories. Most current MMFs are included as expected but so are half of all bond funds that were formerly MMFs, as shown in Table 5. A small but not insignificant number of other bond funds are also included.[20]

Table 5

Deposit Gathering by Fund Type in Q2 2012

	>50%			
	Number of Funds	**MMIs + cash and deposits (€ bn)**	**Total Assets (€ bn)**	**Average %**
MMF	74	258.4	279.3	92.5%
Ex-MMF	35	91.6	104.3	87.8%
Bond	34	6.5	7.1	90.4%

Note: MMIs are money market instruments

19 It also requires the investment manager to take into account issues such as credit quality, asset class, counterparty risk and liquidity. This definition applies to all assets whereas the old definition covered 85 per cent of total assets.

20 This excludes those funds that hold short-term assets as part of a winding down process.

The results are not particularly sensitive to different thresholds in our definition of deposit gathering. Reducing the threshold of short-term assets to 40 per cent of total assets brings in 11 funds (6 bond, 3 MMFs, 2 Ex-MMFs) while increasing it to 60 per cent takes out 6 funds (4 bond, 1 MMF and 1 ex-MMF).

5. Results

The results illustrate the extent to which existing categories need to be disaggregated in order to measure shadow banking behaviour as defined by the FSB. Around two-thirds of all FVCs, MMFs and IFs combined, by total assets, are identified as engaging in shadow banking behaviour.

Table 6

Shadow Banking Behaviours by Size in Q2 2012

€ billion	Total assets	Leverage (excl. repos)	Repos (Q1)	Credit risk transfer	Maturity transfor-mation	Liquidity transfor-mation	Deposit gathering
FVC's	**469.2**	448.2		469.2	47.5	469.2	–
MMF's	**279.3**	–	35.6	–	–	?	279.3
Bond funds	**111.6**	2.8	2.1	?	103.7	?	7.1
Ex-MMFs	**108.5**	–	22.8	?	4.1	?	104.3
Hedge funds	**41.6**	26.4	1.7	?	29.4	?	–
Mixed funds	**37.4**	10.9	0.1	?	35.9	?	–
ETF funds	**31.8**	9.1	–	?	22.7	?	–
Other funds	**18.7**	2.2	0.1	?	18.4	?	–
Equity funds	**12.6**	2.5	0.7	?	12.3	?	–
Private Equity funds	**–**	–	–	–	–	–	–
Real Estate funds	**–**	–	–	–	–	–	–

Note: As entities may engage in a number of shadow banking activities, the sum of the categories may not equate to total assets

Table 6 populates table 1 on the basis of the analysis undertaken, with Chart 5 below updating Chart 1. The main conclusions are:

FVCs – All are included in measurements of behaviours as expected with some additional information provided on maturity transformation by vehicle type;

MMFs – Most engage in deposit gathering activity as expected but a small minority do not;

Bond Funds – A quarter of the total engages in maturity transformation while smaller numbers are identified under leverage and deposit gathering;

Ex-MMFs – Most of these engage in deposit gathering, measured by total assets, but are now classified as bond funds in published data;

Equity Funds – Although not associated with shadow banking, a small number of funds are identified under both leverage and maturity transformation;

Hedge Funds – Consistent with the public debate, almost half of the category is captured, though maturity transformation activity is as strong as leverage;

Mixed Funds – Over one-third of these are captured, mostly under maturity transformation, though the leverage behaviour of a substantial minority is quite similar to hedge funds;

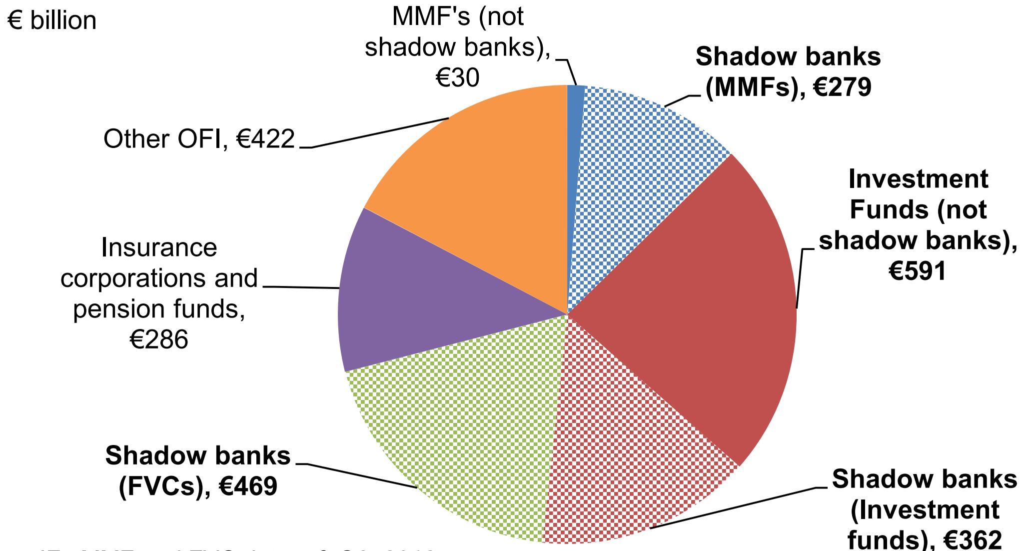
ETFs – Almost half of the category is engaged in leverage and/or maturity transformation;

Private Equity Funds and Real Estate Funds – These are not included in the FSB definition as they are not involved in the credit intermediation chain though may be included in other shadow banking definitions;

Other Funds – Almost half of these are included though their share of shadow banking activity is much smaller once ETFs and private equity funds are removed.

Chart 5

Breakdown of Non-Bank Intermediaries in Ireland in Q1/2 2012



Notes: IF , MMF and FVC data ref. Q2, 2012.

6. Interconnectedness with banks

The data only provides limited detail on links between shadow banking activity and the banking sector.

For FVCs, disaggregation is available for deposit and loan claims and a portion of securitised loans still serviced by banks. Debt securities assets can be matched to MFIs[21] using ISIN codes but the amounts involved are relatively small. Share register information is not available to determine ownership for FVCs. Deposit and loan claims amounting to €3.9 billion can be linked to Irish banks, and €7.1 billion to other euro area banks, but no breakdown is available for the rest of the world. For securitised loans, €53.4 billion are serviced by Irish banks and €3.6 billion by German banks. In most cases, the servicer of the loans is also the originator.

For MMFs/IFs, a breakdown is available for asset holdings of debt and equities issued by banks. Deposits and loans are not available but banks are likely to be the major counterpart. A total of €63 billion is invested in bank assets, 80 per cent of which is investment in bonds by deposit gatherers. Funds involved in leverage account for the remainder. Fund ownership is collected but on a first known counterpart basis only. Banks directly own around half of all shares / units in deposit gatherers and around a quarter, on average, in other shadow banking entities. The existence of crossholdings between funds, and nominee accounts means that these shares may not accurately reflect the ultimate beneficial owner. The data, however, show that banking exposures are mostly situated outside the euro area, in particular, in the UK and US.

7. Data gaps

The analysis undertaken highlights the importance of granular data in understanding shadow banking behaviour. While the source data has improved considerably, primarily from the development of the euro area statistical framework, significant gaps still remain. In Ireland, the detailed granular information is only available for investment funds, money market funds and financial vehicle corporations,[22] meaning that a significant part of the other financial intermediaries sector is not covered. In particular treasury companies, leasing companies, some private equity funds and securitisation-type vehicles falling outside the FVC definition, are not covered.

Information on the measurement of liquidity transformation is a particular challenge. Ideally, securities databases could provide information on transactions per security, bid-ask spreads and credit ratings but this is a major operational challenge. Alternatively, reporting agents might be asked to classify securities according to particular liquidity buckets, but this probably represents an unacceptable reporting burden.

Limited information is available for derivatives, repos and securities holdings, both in terms of counterparties and volumes of activity. For derivatives, reporting on the basis of nominal positions, as well as mark-to-market, would provide a much clearer picture of the type of leverage used, particularly in the funds sector. Greater use of trade repository and central counterparty data could also be considered. Data gaps on security holdings are being addressed, however, in the context of a securities holding project underway at the ECB. This will improve counterpart information for securities where ISIN codes are reported – however, some domestic respondents use other codes, SEDOL or CUISIP, as their primary security identifier.

Gaps also exist in terms of identifying positions between financial sector entities, and particularly between entities within a common group structure, most of which operate on a

[21] Monetary and Financial institutions include MMFs but the latter holdings of IFs and other MMFs are minimal.

[22] Granular data collection will be expanded shortly to the Insurance sector, allowing an assessment of what shadow banking activities are undertaken in this sector.

cross-border basis. These gaps may be reduced through the development of international registers.

While some gaps need to be addressed through international initiatives, improvements can also be implemented at national level. As part of a project to implement ESA2010[23] changes, the Central Bank of Ireland is proposing a number of improvements to reporting forms in 2014. Enhancements to the identification of ETFs and private equity funds will be included. Expanded instrument coverage is also proposed for repos, reverse repos and other securitised lending. The potential for separately identifying unquoted securities and derivatives used for credit risk transfer will also be explored. Greater information may also be requested on the holdings of fund shares, but it is accepted that information on the ultimate beneficial owner may not be available to reporting agents. The securities holding project underway at the ECB offers potential in this regard.

For FVCs, the feasibility of collecting ownership structures by sector and geography is being explored. There is also scope to further expand asset and liability categories by maturity, sector and geography, and to enhance the reporting of securities by ISIN code.

8. Conclusions

The main purpose of the paper is to show the value of using granular data to measure shadow banking activity. This exercise represents a snapshot of shadow banking in Ireland at a particular point in time, according to the FSB definition. It also provides a framework for analysing these data. The results show that shadow banking activity does not fit neatly into the broad categories of published statistical data. Measurement is also sensitive to the various thresholds chosen in order to define shadow banking behaviours.

All Irish resident FVCs and most MMFs engage in shadow banking activity, though granular data is required to quantify the extent. All categories of IFs contain some shadow banking entities, although most categories fall outside the top-down definition. Measurement, therefore, requires access to granular data on a fund-by-fund basis to define and quantify shadow banking behaviours.

The statistical classification of IFs is problematic for the purposes of measuring shadow banking and, therefore, the creation of some alternative data categories needs to be considered. The recent reclassification of some MMFs highlights how borderline entities can significantly impact on a top-down measurement. Furthermore, the existence of broad investment strategies allows some types of funds (e.g. mixed) to engage periodically in shadow banking activities. It is important to note that classifying particular entities as falling within various types of shadow banking behaviours does not necessarily indicate major risks from a financial stability perspective. However, adherence to more than one behaviour, or being in excess of chosen thresholds, may indicate greater vulnerabilities. The framework and the dataset outlined in this paper may offer potential for refining the analysis of risk.

The paper shows that the shadow banking sector in Ireland is significant, with predominantly non-domestic risk exposures. This underlines the international nature of shadow banking and the need to share information across borders. The introduction of shadow banking measurement as a consideration when designing future reporting requirements would yield significant benefits in isolating shadow banking behaviours. A number of data gaps exist that can be addressed by measures that range from relatively easy to difficult and expensive to implement. On an international level, the development of share registers and data from

[23] European System of Accounts definitions as updated in 2010.

centralised clearing houses would provide key information on counterparties and indirect linkages that are currently missing. Initiatives are also required at national level, and the Central Bank of Ireland proposes expanding granular data collection in forthcoming revisions to reporting forms.

In summary, granular data clearly has an important role to play in efforts to measure and understand shadow banking and the risks therein, both at national and international level. These types of data should be more integrated with top-down approaches to fully understand the full extent of shadow banking activities and to better identify vulnerabilities.

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Measuring the off-balance-sheet wealth management business of commercial banks

The case in China

Qizheng Mao[1]

1. Introduction

This paper narrates the methodology adopted by the People' Bank of China in monitoring wealth management business of commercial banks. Wealth management product (in Chinese, *licai*) was first introduced into China's financial market in 2004. There are two types of it, one is recorded on bank's balance sheet, and the other is recorded off balance sheet. The off-balance-sheet ones have their own independent assets and liabilities and are booked on their own balance sheets. Usually it is considered as a typical kind of shadow banking. *Licai* can offer a return rate higher than the deposit interest rate that is determined by the central bank. What is more, they are not required to comply with the regulating requirements. Due to these characters, both the individual investors and commercial banks flush to it. In the past two years, the market saw an explosive growth of *licai* business. The size of *licai* is big enough to affect the balance sheet of commercial banks.

The People' Bank of China has begun to implement statistical standardization in recent years. Different from traditional ways, statistical standardization not only requires the numerical information of the transactions, but also non-numerical ones such as the transaction dates, term structures, the counter-parties, the interest rates and so on. All of the above can help the economists understand the business in all dimensions. The standardization method was thought as the most appropriate solution to monitor *licai*. The statistician defined the necessary attributes and required the banks to report data in the pre-defined format. By this way, all the requirements on information are met.

The statistics on *licai* was successful, many interesting things were found from the results. But there is still a long way. *Licai* is only a part of shadow banking; the central bank intends to extend this solution to other instruments and other SPVs.

This article describes the statistical reporting framework used by PBoC in monitoring commercial banks' wealth management products, especially those off-balance-sheet ones. It is organized as follows: the second part gives a brief introduction of *licai* and the reason why it is necessary to build a monitoring framework; the third part describes how the central bank constructed the monitoring system; the forth part shows some interesting findings and the final part makes a further consideration.

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[1] The views expressed in this paper are those of the writer and should not be attributed to People's Bank of China.

2. A need for further information of *licai*

Wealth management product (in Chinese, *licai*) was first introduced into China's financial market in 2004 by China Everbright Bank. Although literally it is wealth management product, it is not the comprehensive service offered by banks to their client. It is more like collective investment vehicle. It performs like mutual funds, but are managed by commercial banks. Customers usually buy the shares from bank counter and most of the products are close-ended. The threshold of investment is at least 50,000 CNY usually.

Nearly one third of *licai* products are recorded on the banks' balance sheets currently, while others are independent from the banks' balance sheets. The independent (off-sheet) *licai* can also take part in financial activities such as repos and security transactions. The products would book the transactions on their own financial reports like real entities. However, few of the regulating rules designed for banks are applicable for them. Therefore, the off-balance-sheet *licai* should be considered as a typical kind of shadow banking business.

Since the product is not deposit, it can give the investors a higher return rate than the deposit interest rate determined and controlled by the central bank, sometimes the spread touches 100 to 200 base points. This feature makes *licai* very popular in investors, especially the individual investors who have few investing channels and are more sensitive about the return rate. When there is a high CPI rate, more and more people draw money from their saving accounts and turn to *licai*.

On the other hand, in the past years, to keep the economy from overheating and fight with the climbing price, the policymakers took tightening policies. From January 2010 to June 2011, PBoC raised required reserve ratio 12 times in eighteen months. The ratio touched the peak of 21.5% in June 2011 and remained at that level for 5 months. At the same time, the banks were told to control their total credit size. This makes the enterprises very thirsty for fund. However the off-balance-sheet *licai* is much less regulated than tangible entity. Therefore many companies turned to *licai* for fund.

Then things seemed perfect! The investors received a return higher than deposit, the companies raised money other than bank loan, the banks earned rich intermediate fee. Every part satisfied. This gave a boost to the development of (off-balance-sheet) *licai*. But there might be some potential problems behind the fast growth. One of them was that the above process weakened the effect of the tightening policies. The real financing activities of private sector exceeded the limit of the policymakers' intension by borrowing from these off-sheet SPVs. Another problem lay in that since these SPVs were less regulated as tangible financial institutions, they might be over leveraged and the quality of their assets would be not that robust. Once there is a shock in economy, *licai*'s ability of paying would be doubted.

At the end of 2010, in fact, the amount of off-balance-sheet *licai* reached 2.5 trillion CNY, accounting for 3.5% of the money supply M2. The economists were highly interested in understanding further information.

3. The project implementation

The boom of *licai* posed challenges on current statistical system, which were amplified when there were tightening policies. Obviously just measuring the size of it was not enough, to understand the whole story, more attributes such as maturity, investment portfolio, counter parties, mode of business were required. However, the limited structure of traditional reporting system, which is designed based on the balance sheet of financial institution, could not get such information. Only the amounts of fund raised and the size of the asset could be obtained via traditional method. Meanwhile, in recent years, PBoC was considering to adopt standardization in statistical tasks. This solution was thought, by the statisticians of PBoC, as a way out.

Work on this project started in autumn 2009 and lasted 18 months or so. Its objective was to define conceptual and technical framework to ensure the information for the needs of monetary and banking statistics and other needs of central bank such as risk analysis. Joint efforts of experts from both central bank and commercial institutions made sure that the required information was useful and available.

3.1 Statistical standardization

Since 2009, People's Bank of China has been reviewing the statistical challenges and lessons brought by the passed crisis. The experts thought there were mainly five major challenges facing the authorities. First, traditional central bank statistical practice has not kept pace with the progress of financial innovation, and could not fully cover the new types of financial institutions and financial instruments. Second, the current statistics schema focuses on balance sheet data of commercial banks, but does not pay enough attention to off-balance-sheet operations, structured products and contingent assets and liabilities. Third, central banks need to improve their access to high-frequency data and transaction-connected data. Fourth, central banks are lack of experience in monitoring the contagion of cross-border and cross-market risks. Fifth, information sharing is poorly based due to lack of harmonized standards-setting efforts.

To find a solution a desirable direction is to establish a comprehensive, consistent, harmonized and sensitive financial statistics framework. In this endeavor, the key we think about is standardization. Financial statistics standardization can ensure the authenticity of statistical data and offer a "searching engine" for monitoring cross-border, cross-market and cross-institution transactions. What is more, it also enhances the harmonization among the sources of micro-level sources and between micro and macro-level data, and makes it possible for data collected by one party to be shared by every other party, solving the information sharing difficulties. The central bank plans to refine the different attributes of economic activities on the basis of current statistical framework, to dig further into the source data of financial institution and transaction, to realize dual-core statistics for balance sheet and financial instrument, to formulate standards for financial institutions, financial instruments, and source data, to define financial statistics terminologies and release data exchange standards, and then build IT system for it. The objective is to set up a sensitive and efficient central bank statistical system.

3.2 The monitoring framework

First, even though *licai* was relatively a new business of commercial banks, its activities nevertheless consist of the source and usage of fund like other on balance business. As a result, both sides should be considered when designing the statistical framework. Second, while the task was organized in the statistics department, the data would also be used for other purposes. Therefore what was different from the traditional way lay in that non-numerical information was also included. Another thing should be mentioned is that unlike savings and loans which are collected on institutional basis, *licai* is measured product by product, i.e. asset and liability of each product should be collected rather than the total outstanding amount managed by certain banks. The information of issuing institution of a certain product is required, so when necessary, we can get the exact total outstanding amount of *licai* issued by every individual bank. This can be obtained simply by accumulating the data of products grouped by issuing institutions.

Thorough preliminary analyses showed that the standardization method was the most appropriate solution. The first step taken by PBoC was to set up the statistical standards for SPV products like *licai*. The first one was for codings of *licai* products. According to this standard, every product had been assigned one unique code in order that it could be dealt with by computer systems. The code also included the information of issuing institutions (the standard code of financial institutions had been published already), issuing date and type of product (*licai*, trust plan, mutual fund, etc), which could be decoded by computer as well. The second standard decided what attributes should be reported for each product, all related data needs were organized. What is more, for those non-numerical attributes, the codomains were determined, i.e. the possible values have been determined and there would be no other choices beyond the range for certain attributes. Automatic built-in controls at the reception phase assured that the data could be used for all functional needs of the central bank, particularly for market supervision and risk analyses.

Standard code list was a breakdown of specific attributes for one or several purposes. It was important that breakdowns for different purposes (defined by attributes) were not mixed together in one code list, but separated in different ones. If different purposes were combined in one code list, the breakdowns were normally more detailed (granulized). Breakdowns of the same kind for different purposes had to be commonly defined, which also required reconciliation efforts. The experience furthermore showed that exceptions are to be avoided in reporting, as they complicate matters.

Number of codes in the standard code list was, in principle, not limited and nor was the number of reporting items. This gave to the system the desired flexibility and was, consequently, at least technically, easy to introduce subsequent changes in reporting.

In such a framework, the logical output of the information reported would be a flat table with data records extracted directly from data warehouse system.

3.3 Data structures

The information required was divided into three themes according to their nature and purpose of use. The first one was the descriptive information, illustrating the characteristic of products, most information under this theme were nun-numerical. The second was fund raising related information, describing how much money collected in certain period. Both the on/off-balance-sheet kinds of *licai* were required to report descriptive and fund raising information. The third one was the balance sheets of products. It was unique for off-balance-sheet ones. The reporting items were defined like the balance sheet items.

The details of the themes are listed as follows,

Table 1

Descriptive information

Number	Information required	Explanations
1	Product code	
2	Name of issuing institution	
3	Fund raising currency	
4	Principle paying back currency	
5	Profit paying currency	
6	Client types	Household or corporation
7	Collecting mode	Public or private
8	Managing mode	Singular or collective
9	Type of product	Trust, QDII, structured, etc
10	Business mode	On-balance or off-balance
11	Principle guaranteed indicator	
12	Highest estimated return rate	
13	Lowest estimated return rate	
14	Beginning date of raising fund	
15	Ending date of raising fund	
16	Beginning date of product	
17	Ending date of product	
18	Callable option indicator	Whether the issuing institution can finish the product before expiry
19	Puttable option indicator	Whether the client can finish the product before expiry
20	Credit enhancement indicator	
21	Credit enhancing institution	If any
22	Domestic custodian institution	
23	Overseas custodian institution	If any
…	…	…

Table 2

Fund raising information

Number	Information required	Explanations
1	Amount of initial raising	
2	Amount raised in current period	Transaction happened in this period
3	Amount redeemed / paid back in current period	
4	Outstanding amount	Stock of the end of this period
…	…	…

Table 3

Balance sheets information

Number	Information required	Explanations
1	Total asset	
2	Cash	
3	Deposit	
4	Loan	
5	Securities	
6	Equities	
7	Derivatives	
8	Receivables	
9	Liabilities and equities	
10	Loan	
11	Derivatives	
12	Payable	
13	Principles	
…	…	…

The related data collected by this system are reported with a single monthly frequency in three (theme) groups of files, which makes reporting and especially potential revisions much easier, compared to the mode of multiple frequencies for multiple themes.

4. General findings

Via the framework described above, for the first time, we had a clear scene of the situation of *licai* products. Some of the findings are listed here.

4.1 Total size

At the end of 2011, the number of on-balance- sheet *licai* products reached 10.4 thousand, the outstanding amount of the principle raised was near 1.3 trillion CNY, which constituted 1.6% of the total deposit, showing an increment of more than 240 percent year on year.

The number of off-balance-sheet *licai* reached 10.3 thousand, the outstanding amount of the principle raised was near 2.7 trillion CNY, which equaled 3.4% of the total deposit, showing an increment of about 16 percent year on year.

4.2 Term structure

More than half of the money raised by off-balance-sheet *licai* was raised by products with maturity less than one month. Meanwhile nearly 30 percent was raised by those with maturity between one and three months. The long-term products only constituted 16.6 percent of the total fund raised. However, from the stock's point of view, we have a different story. The products with long-term account for more than 75 percent of the total outstanding amount. Those with maturity less than one month only stand for 1 percent. The short-term products raised and paid money more frequently and had a larger effect on the market.

4.3 Return rates

In December 2011, the average return rate of off-balance-sheet *licai* was 5.2%, increased by 160 basis points compared with the beginning of the year. While the interest rate of one-year deposit was 3.5 percent. *Licai* did seem more attractive. From January to September, the return rates of all terms climbed up, but after that, the returns of short term products decreased slightly while the long term ones kept the climbing trend.

4.4 Investment portfolio

The investment portfolio of off-balance-sheet *licai* included mainly five assets. The largest part was trust plan. More than one third of the fund was invested in trust plans. The reason lay in that some banks cooperated with trust companies to make loans to the clients. They operated like this, *licai* products invested in trust plans, and the plans made the loans. The second one was securities, accounted for 22.2 percent. The third was equities, which contributed 21.7 percent. The forth was loans issued directly by *licai*, accounting for nearly ten percent. The fifth was call loan or repos with financial institutions, constituted for about 7 percent.

4.5 Client types

The statistical data illustrates that more than 70 percent of the *licai* fund was raised from households. Less than 30 percent came from institutions (including financial institutions). This was perhaps because that in China, the households has fewer investing channels than institutions. Meanwhile they think high of the returns. Therefore deposits and instruments alike are important choices. Generally, *licai* has higher return rate than deposits and lower threshold and risk than other instruments. That explains why household like to invest in *licai*. On the other hand, institutional investors more use bank accounts as paying tools, not for return

4.6 The effect on banks' balance sheets

We also found that some banks used *licai* products to manipulate the size and structures of their balance sheets. The most popular way was that the products were designed to expire just before the end of the month, especially the end of the quarter, when the principle and return were paid back, the fund was usually credited to the clients' deposit accounts. Thus the size of the deposit would be enlarged to meet the relevant requirements such as loan to deposit ratio. A more complicated way was that the banks offered liquidity (by repos for example) to their products, and the products provided fund to clients, then the clients' deposit would also be increased.

5. Conclusion and further considerations

5.1 The advantages of the framework

As we are emerging from the most severe financial and economic crisis of the modern era, lessons can be drawn also for financial statistics function. One of them is the lack of some pertinent and important statistical information linked to fresh financial instruments and exposures.

Under this condition, it is of importance that new information is obtained as soon as possible with maximum efficiency. The main benefit of the solutions we adopted lies in:

a) The reporters prepare data only once for multiple purposes. The cost of both sides, reporting and receiving, is lowered. At the same time the efficiency and consistency is enhanced. Simultaneously, information provided by reporters also included multi-functional needs, such as supervisory and policymaking.

b) Central bankers learn more information than merely total size, leading to a more precise risk analysis and policy making. The introduction of new framework was followed by necessary harmonization processes to support monetary policy decision-making.

5.2 Consolidation of off-balance-sheet *licai* products and banks

In May 2011, the International Accounting Standards Board published "IFRS10—Consolidated Financial Statements" and "IFRS 12 — Disclosure of Interests in Other Entities" to replace "IAS 27 — Consolidated and Separate Financial Statements" and "SIC 12 - Consolidation – Special Purpose Entities". The new standards will come into force on Jan 1, 2013. The new standards require an entity (the parent) that controls one or more other entities (subsidiaries) to present consolidated financial statements.

The basis for consolidation is control. The criteria of control is defined as whether an investor is exposed, or has rights, to variable returns from its involvement with the investee and has the ability to affect those returns through its power over the investee. The relationship between off-balance-sheet *licai* product and its issuing bank just satisfies the definition of control. Because the bank can decide the activities of products and the profit allocation, thus the return it receives can be decided by itself.

In most cases, *licai* products are guaranteed by their issuing banks more or less, and theses SPVs often have business with their "parents". Risk can be contaminated to the banks quickly. There are also banks utilizing *licai* to avoid the regulatory requirements. To understand the whole risk situation and asset and liability structure, therefore it is necessary to require consolidated reports from reporters sometime in the future.

5.3 Extension

Encouraged by the success of the application of the system on *licai* products issued by monetary financial institutions, the idea has been taken up to extend this method also to reporting of other financial instruments and other SPVs initiated by nonmonetary financial institutions. The interest rate monitoring system, which is under construction, adopts the same method, collecting information of each deposit and each loan then computing the average interest rates. PBoC will also soon begin to cooperate with the CSRC, supervisor of capital markets in China, to expand this system to security companies and to mutual funds. Preparations are under way.

Compiling statistics of shadow banking

Sayako Konno, Ai Teramoto, Yuka Mera[1]

1. Introduction

Shadow banking has attracted increasing public attention since U.S. subprime mortgage crisis became apparent in the latter half of 2007. During the financial crisis in 2008, many large non-bank financial institutions faced financial difficulties as their values of subprime related assets were impaired sharply. More specifically, Bear Stearns, the U.S. fifth largest investment bank and securities companies were sold to JP Morgan Chase in May 2008. Following September, Lehman Brothers, the U.S. fourth largest investment bank, filed for Chapter 11 bankruptcy protection. Furthermore AIG, which was the world's largest insurer and was rescued by NY Fed's bailout in order to avoid global catastrophe, exerted significant impacts on the financial market.

After experienced the financial crisis in 2008, public voices stressed the importance of enhancing the monitoring of financial flow outside the banking system, i.e. shadow banking activities, in order to grasp systemic risk beforehand. Paul Krugman, professor of Economics and International Affairs at Princeton University, wrote "One thing financial reform must do, then, is bring non-bank banking out of the shadows" in The New York Times' column on June 18, 2009. In April 2011, in response to the G20's request, the Financial Stability Board (FSB) formed a Task Force in order to develop recommendations to strengthen the oversight and regulation of the shadow banking system by 2011. In October 2011, FSB (2011) developed recommendations to strengthen the oversight and regulation of the shadow banking system.

The Flow of Funds Accounts (FFA) is often used to describe behaviour of sectors in financial market including shadow banking. FSB (2011) recognizes the FFA as a useful source for the broad sweep of the scale and trends of non-bank credit intermediation for an appropriate monitoring process. It conducted a monitoring exercise for eleven nations using the FFA, and analyzed historical movements of sectors such as OFIs (other financial intermediaries). It also reaffirmed the importance of compiling the figures for the breakdown of non-bank financial intermediaries such as insurance companies, structured finance vehicles for more detailed analysis. As a result, the remark has motivated statistics compilers to keep refining FFA data about financial flows outside banking system in particular.

Looking at overview of Japan's shadow banking sector with FFA, OFIs' asset is around 10% of the total financial system while depository corporations' asset has still occupied about a half of the total. The share of OFIs peaked in 2007, and gradually declined at the background of financial crisis. In more details, the breakdown of OFIs with FFA presents "securities investment trusts" and "financial dealers and brokers" sectors have dominant shares. Its share is around 70% of the total OFIs.

The Japan's FFA is regarded as one of the most detailed and comprehensive financial statistics. Although it is supposed to cover all shadow banking entities and their transactions in principle, source data are not always available. The BOJ investigated ways to refine the current estimation methods concerning shadow banking entities. This paper introduces

[1] 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 or omissions.

BOJ's recent measures to reflect the rapid changes of financial market specifically in the shadow banking field to the FFA.

Section 2 begins by presenting the revision of investment funds. Section 2.1 illustrates the background of its review and section 2.2 and 2.3 introduce the recent 2 revisions regarding to investment funds: (1) Equity Transaction for Investment Funds, (2) Fund-of-funds. Next, section 3 describes the revision of nonbanks. Section 3.1 illustrates the background of its review, and section 3.2 and 3.3 introduce the recent 2 revisions regarding to nonbanks: (1) Life Insurance, (2) Finance Companies. Section 3.4 sets out the conclusion for the revision of nonbanks. The last section, section 4 concludes this paper.

2. Investment Funds[2]

2.1. Background

The trend of Investment Funds, which is also called collective investment schemes, has been watched with much interest and concern in the financial market. Investment funds take various structures such as hedge funds, venture capital (VC), private investment funds (Table 1), and adopt different strategies.

Typically, hedge funds have had a huge impact on the financial market. For instance, during the middle of European financial crisis in 1992, Quantum Fund broke the Bank of England, forcing it to leave EMS by betting its entire fund in a short sale of the British pounds on the prediction that its currency would depreciate. In 1998, Long Term Capital Management (LTCM) avoided bankruptcy through the FRB's intervention. Moreover, as the subprime crisis occurred in 2006, hedge funds that had much exposure to subprime-backed securities had suffered significantly.[3]

In this section, we set out the two revisions of data for investment funds that we conducted recently: (1) Revision of equity transaction for investment funds, (2) Revision of fund-of-funds.

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[2] Investment funds or collective investment schemes pool fund from two or more investors and invest the fund into any business or securities. The investors hold a participatory interest in a portfolio of the funds through shares, units or other form of participatory interest.

[3] The amount invested by domestic investors was 7,438 billion yen as of March 31, 2006 based on "*Hedge Fund Survey Results (2006)*" conducted by Japan's Financial Services Agency (FSA). The breakdown of type of investors shows that 26% was invested by life and non-life insurance companies, 15% by trust banks, 24% by major banks and other banks, 15% by regional banks and 20% by other financial institutions, including cooperative banks. Financial institutions sold a total of 3.0 trillion yen in hedge funds to their clients, of which 23% is to individuals. 53% of hedge funds are launched outside of Japan, mainly in the Cayman Islands. The survey was conducted by sending questionnaires to the 1,252 financial institutions regulated by the FSA, including banks, insurance companies, securities companies, investment trust management companies, etc.

(Table1) Types of Investment Funds

Types	Asset Values of Funds	Main Investing Assets	Overview of Business Operations	Main Investors
Hedge Fund	about 7.4 trillion yen (2006 Fiscal Year End)	General financial asset in a high liquidity	Hedge funds are established under relaxed rules and the main purpose is to obtain the absolute returns while conducting a certain risk-hedge.	Banks, Insurance companies, financial Institutions such as trusts are main investors. Some of pension funds, corporations, individuals in a wealthy class also participate.
Activist Fund	--	Posted shares	Activist funds buy posted shares aiming to raise the income gains as shareholders and obtain capital gains through participation in the management and decision making.	Institutional Investors are main players, but some individuals are also participating.
Buyout Fund	3.0 trillion yen (2009 Annual Year End)	Minority interest of shares	A buyout is the purchase of more than 50% of a company's shares and control over the company. It is aiming to receive capital gains through the improvement of companys' values.	Mainly Institutional investors are such as pension funds, including foreign investors (Rarely indivisuals).
Venture Capital Fund	1.9 trillion yen (2006 Fiscal Year End)	Minority equity stake of Venture Enterprise	An investment fund that manages money from investors seeking private equity stakes in startup and small- and medium-size enterprises with strong growth potential. It is aiming to obtain the capital gains by selling stock at IPO after the enterprise's values are heightened by management supports. These investments are generally characterized as hig-risk/high return opportunities.	Institutional Investors are main players, but some individuals are also participating.
Content Fund	about a few billion to tens of billion yen	Copyright, Patent Right, etc.	An investment fund invests its funds in content production such as films, games, animated cartoon,etc and obtain intellectual property rights. It is aiming to receive investment returns from business profits.	Industry officials and financial institutions are main investors.
Real Estate Fund	--	Real Estate	Real Estate Fund is aiming to obtain the investment returns from rentals on property owned by them, develop and sell property and capital appreciation on the sale of property.	Institutional Investors are main players.
Commodity Fund	about 400 billion yen (2005 annual year end)	Commodity (commodity goods,futures,options)	Commodity Fund is aiming to obtain the investment returns by investing its funds mainly into commodities.	Indivisuals, corporations.
Other Funds (Emission Rights Funds, Wine Funds)	Unknown	Various Assets	Other Funds are aiming to secure profits by investing its funds into possible assets to produce economic benefits.	Unknown

Source: Financial Services Agency, Venture Enterprise Center

2.2. Equity transaction for Investment Funds

2.2.1. Coverage of the Investment Funds

Investment Funds usually take one of the forms on Table 2, i.e. investment trusts, trusts, SPC and kumiai (i.e. partnerships or unincorporated cooperatives).

Currently Japan's FFA captures fund raising and financial investment by "Investment Trusts", "Trusts" and "Special Purpose Companies (SPC)" sectors in both flow and stock bases.[4] Source data for those forms of investment funds are included in existing statistics compiled by industrial associations and a central securities depository.

[4] In the FFA participation into the funds are recorded as "Investment trust beneficiary certificates", and "Structured-financing instruments" transaction items.

(Table2) Forms of Collective Investment Scheme

	Main Forms	Main Investment Assets	Sectors in the FFA	(Reference) Treatment in Financial Instruments and Exchange Law
Investment Trusts	Securities Investment Trusts Real Estate Investment Trusts Investment Corporation	Securities Real Estate	Securities Investment Trusts	Securities
Kumiai	Nini-Kumiai (Associations) Tokumei-Kumiai (Anonymous Associations) LPS (Limited Partnership) LLP (Limited Liability Partnership)	Unrestricted *Exceptions: LPS's investment is restricted to shares,etc.	Not Specified *"Outward / Inward Portfolio Investment Securities" in the Balance of Payments includes deemed securities.	Some securities that fill a certain requriement are deemed securities
Trusts	Trusts	Property Rights in general Money, Securities, Monetary Claims, Personal Estate, Real Estate, Intellectual Property Rights, etc.	Collectively Managed Trusts *Consolidated with the original investing entities SPC・Trusts	Securities or Deemed Securities
SPC	SPC	Monetary Claims, Real Estate, etc. *Includes equity investment in a partnership aggrement and exculudes beneficial interest in Money Trusts	Structured-Financing Special Purpose Companies and Trusts	Securities

2.2.2. *Data availability for Kumiai (unincorporated cooperatives)*

Several types of domestic kumiai are used for investment funds. Typical structures include the follows: (1) nini-kumiai (Associations), (2) limited partnership (LPS), (3) limited liability partnership (LLP), and (4) tokumei-kumiai (Anonymous Associations). (Table 3).

(Table3) 4 types of Kumiai used for Collective Investment Scheme

	Nini-Kumiai (Associations)	LPS (Limited Partnership)	LLP (Limited Liability Partnership)	Tokumei-Kumiai (Anonymous Associations)
Laws to authorize	Civil Code	Limited Partnership Act for Investment	Limited Liability Partnership Act	Commercial Code
Constituent Members	General partners	- General partners - Limited partners	All LLP partners have limited liability.	- Manager - Anonymous Partners
Contract	Agreement among partners	Agreement among partners	Agreement among partners	Bilateral agreement between manager and anonymous partners.
Scope of Business Operations	No restrictions	Business pertaining to investments. Business activities are stipulated in the Act.	There are certain restrictions*.	No restrictions
Liable Liability	All partners have unlimited liability.	-General partners have unlimited liabitlities. -Limited partners have limited liabilities.	All partners have limited liabilities.	- Managers have unlimited liabilities. - Anonymous partners have limited liabilities.
Corporate Entity	No	No	No	No
Tax Treatment	pass-through entities	pass-through entities	pass-through entities	pass-through entities

*eg. Businesses that could incur liabilities exceeding the amount of capital of a LLP cannot be undertaken.

Reliable source data for kumiai's domestic transactions are difficult to obtain. Their domestic transactions are not captured as for other forms of investment funds. Kumiai can be set up wherever a contract among members exists and financial statements are neither disclosed nor filed to authorities.[5]

On the other hand, Japan's FFA captures kumiai's cross border transaction flows. It is included in "Outward / Inward Portfolio Investment" in Balance of Payments statistics, which is used as one of source data of Japan's FFA (Table 4). Data for cross-border's transactions by kumiais are submitted to the BOJ as required by Foreign Exchange and Foreign Trade Act.

(Table 4) Transaction Items in FFA for the Cross-Border's Transactions by Kumiai

Transaction Items in FFA	From-Whom-to-Whom	Source Data
Outward investments in securities	domestic kumiai to overseas	Outward / Inward Portfolio Investment in Balance of Payments
Shares and other equities	overseas investors to domestic kumiai	Outward / Inward Portfolio Investment in Balance of Payments

Two issues need to be considered with regard to the cross-border's transactions by kumiai (Table 5):

(1) Is it appropriate to compile the outstanding amounts of kumiai's equity investment?

(2) Are there any rooms to refine the estimation method of the flow data for kumiai's equity investment?

(Table 5) Cross-Border's Figures for Kumiai's Equity Investment

	FFA	Issues
Stock Data	×	Is it appropriate to add the outstanding amounts of kumiai's equity investment to FFA?
Flow Data	△	Are there any leeway for further improvement in estimation method?

2.2.3. Revision of flow data for Kumiai

In the FFA, capital investment from overseas' investors to domestic sectors are included in "Shares and other equities" item. The item is defined as the sum of "Of which: shares", i.e. listed shares, and other types of equities such as unlisted and participating shares. Prior to the revision, the FFA recorded the same data on both items due to the limited availability of source data.

[5] Kumiai is not required to register under Financial Instruments and Exchange Law in case it conducts private placement for qualified institutional investors, etc.

By this revision, we started to apply new source data, i.e. statistics for listed shares compiled by Tokyo Stock Exchange, to item “Of which: shares”. We also apply Balance of Payments data, which include all types of shares, to item “Shares and other equities”. The revision made it possible to take the difference between the two items “Shares and other equities” and “Of which: shares”. The difference includes investment in Kumiai or unincorporated cooperatives.

2.2.4. Remaining task

The source data of outstanding amount of cross border transactions, i.e. International Investment Position (IIP) does not include kumiai’s stock data. When the Balance of Payments statistics starts to include stock figures of kumiai’s equity investment in future revision, then the FFA will also be able to reflect that data. So far our sample study suggested that accumulated amount of transaction flows of Kumiai would be minimal.

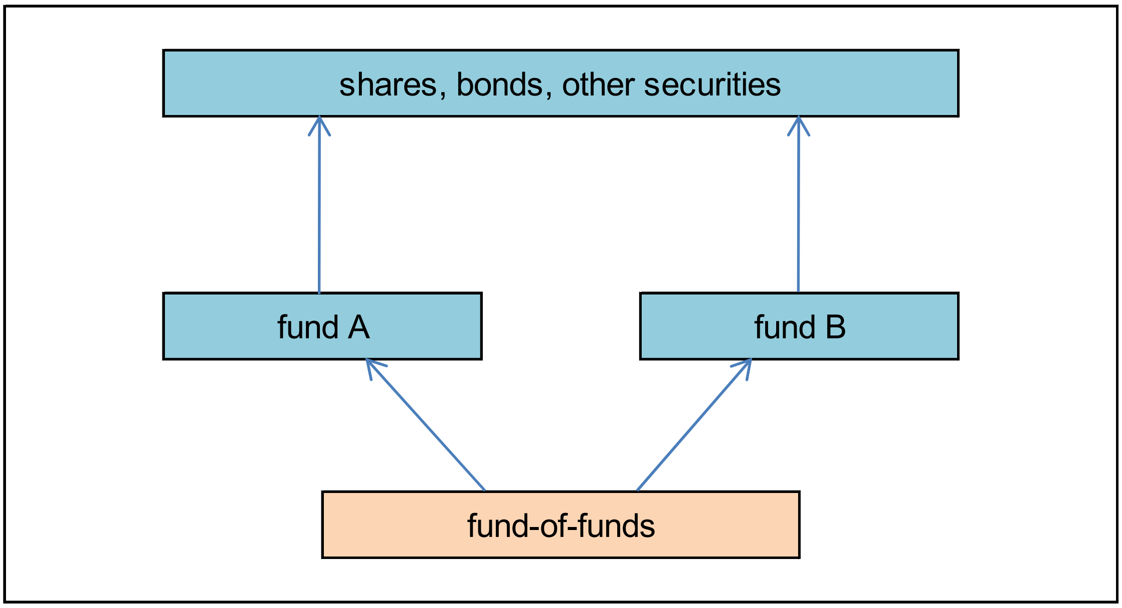
2.3. Fund-of-funds

2.3.1. Definition of fund-of-funds

“Fund-of-funds (here after FOFs)” is investment funds which invest in other investment funds instead of investing in securities directly (Chart 1). Thus FOFs diversifies their portfolio effectively. They are classified as “Stock investment trusts” sector in Japan’s FFA.[6] Total net assets of FOFs increased rapidly in recent years.[7]

(Chart 1)

Example of fund-of-fund’s structure



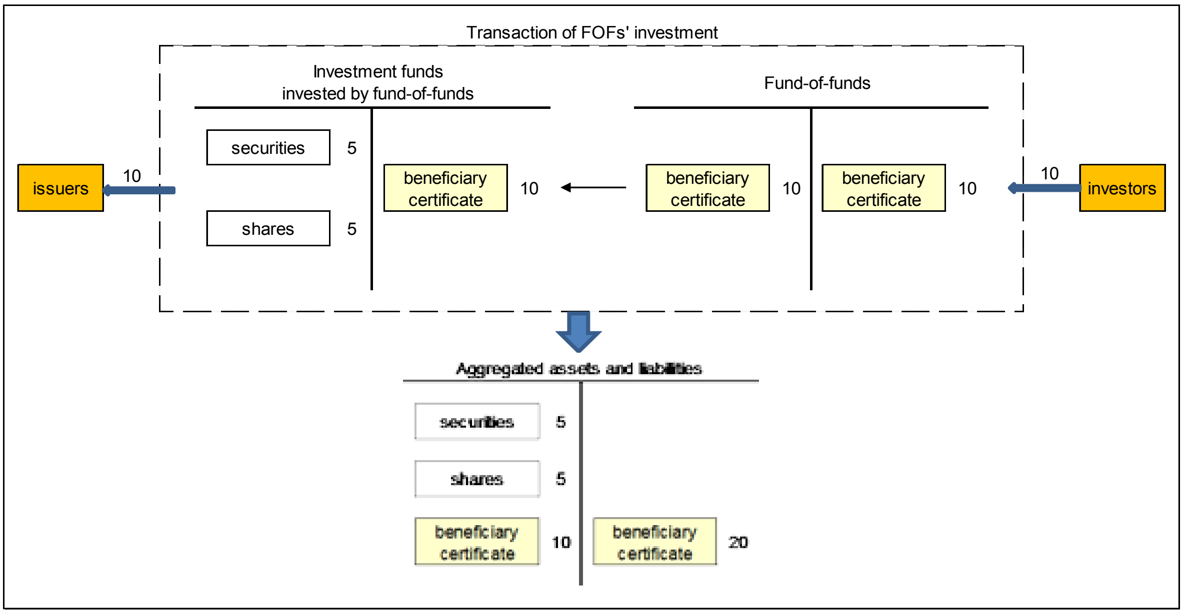
[6] “Stock investment trusts” sector is classified as a subsector within “Securities investment trusts”. The investment trusts can include stocks as investment targets. Even those investment trusts whose primary investment targets are bonds and short-term money market instruments are assigned in this category if they can include stocks to some extent.

[7] As of the end of March 2003, the total net assets of FOFs (publicly offered) was 481 billion yen. As of the end of March 2012, that has increased up to 22 trillion yen.

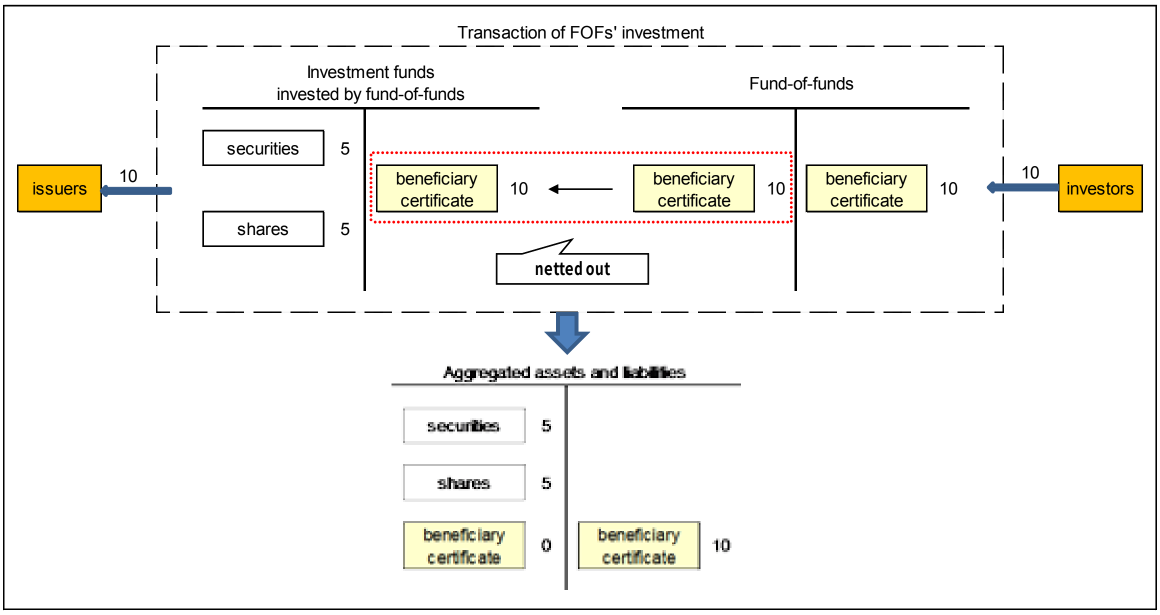
2.3.2. *Treatment of fund-of-funds*

In the framework of FFA, FOFs' investments are regarded as intra-sector transactions. In principle, Japan's FFA records both intra- and inter-sector transactions on gross basis. The principle, however, is not applied to the treatment of FOFs. FOFs is one of collective investment schemes and plays a role as a financial intermediary, which raises funds and holds financial assets as an investment. To record its activities vis-à-vis other sectors and to avoid double-counting of the same source of fund, we do not apply the principle and cancel intra-sector transactions in the FFA (Charts 2 and 3).

(Chart 2) Aggregated assets and liabilities of FOFs' investment



(Chart 3) How to compile FOFs' investment in the FFA



2.3.3. Fund-of-funds data

In the recent revision, we adopted new source data and estimation methods for FOFs' investment, which is deducted from the assets and liabilities of "Stock investment trusts" sector. The amount deducted is the sum of investment trust beneficiary certificates held by publicly offered FOFs and privately placed FOFs. Estimation process is as follows.

The amount of beneficiary certificates held by FOFs can be obtained from the data released by the Investment Trusts Association.[8] The source data for publicly offered FOFs cover beneficiary certificates issued by both domestic and overseas investment funds. We estimate the amount of beneficiary certificates issued by domestic funds by using the ratio of domestic funds to the total amount,[9] which can be calculated based on the BOJ's research.

Then the sum of the figures calculated as stated above is deducted from the assets and liabilities of "Stock investment trusts" sector.

2.3.4. Impact on the outstanding amounts

The data and estimation method above are applied from the data for the end of March 2004.

As a result of the above-mentioned revision, the amounts of "Investment trust beneficiary certificates" issued by "Stock investment trusts" sector, from which investment of FOFs are deducted, were revised upward.

As its secondary impact, the amounts of "Investment trust beneficiary certificates" held by "Household" and "Private nonfinancial corporations" sectors were also revised.[10, 11]

3. Nonbanks

3.1. Background

"Finance companies" sector in the FFA includes institutions that raise funds by methods other than deposits and deposit-like instruments and make investments through lending or similar activities. As the number of money lending companies, i.e. main players in "Finance companies" sector, decreased sharply in recent years due to the change in the legislation of

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[8] Data for holding by publicly offered FOFs: "Benefiting Certificate" and "Investment Securities issued by Investment Companies" held by Stock Investment Trust in "*Distribution of Assets of Publicly Offered Investment Trusts of Contractual Type*". Data for privately placed FOFs: Total net assets (excludes the amount invested in FoFs) of Privately Placed Stock Investment in "*Changes in Assets of Privately Placed Investment Trusts*".

[9] "Securities investment trusts" sector in the FFA does not include overseas investment trusts (investment trusts established overseas). When domestic FOFs acquire or dispose of overseas funds, they are treated as "Outward investment securities". Thus only domestic FOFs' investment in domestic investment funds corresponds to a double counting and needs to be identified for deducting.

[10] Revision of publicly offered FOFs' investment affects the holding amount of "Households". In the FFA, "Investment trust beneficiary certificates" held by the "Household" sector are estimated on the assumption that all small scale publicly offered investment funds are held by retail investors. More specifically, holding amount of "Household" is estimated to be equal to the issued total of small scale publicly offered investments funds. Almost all publicly offered "Stock investment trusts", from which publicly offered FOFs' investment is excluded, are small scale. Therefore this revision affects the amount of investment funds held by "Households".

[11] Revision of privately placed FOFs' investment has an impact on the holding amounts of "Private nonfinancial corporations". Privately placed stock investment funds are supposed to be owned by institutional investors. Holding amount of "Private nonfinancial corporations" sector is estimated as residuals by deducting holding amount of other sectors from the issue total of "Securities investment funds", from which FOFs' investment are excluded. Consequently, this revision affects the amount of investment funds held by "Private nonfinancial corporations".

money lending industry, it became more likely that we cannot (or will not be able to) grasp the actual situation of this industry without revising our estimation method. Therefore we reconsidered estimation methods. Also as shadow banking attracted more public attention after the financial crisis, we considered whether we could add extra data of shadow banking to the FFA.

3.2. Life Insurance

Life insurance companies are large institutional investors and play an important role in financial flow outside the banking system. Their investment strategy is different from other sectors. They tend to hold long-term bonds to match assets' maturity to that of liabilities, i.e. life insurance contracts.

3.2.1. Transaction flow data

In the FFA, transaction flow is recorded separately from changes in price and in definitions etc. We calculate transaction flows of bonds held by life insurance companies by taking term-on-term difference of the outstanding amounts on a book value basis.

This raises an issue of discrepancy in evaluating values of bonds between financial statistics and financial statements. In financial statements, bonds are evaluated on various evaluation methods depending on the purpose of holding. Typical evaluation methods include market value method, historical cost method, and amortized cost method.[12] Among those, only historical cost method[13] is consistent with the definition of transaction flow in the FFA.[14]

In the revision, we replaced financial statements data, from which we previously estimated book values, with the aggregated data of life insurance companies' assets on a book value basis. The new source data are based on book-keeping journals that apply historical cost method to the evaluation of bonds.

3.2.2. Stock data

In the FFA, amount outstanding is recorded on a market value basis. Previously we calculate the market value of bonds held by life insurance companies by multiplying the amount outstanding on a book value basis by market price indices. The method was not accurate enough to measure the market value because market price indices are the weighted average of market prices of constituent bonds. Compared to the market average, life insurance companies tend to hold long-term bonds. The accuracy of the previous method is lost further when the slope of yield curve changes.

In this revision, the method of using market price indices was abandoned. Instead, we adopted the summary data of investment bonds on a market value basis, which are calculated separately from financial statements. In the data, bonds held by each life insurance are aggregated, and all marketable securities are completely evaluated on a market value basis.

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[12] Which evaluation methods are applied is dependent on the property of the purpose of holding of the securities. In principle, "trading securities" and "other securities" are evaluated on a market value method, and "securities to be held until maturity" are evaluated on an amortized cost method.

[13] Historical cost is the price of assets based on original cost when they are acquired by company.

[14] For transaction flows of "Shares" and "Outward investments in securities", on the other hand, appropriate figures can be estimated with existing method. Therefore, this revision does not apply to transaction flows of them. Specifically, transaction flow of "Shares" are estimated based on the data for trading in the Stock Exchange market (*the Trading Volume & Value by Types of Investors*), and transaction flow of "outward investments in securities" is estimated by using the data of outward portfolio investment by type of investors (*Balance of Payments Statistics*).

3.2.3. Impact of the revision

The data were revised retroactively from the end of March 2009. Major impacts of this revision are as follows.

The outstanding amounts of “Central government securities and FILP bonds” and “Investment trust beneficiary certificates” held by “Life insurance” were revised upward. As its secondary impact, the holding amounts of residual sectors were also revised. For “Central government securities and FILP bonds”, the holding amount of “Domestically licensed banks” decreased. Regarding “Investment trust beneficiary certificates”, the holding amount of “Private nonfinancial corporations” also decreased.

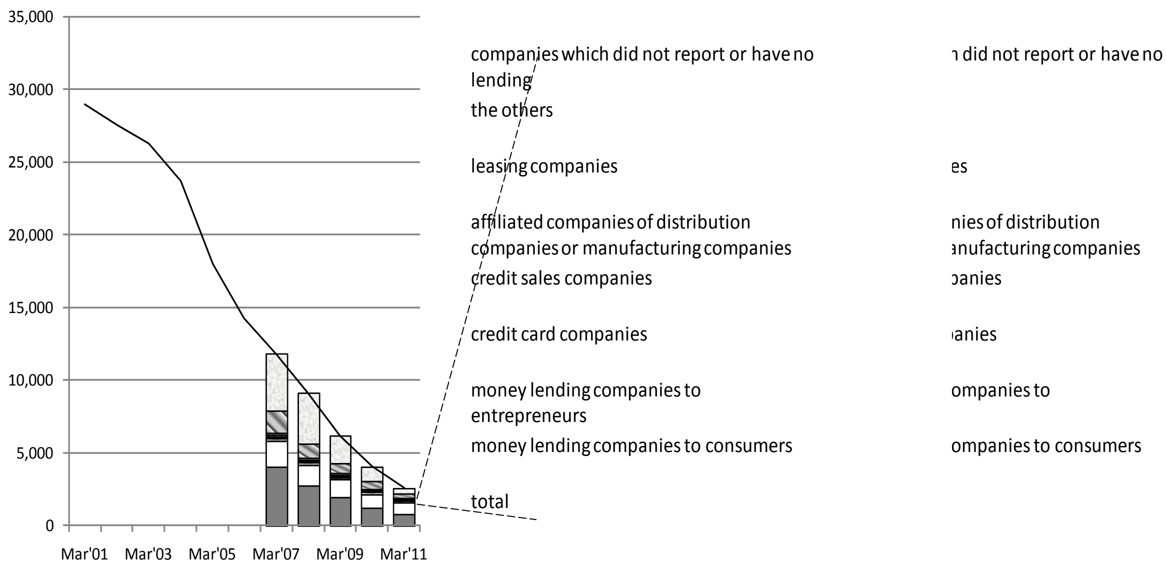
3.3. Finance companies

3.3.1. Money lending companies

Money lending companies are the main players in “Finance companies” sector. Their number decreased sharply in recent years because the regulation on lending conditions was strengthened by the amendment of Money Lending Business Act. The number of companies decreased from 28,986 at the end of March 2001 to 2,589 at the end of March 2011 (Chart 4). The amount of lending by money lending companies also decreased from 45 trillion yen at the end of March 2001 to 26 trillion yen at the end of March 2011 (Chart 5). The changes in the industry forced us to check the robustness of the previous compilation method that was based on estimation from sample data.

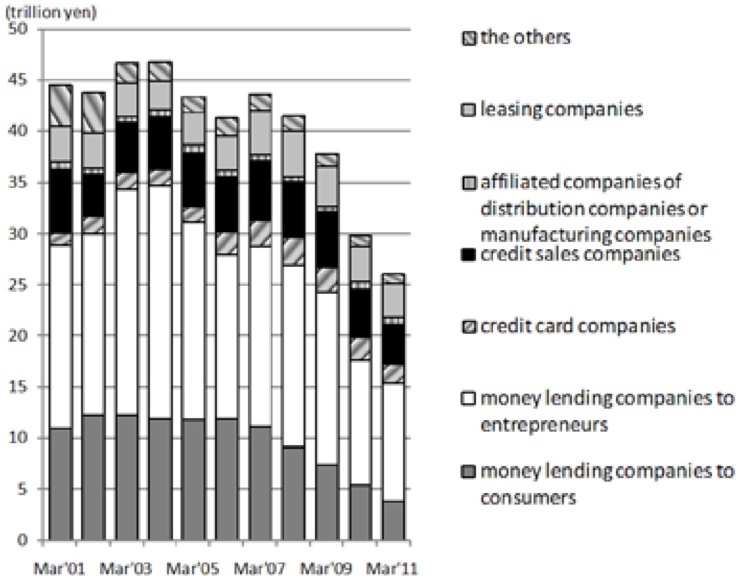
(Chart 4)

Transition of Number of Companies



(Chart 5)

Transition of Amounts of Lending



Source of Chart 4 and 5: Financial Services Agency, "Data on Money Lending Industry"

The outstanding amount of each transaction item in the FFA is estimated by using outstanding amounts of loans of the whole money lending industry ("*Outstanding amounts of loans by each classes*" published by the Financial Services Agency). The estimation method of whole balance sheets of money lending companies before revision was based on the six categories of money lending companies that were set up by Financial Services Agency (FSA): (1) money lending companies to consumers, (2) money lending companies to entrepreneurs, (3) credit card companies, (4) credit sales companies, (5) affiliated companies of distribution companies or manufacturing companies, and (6) leasing companies. For each category we take the ratio of sample companies to all companies in terms of loan outstanding and apply it to other transaction items to estimate the whole balance sheet of the category. The sum of six categories' balance sheet presents the whole balance sheet of money lending companies.

Our revision of compilation method focused on the estimation procedure using samples. Evidence suggested that enough number of samples could not be maintained to make robust estimation due to the decreased number of companies in the industry. In some categories all sample companies ceased operations. Then we checked whether the six categories could be reclassified and reduced with little impact on estimation by combining those with common factors. As a result we combined "(3) credit card companies" and "(4) credit sales companies" and "(5) affiliated companies of distribution companies or manufacturing companies", all of which conducted sales credit business.

The reclassification was reinforced by the increased number of sample companies. The added samples were about 160, which had not been used fully in estimation because limited items were available. Our latest study about the characteristics of the samples also suggested that their balance sheet composition was not significantly different from those in use. The finding led us to add the samples.

(Table 6)

Classes Before / After Revision

Before Revision	No. of sample
(1) money lending companies to consumers	8
(2) money lending companies to entrepreneurs	7
(3) credit card companies	1
(4) credit sales companies	5
(5) affiliated companies of distribution companies or manufacturing companies	6
(6) leasing companies	7

After Revision	No. of sample
(1) money lending companies to consumers	12
(2) money lending companies to entrepreneurs	21
(3+4+5) credit card companies, credit sales companies, and affiliated companies of distribution companies or manufacturing companies	78
(6) leasing companies	82

3.3.2. Venture capital

As increasing attention was paid to financial flow outside the banking system, i.e. shadow banking, we worked on extending the data coverage of "Finance companies" sector. In particular, source data were found available for "venture capital". The market size of venture capital was also relatively large (about 1 trillion yen in 2011). We classified it as "Financing companies" in the FFA. Note that 2008SNA suggests that the principal part of venture capital belongs to "Specialized financial corporations" and the venture capital fund part belongs to "Captive financial institutions and money lenders" or "Non-MMF investment funds", but Japan's FFA has not moved to 2008SNA yet.

Source data include "*Survey Results on Trends in Venture Capital Investment*" published by the Venture Enterprise Center and the financial statements of listed companies.

3.3.3. Impact on outstanding amounts

By revising the estimation method of the money lending company, the amounts of loans on the assets/liabilities side of "Finance companies" sector turned out to be overestimated and were revised downward. The amounts of bond issues (Industrial securities mainly) and bond possessions (Commercial paper and Industrial securities mainly) by this sector turned out to be underestimated and were revised upward. And by adding venture capital, the amounts of Shares and other equities increased.

3.4. Conclusion for revision of nonbanks

In the revisions of "Life insurance" sector and money lending companies of "Finance companies" sector, we encountered typical issues that statisticians have to solve when they compile financial statistics.

Selection of source data for life insurance companies involved discrepancies between statistics and accounting standards. Primarily we need to rely on accounting data that are disclosed and are readily available. In order to evaluate financial assets more accurately, we were required to go beyond accounting data, under which different evaluation methods are applied to bonds according to the types of holding purposes. With a cooperation of reporters we were able to obtain appropriate data for statistics, i.e. book value data for transaction flow and market-to-market data for amount outstanding.

The robustness of estimation is vulnerable to sample size. When the number of samples for "Finance companies" sector decreased, we checked whether we could improve stratification process. We scrutinised common factors of each group of samples and found that we could combine some groups to enlarge sample size. Further we utilised existing sample data more efficiently.

4. Concluding remarks

This paper introduced BOJ's recent attempt to reflect the rapid changes of financial market with a focus on the shadow banking field. As a result the FFA now shows financial flow outside banking system more accurately. We will continue examining the ways to improve estimation accuracy of the FFA to make it more useful for its users.

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Shadow banking in Spain

Orestes Collazo Brañanova

Credit intermediation

The normal functioning of an economy leads to a situation with some institutional units in possession of more funds than they want to spend and others with less. As long as there is a price such that these groups willingly exchange the funds across time, the economy will be better off. This exchange can be performed without intermediation. Savers transfer the funds directly to borrowers, which acquired the obligation to return them at an agreed price at a later date. However, direct lending between savers and borrowers has three mayor problems which reduce the execution of profitable exchanges. First, the risk that the borrower defaults on its obligation may be too high for a single saver, the so called credit risk problem. Secondly, the period of time for which the saver wishes to lend the funds must match that in which the borrower wishes to have them, the maturity problem. Finally, the saver may want to transform the obligations against the borrower into money before maturity and not be able to do so without a loss, the liquidity problem. Traditional credit intermediation, in which savers entrust their savings to banks[1] in the form of deposits which banks channel to borrowers, involves credit, liquidity and maturity transformation that solves these problems. Pooling a large number of credits creates risk economies of scale. The credit risk exposure for every single saver is reduced as all savers share the performance of all loans. Moreover, credit risk is further enhanced as banks have equity to partially cover losses from the loans, and can screen and monitor more efficiently borrowers. On the other hand, maturity match is not necessary as no funds of a single saver are linked to any loan; rather all deposits are pooled and partially used to finance the borrowers. But as the amount credited to borrowers is lower than the deposits taken from the savers, each single saver can withdraw the full amount of its funds without loss, solving the liquidity problem.

We have presented how traditional credit intermediation solves the problems associated with direct lending between savers and borrowers. In general, we call credit intermediation to the activity where credit risk, maturity or liquidity transformation occurs between the initial saver and the final borrower. In this broad sense, credit intermediation also includes the funds channeled as debt securities and not merely the intermediation instrumentalized as loans.

Originate-to-distribute credit intermediation

The traditional banking system just described – borrow short, lend long, and hold on to loans as an investment – in which the funds are channeled through a single institution now covers only a part of the credit intermediation process. A new process of credit intermediation has materialized as market forces, regulation and technology have evolved. The exponential increase of assets under management resulted in a larger demand for financial assets that brought specialized firms into the credit intermediation system which ended up increasing competition; changes in regulation governing capital requirements reduced the profitability of traditional banks; financial innovations such as securitization and credit risk transfer allowed the use of different tools along the credit intermediation process. As a consequence, the

[1] We use the term "bank" in a general sense, referring to any deposit taking institution.

economy moved from a deposit-funded single-intermediary originate-to-hold system, into a market-funded multiple-intermediaries originate-to-distribute system, which is structured in multiple sequential steps.[2] First credit is originated. When credit is instrumentalized as loans, these may be bought by loan warehouses which specialize on their trading and accumulate the credit risk. Ultimately financial vehicle corporations (FVCs) pool and, possibly, structure the financial assets into asset-backed securities (ABSs[3]). These securities may be bought by ABS warehouses which specialize on trading ABSs. FVCs may also buy ABSs from ABS warehouses or other FVCs, and then resecuritize those issuing ABS CDOs. Finally, ABSs are held by a number of different institutions from investment funds to special purpose entities as structured investment vehicles. Funding the above activities is heterogeneous and depends greatly in the type of entity involved, but can be divided in two broad categories, micro-funding where funds come from end-savers and wholesale-funding, where funds come from collective investment institutions.

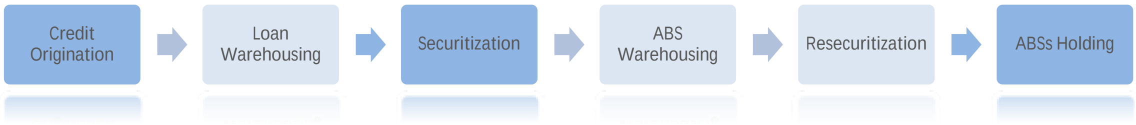

Figure 1. The originate-to-distribute credit intermediation process (Spanish main stages in darker blue)

Even when the originate-to-distribute model evolved from the traditional banking intermediation, banks do participate in this process at different stages. In addition, we have described this model as a series of stages, but not all these stages take place and some may be repeated several times. For example, a conduit could buy some loans originated by a bank and hold on to them. In this case the credit intermediation process would finish after two stages. However the conduit could sell them to a financial vehicle corporation (FVC) which issues ABSs which can then be multiple times resecuritized.

Shadow banking

The current financial crisis has driven much attention towards the credit intermediation developed off-banks' balance sheets. The term "shadow banking", coined by McCulley (2007), has been used to describe the miscellaneous activities involved in this process; however, no common definition has been drawn in the literature. Depending on the area of focus, several attempts have been proposed. Pozsar et al (2010) use a somehow narrow perspective of the concept. They consider shadow banking the credit intermediation activity that is not officially and explicitly enhanced. This is a sensible approach when one wants to focus on financial stability issues as they do. However it doesn't facilitate the international comparison of data as the enhancements greatly vary across nations. A more general approach is taken by Poschmann (2012) who identifies shadow banks with non-banks financial intermediaries in order to construct a typological framework to study the optimal size of the different types of financial intermediaries.

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2 Pozsar et al. (2010) describes in more detail these steps.

3 Here ABSs represent any securities issued in a securitization of first degree, where the assets securitized have not been previously securitized. Thus ABSs include residential and commercial mortgage-backed securities, consumer credit-backed securities, collateralized loan obligations, collateralized debt obligations (CDO) and synthetic CDO among others.

The traditional originate-to-hold and the more modern originate-to-distribute classify credit intermediation by how credit intermediation is performed. Along these lines, we define shadow banking as credit intermediation channeled through non-deposit taking institutions to explicitly separate credit intermediation by the entities involved. Also, notice that the originate-to-distribute model is not synonym of shadow banking; for instance, banks do participate in the former.

We have reached this definition by extending the main conceptual activity of banks to all other institutions, rather than focusing arbitrarily on a specific subsector of the economy. As a consequence, it includes a large area of the financial intermediation specter since most financial intermediaries perform some credit risk, maturity or liquidity transformation. Since there is no consensus on the definition of shadow banking, we will also provide a measure of a reduced shadow banking excluding the credit intermediation activity of investment funds, pension funds and insurance corporations, which is closer to the entities used to measure shadow banking in other studies.

Shadow banking in Spain

Spanish banks concentrate most credit intermediation in the form of traditional bank intermediation. Moreover, investment banking is integrated within commercial banks, thus capital requirements are applied to both activities jointly, reducing the size of shadow banking. Regarding shadow banking, the main activity in Spain is securitization, which is promoted and initiated by banks. The originate-to-distribute model is relatively small, both in terms of the funds channeled and the diversity of institutions and methods involved. Other sizable financial intermediaries are the issuers of preference shares; however we argue that they should not be accounted within the shadow banking system. Institutions of relative importance in other markets such as specialized credit institutions and money market funds (MMF) move a low volume of resources in Spain. Below, we discuss in more detail these elements of the shadow banking system.

Spanish securitization

Securitization is the major shadow banking activity in Spain with financial vehicle corporations (FVCs) carrying a balance sheet of 457 billion Euros by the end of 2011, but also a simple one in many aspects. More than 99% of securitized assets are originated by banks. Not only banks do originate those assets, but also initiate the securitization process. Two reasons justify this claim. First is that there are no conduits in Spain, or more generally, loan warehouses, which acquire assets from banks that in a posterior step securitize through a FVC. The second reason is that the assignor of assets to the FVC keeps the benefits (not the losses unless it is designed that way) from the securitization. In Spain FVCs are funds without legal personality. Thus, once the FVC’s debt is serviced, the remaining value is transferred to the assignor. This also explains why the assets transferred to the FVCs are not necessarily priced at market value, but are often sold at their nominal value. Moreover, the assignor will receive the positive value between the collections from the securitized assets and the ABSs during the life of the ABSs and not just when they mature.

FVCs finance the purchase of the assets by issuing securities. Figures 2 and 3 below depict the structure of the FVCs assets and liabilities where we can see that the securities issued cover the securitized assets, both the securitized loans and covered bonds, as well as other minor assets securitized. Both the Spanish flow of funds and other monetary statistics record the financial instrument by original maturity. Therefore, no analysis on the maturity mismatch between the assets and the securities issued can be performed using these statistics. However, a study of the FVCs original prospectus, on the other hand, shows that this is the case. Typically, along with the assets transferred to the FVC, the bank will concede a subordinated loan of 5% to 10% of the assets transferred that the FVC deposits to cover the first losses from the assets, securing the ABSs. Finally, FVC smoothes payments to investor by removing the fluctuations in its collections using interest rate swaps, normally contracted with the banks transferring the assets.

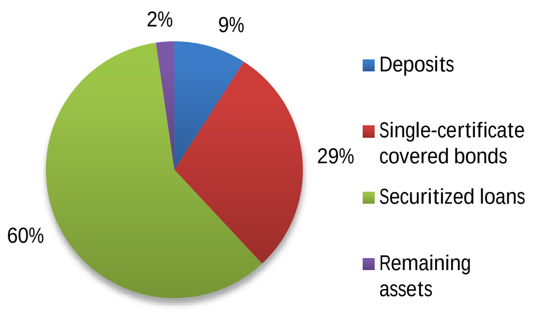

Figure 2: Assets of Spanish FVCs, 2011.
Source: Banco de España

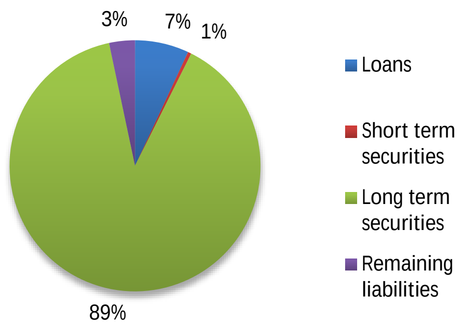

Figure 3: Liabilities of Spanish FVCs, 2011.
Source: Banco de España

FVCs securitize two main assets: loans originated by banks and single-certificate covered bonds issued by banks, both transferred directly from the banks. The Spanish flow of funds registers these transactions in a particular way. Due to regulatory requirements meant to identify banks' risks more accurately, Spanish banks cannot derecognize loans unless they do not keep any residual risk (e.g. as when they hold a subordinated loan in a securitization). By the end of 2011, 91% of loans securitized were not derecognized, amounting for 224 billion Euros. In this case, the transaction is recorded in the banks' balance sheets as an increase in the banks' deposits reflecting the payment received for the loans, but not as a decrease in the loans held by banks, rather as an increase in the banks' liabilities in the form of deposits, which are held by the FVCs. These single-certificate covered bonds issued by banks have typical nominal value of several million Euros and even when they are assigned an ISIN, they are recorded as deposits because their negotiability is very restricted in practice and because they are registered, no bearer instruments.

Securitization in Spain grew very rapidly from the mid-nineties until 2009. At an average growth rate of 58%, it reached its peak with 472 billion Euros in June 2009 as depicted in figure 4. During this development, Spanish securitization remained simple. Both synthetic securitization and resecuritization were negligible, as the securitization of other complex assets. On the other hand, Spanish straightforward CDOs, mostly backed by single-certificate covered bonds issued with the sole purpose of being securitized, took a large share of the ABSs market. After attaining a maximum, the level of redemptions surpassed the issues which at these rates will stabilize the outstanding amount of ABSs around 310 billion by 2014. However, this estimate depends on current trends which are closely related to banks' liquidity necessities, and may change during current events.

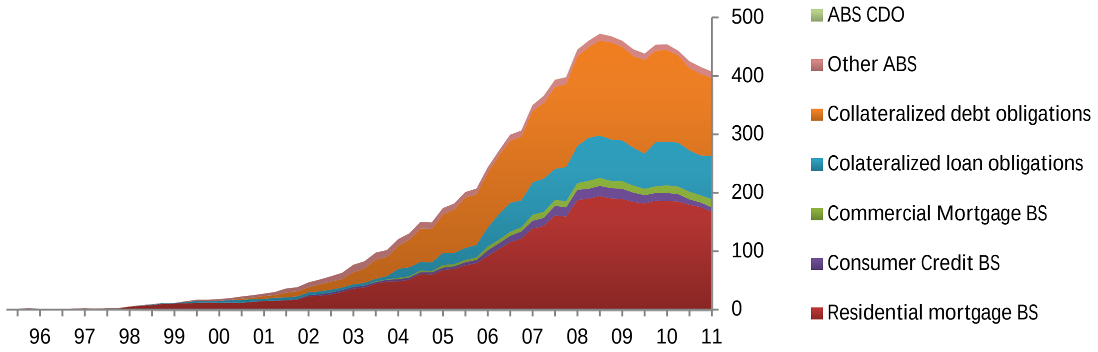

Figure 4: ABSs at nominal values (billion of Euros)
Source: Banco de España

The Spanish flow of funds does not provide detail on the institutions holding FVCs' issues. Although we couldn't obtain a time series for these data, we estimated the structure of the ABS holders by the end of 2011 as shown in figure 5. With more than 90% of the market in the banks' and rest of the world's portfolios, no relevant maturity mismatch is added to the Spanish financial system, as banks already run on a maturity mismatch balance sheet. As a corollary, both hedge funds and money market funds have little relevance in the Spanish securitization process, contrary to more complex and market oriented financial systems. Although no precise data is available for the holders of ABSs using the flow of funds, this does provide historical data for the holdings of debt issued by other financial institutions, which in conjunction with data from the other financial institutions, other than the FVCs, we can conclude that from the beginning of the financial crisis in mid-2007 and until the peak in the securitization market in mid-2009, banks bought about 200 billion Euros of ABSs to obtain liquidity from the Eurosystem. Of these 200 billion Euros, about 30 came from the rest of the world, as they divested the ABSs, while the rest came from new securitizations promoted by banks as international markets dried up.

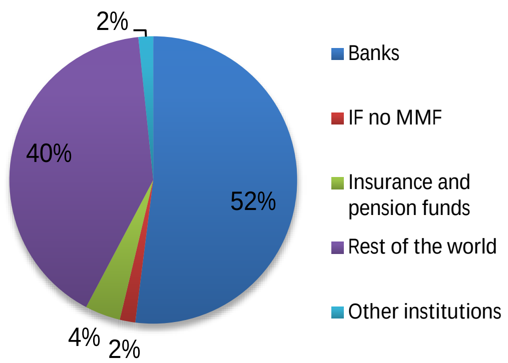

Figure 5: Holders of ABS, 2011.
Source: Banco de España

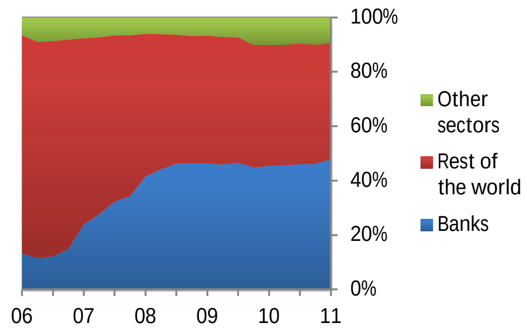

Figure 6: Holders of ABS.
Source: Banco de España

Other shadow banking institutions

Regulatory arbitrage has become a relevant issue for the structure of financial intermediaries. As of 2003, the service of preference shares[4] issued by a resident subsidiary is deductible from corporate taxes. Moreover, in Basel I and II preference shares can be computed as Tier I Capital. As a result, both banks and non-financial corporations have created a set of subsidiaries which by the end of 2011 had issued 152 billion Euros of preference shares, of which 101 came from bank subsidiaries. Issuers of preference shares' business is fairly simple. They issue preference shares and deposit the proceeds in or lend the proceeds to the parent company, which pays the service of the securities. As they do not provide any financial service other than tax deductibility, we argue that these institutions should be consolidated within the parent companies for the purpose of this paper, reducing the size of the shadow banking system.

As it is crucial to assess the activity of the most relevant entities in the Spanish shadow banking, it is also important to discuss the role of those entities which have a minor role in the system. In other economic areas, structured investment vehicles (SIVs), MMF, hedge funds and private equity firms have had a significant role, but their relevance in the Spanish economy has been small. SIVs profit from the spread between the interest rate of long term ABSs, and the rate for the short term funding they obtain issuing commercial paper or selling repos. However, SIVs were never profitable for Spanish banks. The Bank of Spain required the SIVs to be consolidated in the group, what in practice posted an 8 per cent capital charge against SIV assets. As SIVs never sprung up, the role that MMF had in other markets as a principal funding source for the SIVs did not materialize in Spain. Also, as FVCs matched the maturity of their ABSs with their securitized assets, the direct involvement of MMF funding securitizations was negligible. In general, the weight of these institutions in the financial system is small. After moving 58 billion Euros in 2004, nowadays they manage 8.

Specialized credit institutions cannot take deposits from the public, which is why their liabilities are not secured, and therefore, we have not included them within the SBS. However they are part of the monetary financial institutions as they do provide credit. Their operations are subject to an administrative regulatory regime overseen by the Bank of Spain similar to banks, especially in regard to minimum capital. They are mostly funded with deposits from other banks, and their weight in the securitization market is small with only 1.1 billion Euros securitized.

Finally, private equity firms and hedge funds, with 10 and 1 billion Euros respectively, are not relevant in the SBS. Moreover, private equity firms' strategy is to provide venture capital and since they are funded using capital, their impact on credit intermediation is almost null. Hedge funds on the other hand have no relevant weight either in the securitization market or the repo market.

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4 Preference shares are a hybrid financial instrument, with features both from debt securities and equity: the holders of preference shares receive a fixed interest; however this is conditional on the parent company having profits. The System of European Accounts establishes that preference shares should be recorded as debt securities because they do not provide for participation in the distribution of the residual value of a corporation on dissolution.

Measuring credit intermediation

The size of credit intermediation is the amount of funds channeled from final savers to final borrowers through financial institutions. Most works[5] use the size of the balance sheet of the financial institutions involved in the process as a proxy. However, this offers several issues. First, both banks and entities engaged in shadow banking, the shadow banking system (SBS), develop more activities than just credit intermediation. For instance, banks and other shadow banking institutions hold large equity portfolios. These assets should be taken into account and removed from the balance as we are specifically focusing on credit intermediation and not on capital investments.

Another problem is to count multiple times the same funds when we aggregate the balance sheets from different institutions. As funds are channeled from final savers to final borrowers, some financial institutions may hold positions on other financial institutions. As this happens, the liabilities of these institutions grow, whereas credit does not. Were we to estimate credit intermediation in such a situation, we would need to account for and correct this multiplicity. In our framework, this shows up when banks and shadow banks hold other banks and shadow banks liabilities respectively, and when banks and shadow banks position into each other. For instance, ABSs acquired by a FVC should not count as credit, since we are already counting as credit the funds that the FVC which issued the ABSs used to buy the assets backing the ABS. Similarly, all intra bank positions should be removed when accounting for bank credit intermediation. Finally, we correct by equal amounts both banks and shadow banks' balance sheet when they hold each other liabilities as they are participating by the same amount in the credit intermediation process, just at opposite ends.

Lastly, we commented before how the Spanish accounting rules for loans transferred but non-derecognized compel banks to keep the loans on the balance sheet and record a deposit for the institution receiving the assets. This procedure artificially elevates banks liabilities and has to be removed when measuring credit intermediation.

The size of Spanish credit intermediation and shadow banking

Spanish credit intermediation is mostly banking. With an overall credit intermediation of 2.87 trillion Euros by the end of 2011 (see figure 7), the shadow banking system channels only 23% of the funds, only 11% when we look at a reduced credit intermediation system without investment funds, pension funds and insurance corporations. The shadow banking system is concentrated around pension funds and insurance corporations (42%) and other financial intermediaries (36%), which nowadays can be confidently identified as FVCs. The remaining portion is mostly taken up by investment funds with a 16%, leaving 5% for the specialized credit institutions and MMF. As investment funds, pension funds and insurance corporations have a small relation with the reduced shadow banking system, the originate-to-distribute model excluding the banking activity can be safely associated with the reduced banking system which in turn can be linked with the FVCs, illustrating the simplicity of the Spanish originate-to-distribute system, both by the number of different entities involved as for its size.

Credit intermediation increased rapidly in the years previous to the financial crisis. From 2004 to 2007 banks and the reduced shadow banking system grew annually at an

[5] E.g. Pozsar et al (2010) and Bakk-Simon et al (2012).

impressive 21%. It is important to notice that the reduced credit intermediation system was not small. It had been growing at 10% annually in the previous ten years, why credit managed for these institutions by 2004 was already 1.4 trillion Euros, reaching in just three years 2.4 trillion. Of this increase, 86% can be accounted for the banks, even when the reduced shadow banking grew at larger rates. During those years, the investment funds, pension funds and insurance corporations grew steadily at 10% from 326 billion.

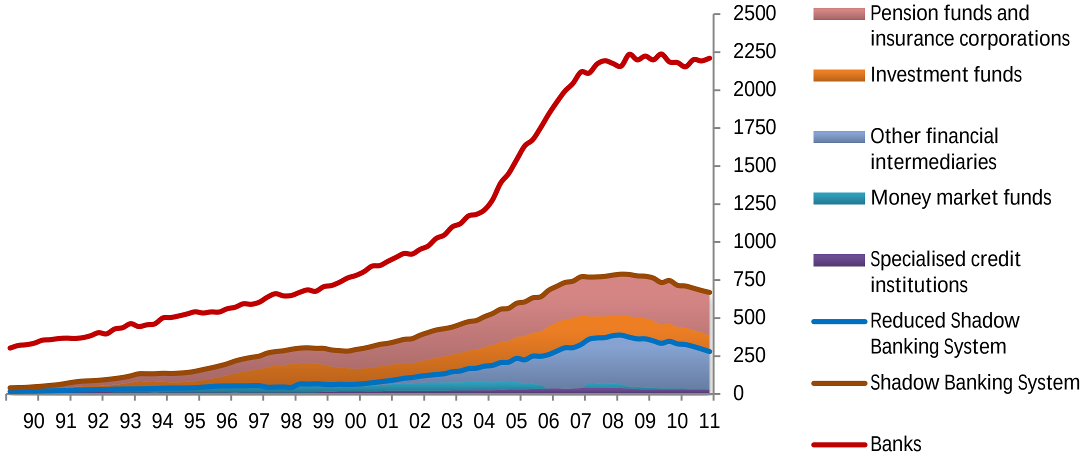

Figure 7: Credit intermediation by sector in Spain. (billion of Euros)
Source: Banco de España

Bakk-Simon et al (2012) analyze the size of credit intermediation at the european level. They use the total assets of the MFI sector minus Eurosystem assets and MMF shares issued by MFIs to account for the size of banks, while their meausure for the reduced shadow banking adds the assets of other financial intermediaries, money market fund shares issued by MFIs. Two mayor differences arise comparing their methodology to ours. In terms of entities, we have moved the special credit institutions from banks into the shadow banking system, and excluded the issuers of preference shares from the other financial intermediaries within the shadow banking. More importantly, we have removed several duplicities in the balance sheet of these sectors. In figure 8 we show how the two methodologies compare. Banking credit intermediation and reduced shadow banking are overestimated by 40% and 75% respectively in average during the last ten years, which for the latter has reached 136% by the end of 2011. The dynamics, on the other hand, are similarly captured; however the estimate à la Bakk-Simon et al for the reduced banking system shows an increase in shadow banking from 2004 until 2008 that should be explained by banks obtaining funds through preference shares and FVCs issuing secuerities for banks to discount in the Eurosystem.

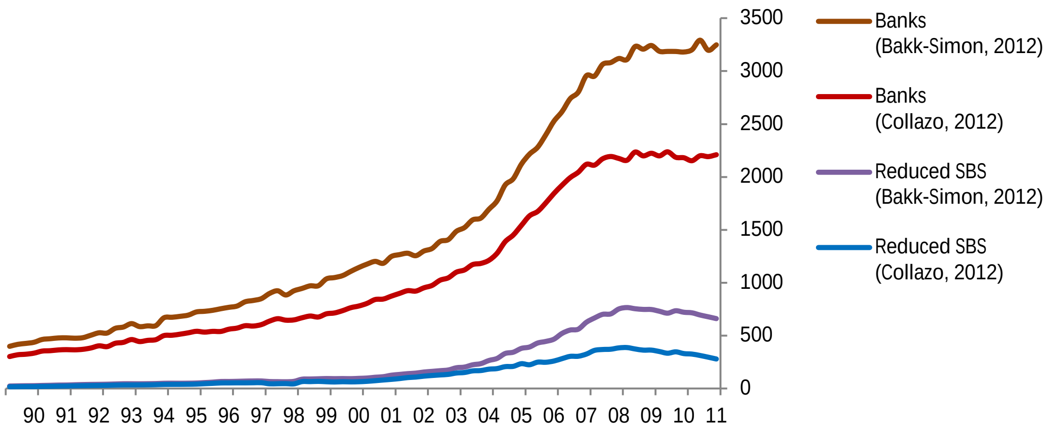

Figure 8: Credit intermediation in Spain. À la Bakk-Simon and à la Collazo (billion of Euros)
Source: Banco de España

Shadow banking is 39% as large as banks in Europe (Bakk-Simoon et al, 2012), a much lower figure than the 123% in USA (Pozsar et al, 2010), suggesting a less integrated and possibly more specialized financial system. Compared to that, shadow banking in Spain takes only 20% the size of spanish banks, a final indication of the minor relevance of shadow banking in Spain.

Conclusions

We found that bank and shadow bank credit intermediation is not well measured by aggregating the balance sheets of the institutions making up the sectors. Rather, several corrections must be taken into consideration primarily to avoid double counting.

Spanish credit intermediation is mostly performed by banks. As a result, shadow banking is small and simple in terms of funds managed and the typology of entities involved, compared to other regions. Moreover, when we exclude investment funds, pension funds and insurance corporations, the Spanish shadow banking system can be associated with the Spanish FVCs with little error. Credit intermediation in Spain grew rapidly in the years previous to the 2008-2009 financial crises. Even when the largest rates of growth came from FVCs, banks were responsible for most credit growth.

The institutions engaged in shadow banking are very heterogeneous and complex. Even if we can obtain a reliable aggregate figure of its size, we may still need to measure other important elements of credit intermediation. From a financial stability perspective, we could be interested on the maturity mismatch, uninsured funds, and financial leverage of the different entities in the SBS, for which different estimates are needed.[6] The Spanish flow of funds does not provide the necessary information to perform financial stability analysis, which requires further granularity in the classification of financial instruments (ABSs and a breakdown by remaining maturity) and financial intermediaries (FVCs, SIVs, conduits).

6 The Financial Stability Board (2011) discusses these issues.

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Monitoring shadow banking and its challenges: the Malaysian experience

Muhamad Amar Mohd Farid[1]

1.0 Introduction

The recent global financial crisis (GFC) in recent years was an eye-opening and defining moment for financial regulators around the world in two ways. First, the GFC has taught us that non-bank financial institutions (NBFIs), which existed in the early nineties to complement the traditional banking system, are a major source of systemic risk to the financial system through its significance as a source of credit and liquidity in the economy or its interconnectedness with the banking system. Second, the GFC shows the failure of regulators and market participants alike to fully understand and appreciate the strength of the amplifying mechanisms particularly those of the shadow banking system that exacerbated business and financial cycles in the financial system (Dudley, 2009).

Learning from the crisis, there have been increased efforts by policy makers around the globe to better understand the shadow banking system and to identify information needs to develop a robust monitoring framework. At the 2010 Seoul Summit, the G20 Leaders called for authorities to put greater focus on shadow banking and requested for the Financial Stability Board (FSB) to be the lead organization, along with other international bodies, in developing recommendations to strengthen the regulation and supervision of the shadow banking system by mid-2011 (FSB, 2011). The FSB has subsequently published a report with broad recommendations to strengthen the oversight and regulation of shadow banking in October 2011. In addition, other jurisdictions have also started to address the policy issues regarding shadow banking, including Malaysia.

While there have been steps forward, challenges abound to unravel the complexity and gain greater understanding of the shadow banking system. The FSB (2011), in its progress report on shadow banking, sets out with seven broad principles in monitoring the shadow banking system but stresses that the working groups on the shadow banking initiatives are in the process of finalizing the policy recommendations. The international setting body also highlights that the broad principles act as guidance for authorities in monitoring the shadow banking system and they are not exhaustive given the unique characteristics of the system varies across jurisdictions. This diversity has remains as the major challenge for authorities in conducting their surveillance on the shadow banking system.

This paper aims to shed some light towards greater understanding of the size and structure of the shadow banking system and its role in the Malaysian financial system. The paper is structured into four sections. The first section reviews the current literature on the shadow banking system. The second section provides a discussion on the shadow banking system in Malaysia. This includes the operational definition adopted by Bank Negara Malaysia (the central bank of Malaysia, BNM), estimated size of the system according to the definition and a brief overview of the components of the system. Given the structure and focus of the

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shadow banking system, the third section of the paper discusses an empirical analysis of the growth in financing by NBFIs to the household sector. Next, the paper looks at the current initiatives undertaken BNM in monitoring the developments in and assessing potential risk of the shadow banking system to the overall financial system stability and the challenges faced by BNM in exercising its surveillance routine on the shadow banking system.

2.0 Literature review

2.1 Overview of shadow banking

The term 'shadow banking' was first coined by Paul McCulley in which he defined the system as a 'levered-up financial intermediary whose liabilities are broadly perceived to be similar in money-goodness and liquidity as conventional bank deposits' (McCulley, 2008). It is worth to note that the term 'shadow banking' does not bring any connotation to it as is the case of 'shadow economy'. Pozsar et al. (2010) note that the term 'shadow banking' is in fact pejorative for such a large and important part of the financial system.

Similar to traditional banking, shadow banking may also be inherently unstable. This instability is particularly evident in the components of the United States (US) financial system, which was instrumental to the propagation of the GFC (Ricks, 2010). The instability of the shadow banking system is mainly attributable to the credit intermediation provided and facilitated by the institutions outside of the regular banking system, which typically rely on short-term funding from the markets (FSB, 2011). McCulley (2009) is among the first to discuss this channel of instability by establishing that shadow banking entities fund themselves with uninsured commercial paper, which may or may not be backstopped by liquidity lines from banking institutions. He further stresses that the short-term funding may render the shadow banking system vulnerable to runs, especially when commercial paper investors refuse to invest in new papers when their holdings mature, leaving the shadow banking entities with a liquidity crisis. Ultimately, the shadow banking entities are left with two choices to keep the entities afloat; either relying on credit lines from banking institutions or liquidation of assets at fire sale prices or both.

The FSB has also attempted at providing guidance on the definition of a shadow banking system. The shadow banking system, intentionally defined to be rather broad, encompasses 'a system of credit intermediation involving entities and activities in an environment where prudential requirements are not applied or applied to a materially lesser or different degree than those applied to the banking system'. Being the core business of the traditional banking system, participation of shadow banking entities in credit intermediation, which involves maturity, liquidity and credit transformation, can significantly reduce the cost of lending (Pozsar et al., 2010). The reduction of cost of lending via credit intermediation is a contributing factor that explains the significant growth of the shadow banking system in the US prior to the GFC.

The complexity of the shadow banking system warrants authorities to cast their net of macroprudential surveillance wide in order to capture entities or activities involved in credit intermediation outside the regulated banking system. Although it is beneficial for authorities to monitor the shadow banking system from a macroprudential perspective, it may not be necessarily helpful if the authorities are unable to focus on specific activities or components of the shadow banking system that are likely to emit and transmit risks to the financial system. Recognising the complexity, the FSB has urged authorities to narrow their focus on activities that give rise to either or both systemic risk concerns and regulatory arbitrage concerns[2]. Regulatory arbitrage is another contributing factor that drove the growth of shadow banking. Regulatory arbitrage enables less-regulated shadow banking entities to offer financial products at prices that are cost-inefficient if offered by the regulated banking institutions.

Bakk-Simon et al. (2012) of the European Central Bank (ECB) provides an overview of the shadow banking system in the Euro area. The size of the shadow banking system in the Euro area is relatively smaller in comparison to that of the US, representing less than half of the total assets of the banking sector. Key components of the shadow banking system were studied in this paper. Similar to the US, the shadow banking system in Europe is diverse across countries, reflecting differences in legal and regulatory structure. Securitisation issuance is smaller in volume and remains less developed than in the US. Money market funds (MMFs) in the European countries are almost the same size as MMFs in the US although the former is more heterogeneous. Meanwhile, the repo market is a key source of funding in both the US and Europe. The study also highlights the increase in Euro banks' reliance on funding from the financial sector, with the bulk of the financing originate from other financial institutions (OFIs) that includes shadow banking entities. The OFIs are the main driver of the overall increase in banks' leverage before the crisis.

While there are scores of analytical literature on the role and development of NBFIs in the US before and after the GFC, similar study on NBFIs in Asia is scarce. A study by Shrestha (2007) is among the few that discusses the role of NBFIs in Asia and provides insights on the diversity of the NBFIs in selected South East Asian Central Banks (SEACEN) countries.[3] The study does not deliberate on shadow banking issues as currently debated globally. Instead, it focuses on the developments of NBFIs and their role in the transmission mechanism of monetary policy and financial system. However, no clear distinction between banks and NBFIs is made due to the different approaches adopted in defining the non-bank financial intermediation system across the countries surveyed. The provisions of credit and other financial services to sections of the population that are normally not served by the banks range from 1% to 27% of the countries' financial system. These institutions also facilitate the growth of selected economic sectors, such as real estate and agriculture through the provision of specialised services. Disbursement by NBFIs in South Korea, Malaysia, Singapore and Taiwan has seen a declining trend for the period between 1995 and 2005. In terms of assets, the market share of NBFIs in Brunei Darussalam, Indonesia, South Korea and Nepal have shown positive growth in the last decade prior to 2005 while the share of NBFIs in Malaysia, Philippines, Singapore and Thailand have shown gradual decline. The evidence led the author to conclude that the NBFIs should be promoted formally in the financial system and the oversight imposed on these entities should not lead to diminished capacity of their intermediary functions.

The size of the shadow banking in Asia, in general, is relatively smaller in comparison to the regulated banking sector.[4] Authorised deposit-taking banking institutions remain the major component of the financial system in most economies in the region (see Chart 1 in Annex).[5] Markets in Asia are also generally less complex. While securitisation has notable presence in

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[2] Systemic risk concerns may arise from maturity and liquidity transformation activities, leverage and flawed credit risk transfer between banks and shadow banking entities. Regulatory arbitrage concerns, on the other hand, arise when shadow banking entities engage in activities that are capable of circumventing banking regulations (FSB, 2011).

[3] The sample countries include Indonesia, Brunei Darussalam, South Korea, Malaysia, Nepal, Philippines, Singapore, Sri Lanka, Taiwan and Thailand.

[4] Source: various national authorities' websites.

[5] Based on estimates on the size of the shadow banking system in selected Asia-Pacific countries, namely Australia, People's Republic of China, India, Thailand and Japan. See Chart 1 in Annex for details.

a few Asian markets such as Japan, Australia and Malaysia, such activity remains almost non-existent in other Asian economies. Pension funds and insurance companies account for a large portion of assets in the shadow banking system while the remaining components are very much diversified, ranging from traditional lending to fund management. Shadow banking activities in Asia remain predominantly the traditional provision of finance in the form of lending to certain segments of the economy, reflecting the less-complex nature of the shadow banking system in this region.

2.2 Data on shadow banking system

Coverage of the shadow banking system is critical to facilitate the understanding of the presence of maturity transformation, leverage and the possible channels for systemic contagion to the overall financial system. The lack of data capture for the shadow banking system also poses challenges for effective formulation of appropriate regulatory measures to contain systemic risk.

In the speech 'Macroprudential Surveillance and Statistical Challenges' delivered by Dr. Andreas Dombret, Member of the Executive Board of the Deutsche Bundesbank, at the Sixth European Central Bank Statistics Conference 2012, two aspects with regard to shadow banking are highlighted that are imperative for macroprudential surveillance exercises. First is the need to put data gap issue at the top of regulators' agenda. In this aspect, shadow banking and insurance are particularly challenging from a statistical point of view. Second is the lack of consensus on the operational definition of the shadow banking system and oftentimes, the classification of the entities is left to the discretion of journalists. This has become a concrete reason for Europe to have its own international business register for shadow banking entities. To address these challenges, Dombret (2012) proposes for central banks to be given the mandate to collect data from both banks and shadow banking entities and for Europe to have its own international business register for shadow banking entities. There has been progress made on these fronts. The ECB is enhancing its act to facilitate comprehensive data capture and establishing inter-agency cooperation with the Bank of International Settlements (BIS) in terms of data collection (Bakk-Simon et. al, 2012).

Shrestha (2007) also highlights the difficulty in obtaining granular data in his study. Furthermore, the data on NBFIs are inconsistent with the data on banking institutions particularly in terms of frequencies, resulting in difficulties in making comparisons between banks and NBFIs.

Given the complexity of the shadow banking system and geo-economic differences in each jurisdiction, there is no standard definition that is applicable across all jurisdictions while the broad definition crafted by the FSB merely acts as a guiding principle. Data availability remains a major challenge, which impedes the effectiveness of surveillance on the shadow banking system (Shrestha, 2007; Dombret, 2012; Bakk-Simon et. al, 2012). Notably, there is little analytical study done on shadow banking in Asia as compared to the growing trend of such study in the US. This paper attempts to contribute to the discussions on understanding the size of the shadow banking system and the challenges faced in monitoring the development of the system.

3.0 Overview of the shadow banking system in Malaysia

In Malaysia, shadow banking is defined as a 'system of credit intermediation that involves entities and activities outside BNM's regulatory capture'. Based on this definition, the Malaysian shadow banking system comprises non-bank entities that engage in (i) loan origination, (ii) purchase of debt securities, (iii) securitisation, (iv) credit guarantee or enhancement exercises and (v) credit rating or scoring activities (*Chart 2*), which account for approximately 93% of GDP.[6]

Similar to the structure of the shadow banking system in Asia, the shadow banking system in Malaysia is relatively less complex and smaller than the banking system. Table 1 indicates the size of NBFIs in Malaysia in comparison with the banking institutions. The data used to measure the size of these entities were obtained through the annual Sources and Uses of Funds survey undertaken by BNM, which has been the central bank's approach in monitoring NBFIs since the early 1990s. The market share of assets held by NBFIs has shown gradual increment in the past decade, with 27% of total assets in the financial system in 2000, rising to 28% in 2010. Unit trust funds recorded the highest growth at 14.8% in the observed period, indicating an increase in wealth accumulation activities by the household sector. The gradual growth of the Malaysian shadow banking system reflects the increase in the complementary role assumed by NBFIs in deepening the Malaysian financial system. On the other hand, banks' assets market share remains above 50% every year, reflecting the position of the banking institutions as the backbone of the Malaysian financial system. In addition, credit intermediated by banks accounted for 61% of total credit intermediated in 2011 while the remaining was dispersed among various NBFIs.[7] The following summarises the key observations of the main components of the shadow banking system in Malaysia, which include (i) provident and pension funds, (ii) unit trust funds, (iii) securitisation activities and (iv) other non-bank credit providers.

Table 1

Assets of Banks and NBFIs in Malaysia

Institutions	2000 (RM billion)	Share (%)	2005 (RM billion)	Share (%)	2010 (RM billion)	Share (%)	CAGR[3]
Banks	699.5	63.8	958.5	59.2	1,549.8	58.5	8.3
NBFIs	301.0	27.0	456.4	28.2	735.1	27.7	10.2
Unit Trust Funds	*32.6*	*2.9*	*57.5*	*3.5*	*130.1*	*4.9*	*14.8*
Co-operative Societies	*12.3*	*1.1*	*34.5*	*2.1*	*15.1*	*0.6*	*2.1*
Provident and Pension Funds	*216.9*	*19.5*	*319.4*	*19.7*	*548.3*	*20.7*	*9.7*
Other NBFIs[1]	*39.1*	*3.5*	*45.0*	*2.8*	*41.6*	*1.6*	*0.6*
Total Assets of Financial System[2]	1,114.3	100.0	1,618.5	100.0	2,650.7	100.0	9.0

Source: BNM

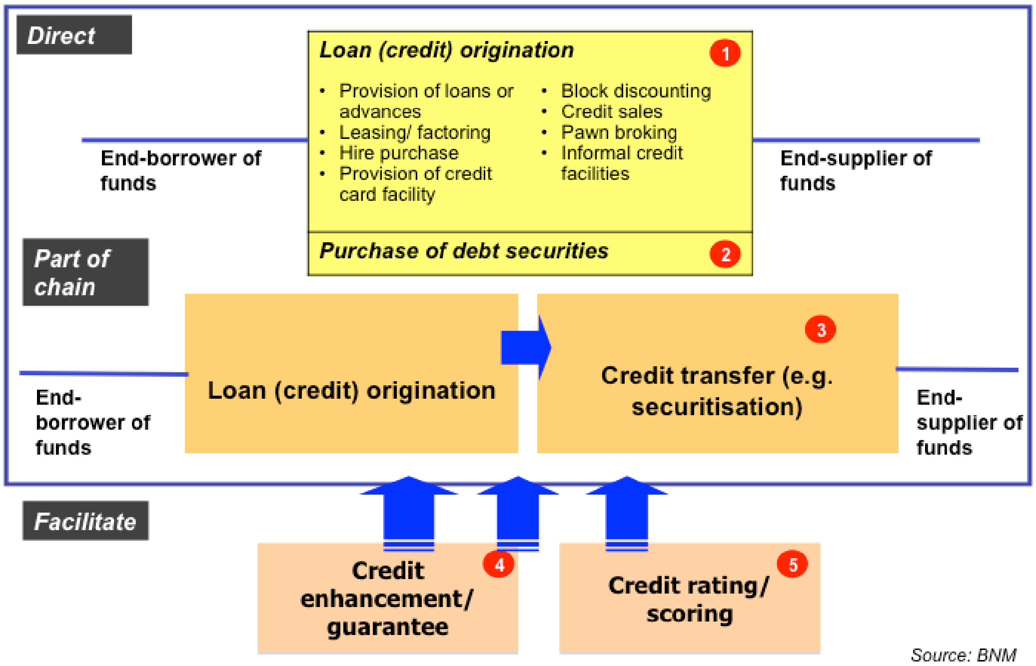
Note:

[1] Other NBFIs comprise leasing companies, factoring companies, Cagamas, and major non-bank credit providers. [2] Total assets of the Malaysian financial system include assets of banks, insurance, development financial institutions (DFIs) and NBFIs [3] Compounded annual growth rate, 2000-2010

6 Size based on the first four shadow banking activities as a percentage of 2011 Gross Domestic Product (GDP).

7 See BNM's *Financial Stability and Payment Systems Report 2011, White Box Article: Non-bank Intermediaries in Malaysia.*

Chart 2: Credit intermediation by non-banks in Malaysia

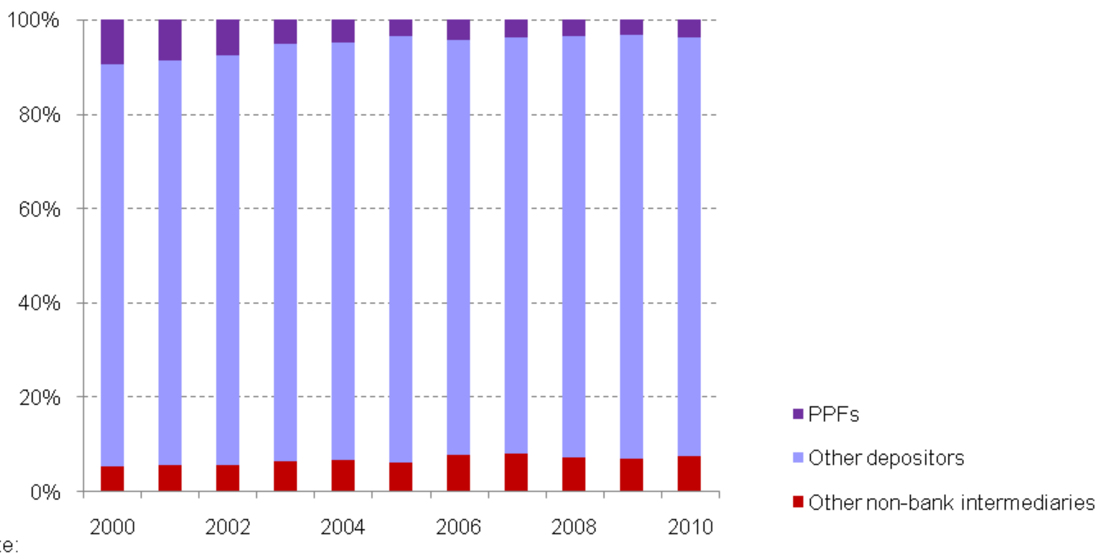


Source: BNM

3.1 Provident and pension funds

Provident and pension funds (PPFs) are the largest component of the Malaysian shadow banking system, accounting for 41% of total assets of NBFIs in Malaysia and 18% of total financial system assets as at end-2010. PPFs in Malaysia are a major provider of liquidity in the financial system, particularly to the banking institutions through their deposit placements. Despite the continuous growth of deposits in the banking system, Chart 3 shows that the deposits by PPFs started to moderate on the brink of the GFC in 2006 while the deposits by other NBFIs only began to grow at a slower pace during the crisis.

Chart 3: Deposits with banks



Note:
i) Other depositors include banking institutions, individuals and corporate

ii) Other non-bank intermediaries include unit trust funds, DFIs, co-operative societies, leasing and factoring companies, credit companies and securitsation company

Source: BNM, author's estimate

A simple regression analysis was conducted to determine whether a mass withdrawal of deposits by NBFIs and PPFs in particular have significant impact on the liquidity in the banking system. Chart 3 suggests that the impact will be minimal if such a situation occurs. There is also a concern that the deposit withdrawal by NBFIs would affect the liquidity standards under the Basel III requirement.[8] In particular, deposits by PPFs, which are made up mainly of households' contributions, would be subjected to severe withdrawal assumptions (or "run-off" rates) under the new liquidity standard. The assumptions, however, do not take into consideration the underlying liquidity risk profile of the NBFIs' deposits. To assess the validity of these assumptions, a simple regression of the total deposits against its components was estimated. The following OLS was estimated:

$$\begin{aligned} log(TotalDep)_t &= c + \beta_1 log(DepBank\&DFI)_t + \beta_2 log(DepIns)_t + \beta_3 log(DepPPF)_t \\ &+ \beta_4 log(DepTrust)_t + \beta_5 log(DepCoop)_t + \beta_6 log(DepOtherNBFI)_t \\ &+ \beta_7 log(DepHH\&Corp)_t + \beta_8 log(GDP)_t + \varepsilon_t , \qquad \varepsilon_t \sim N(0,1) \end{aligned}$$

Where

$log(TotalDep)_t$	= log of total deposits in the banking system
c	= constant
$\beta_1 log(DepBank\&DFI)_t$	= log of deposits by banks and DFIs
$\beta_2 log(DepIns)_t$	= log of deposits by insurance companies
$\beta_3 log(DepPPF)_t$	= log of deposits by PPFs
$\beta_4 log(DepTrust)_t$	= log of deposits by unit trust funds
$\beta_5 log(DepCoop)_t$	= log of deposits by co-operative societies
$\beta_6 log(DepOtherNBFI)_t$	= log of deposits by other NBFIs
$\beta_7 log(DepHH\&Corp)_t$	= log of deposits by households and corporations
$\beta_8 log(GDP)_t$	= log of nominal GDP
ε_t	= error term

The result of the OLS in Table 2 provides suggestive evidence that deposits by NBFIs do not explain the movement of total deposits in the banking system over time as compared to deposits by the households, corporate sectors, banks and DFIs. This suggests that an extremely large withdrawal by the PPFs may not pose a significant concern to the banks when the new liquidity requirements under Basel III take effect.

[8] See *"Basel III: International framework for liquidity risk measurement, standards and monitoring".* (BIS, 2010)

Table 2

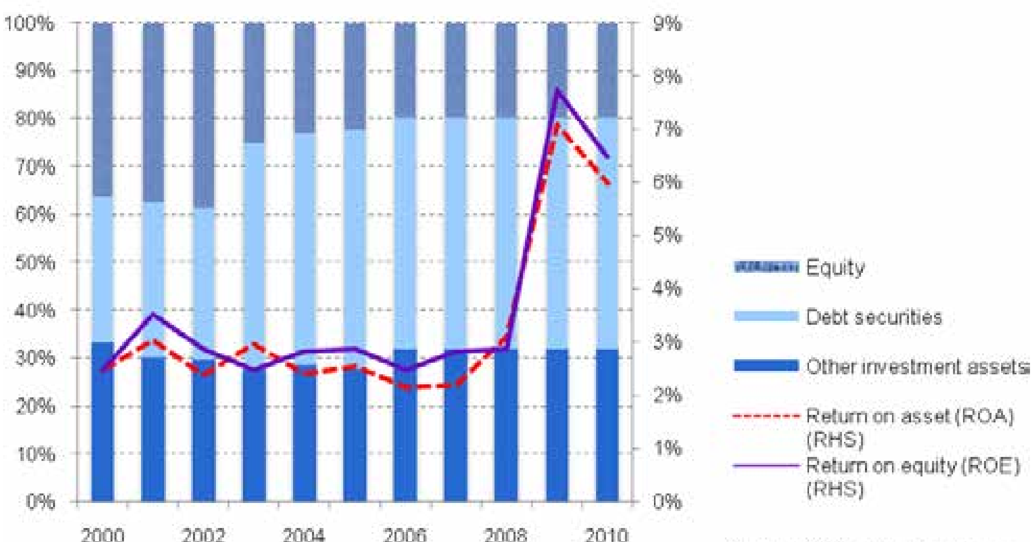
OLS for Deposits by Banks and NBFIs in the Banking System

Explanatory Variables	t-Statistic
Log of deposits by banks and DFI	3.2258*
	(0.2424)
Log of deposits by insurance companies	0.5867
	(0.3004)
Log of deposits by PPF	1.5395
	(0.0481)
Log of deposits by unit trust funds	1.4988
	(0.0305)
Log of deposits by co-operative societies	0.6207
	(0.0041)
Log of deposits by other NBFIs	0.4083
	(0.0026)
Log of deposits by households and corporation	5.0512*
	(0.5271)
Log of nominal GDP	0.0629
	(0.0042)
Adjusted R-squared	0.8966
Durbin-Watson statistic	1.3349
Number of observations	12

Notes: (1) Figures inside parenthesis are the coefficients of the corresponding statistic
*(2) * Significant at 5% level of significance*

PPFs also play a significant role in providing liquidity in the domestic capital and bond markets with the Employee Provident Fund (EPF) and Retirement Fund Incorporation (KWAP) being the most significant players. The asset composition of PPFs has been stable over time since 2003, with investments in debt securities accounted for more than 40% of total assets on average, followed by equity holdings at 16% on average (Chart 4). This is in line with one of the main objectives of PPFs, which is to generate sustainable income in the long run.

Chart 4: PPF asset composition

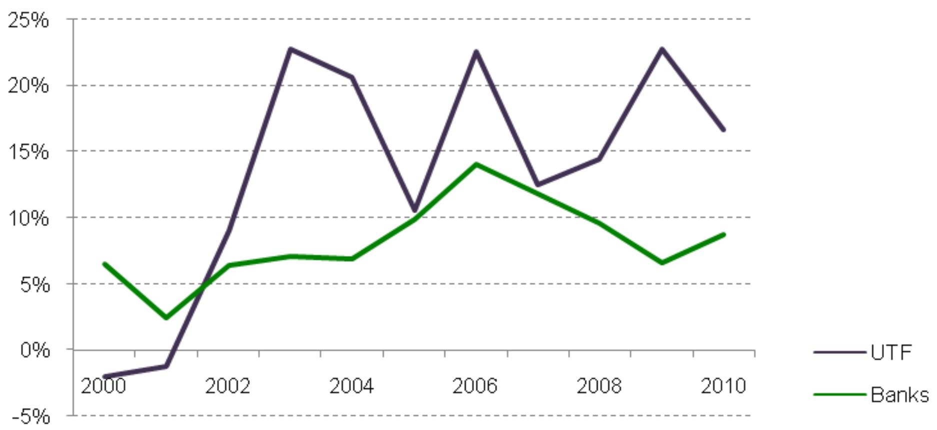


Source: BNM, author's estimate

3.2 Unit trust funds

The unit trust funds (UTFs) industry in Malaysia has grown significantly over the years (Chart 5). This growth was attributed to several factors including the role of the UTFs as an avenue for household to accumulate wealth, the generally high savings level in Malaysia and the introduction of a scheme by the EPF, which allows members to withdraw their funds to invest in UTFs. It is also worth to note that UTFs in Malaysia are not akin to MMFs in the US although both funds are subsets of mutual funds. MMFs are usually funds that invest in high quality and low duration fixed income instruments such as commercial paper and the US Treasury Bill, which are not prevalent in Malaysia. Therefore, UTFs do not transmit the same kind of shocks to the financial system as the MMFs in the US.

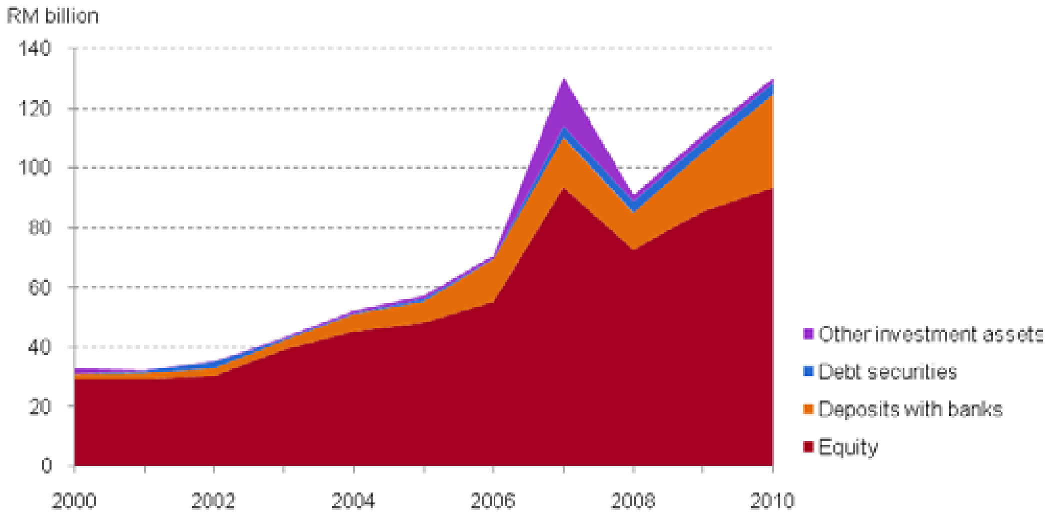
Chart 5: Asset Growth of UTFs *vs.* Banks



Source: BNM, author's estimate

UTFs in Malaysia are heterogeneous, comprising variable and fixed net asset value (NAV) funds. Unlike UTFs, MMFs in the US are homogenous where these funds are required to maintain a fixed NAV at USD1 akin to bank deposits. UTFs in Malaysia are also a major provider of liquidity to the financial system through their deposit placements in the banking system and significant holdings of securities in the capital market. Chart 6 shows that the investment assets of UTFs in Malaysia peaked at the beginning of the GFC and fell sharply in the following year at the height of the crisis. The decline in asset value was due to the decline in asset prices amidst global market volatility. Nevertheless, the impact of the crisis on Malaysian UTFs was short-lived as investments regained momentum in 2009.

Chart 6: Asset Composition of UTFs



Source: BNM, author's estimate

3.3 Securitisation activities

The progressiveness of the Malaysian financial markets over time has spurred innovations for sophisticated instruments such as asset securitisation to meet growing financing needs. While Malaysia is among the few countries in Asia that has some presence of securitisation activities, mainly due to the government's concerted efforts in transforming Malaysia from an unknown bond market to the largest bond market in South East Asia over the past two decades, asset securitisation only accounts for a small share of credit intermediation by NBFIs. The low reliance on securitisation in Malaysia, given the ample liquidity environment and well-capitalised banking system, resulted in securitisation activities to continue to remain small. Cagamas MBS Berhad, a subsidiary of the national mortgage corporation Cagamas Berhad,[9] is the major issuer of asset-backed securities (ABS) in Malaysia. The ABS issued by Cagamas MBS Berhad is currently backed by the Treasury housing loans, which makes it safer than privately issued ABS. The Treasury housing loans are provided only to Government employees and are based on repayment at source (i.e. monthly salary deduction).

3.4 Other non-bank credit providers

Within the Malaysian shadow banking system, other non-bank credit providers account for a sizeable share of credit extension to households. These credit providers include credit co-operative societies, building societies, money lenders, pawnbrokers, factoring and leasing companies. These "shadow" credit providers exist mainly to serve certain sections of the population. Generally, this segment of population comprises borrowers in the middle- and lower-income groups who usually reach for non-bank credit providers for personal financing

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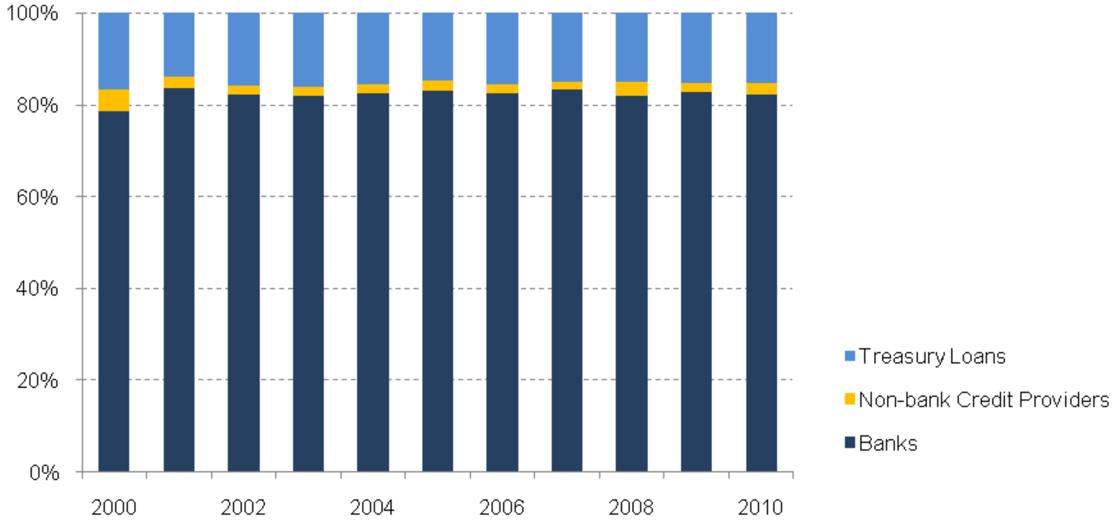
9 Cagamas is majority-owned by banks while BNM has a representative sitting on its Board. More information on Cagamas can be found at http://www.cagamas.com.my

or to finance their small businesses. These institutions continue to be the major provider of personal financing to households, which collectively accounts for approximately 60% of outstanding personal financing to household in 2011 (BNM, 2011). However, in terms of financing to the household sector, which include personal financing, property financing and credit cards, the market share of non-bank credit providers remains small as compared to the market share of financing extended by banks, accounting for approximately 2% of total financing extended to household (Chart 7).

Chart 7: Sources of Funding to Household



Source: BNM, author's estimate

Another salient feature of shadow banking in Malaysia is most activities and entities are subject to certain oversight by various authorities. This shows the stark contrast between the shadow banking system and shadow economy whereby the latter operates as a channel for "underground" transactions beyond the parameter of the formal markets established by jurisdictions, which is not necessarily the case for shadow banking especially in Malaysia. UTFs, securitisation entities, as well as credit rating agencies are subject to oversight by the Securities Commission Malaysia (SC). PPFs such as EPF and KWAP, meanwhile, are governed by their specific legislations and monitored by the Ministry of Finance while private pension funds, which are relatively new in Malaysia, are under the oversight of the SC. The Malaysia Co-operative Societies Commission is the authority responsible for the progress of the co-operative societies' movements in Malaysia.

4.0 Empirical analysis on financing by non-bank credit providers

Shadow banking entities in Malaysia complement the banking system through provision of financial services to specific segments in the economy. In some Asian countries including Malaysia, the emergence of these non-bank credit providers and shadow banking entities in general is the outcome of deliberate policies by the government of the respective country to serve the financial and other supportive needs of specific sectors of the economy (Shrestha, 2007). Non-bank credit providers in Malaysia, which include co-operative societies, building societies and other institutions, are the key providers of personal financing (BNM, 2011). However, in terms total financing to households, banks remain the major provider of credit followed by the Treasury particular for financing the purchase of properties and cars.

Recognising the increasing role of non-bank credit providers in providing credit to households over time, this section of the paper attempts to study further the factors that contribute towards the financing behaviour of these institutions.

4.1 Empirical background on financing by non-bank financial institutions

Carmichael & Pomerleano (2002) examine the factors that drive the growth of NBFIs in both developed and emerging markets. In developed markets, the growth of NBFIs is mainly driven by the benefits that accrue to specialisation while in the emerging markets, they often play a broader role in deepening financial markets and overcoming legal and regulatory shortcomings. However, the recent financial crisis has shown that regulatory arbitrage has been the main factor that drives the growth of NBFIs in developed markets (Pozsar et al., 2010). Lax, ineffective or non-existent financial regulation may lead to excessive risk taking by both financial institutions and investors (Liang & Reichert, 2012). Acharya et al. (2011) and Plantin (2012) argue that many shadow-banking arrangements preceding the recent financial crisis aim at bypassing bank capital requirements, thereby achieving a higher leverage than that permitted by prudential regulation.

The main competitors for banks and insurance companies in the real estate markets have been specialised NBFIs, such as savings and loans associations, mortgage banks and credit societies. In their study, Carmichael & Pomerleano (2002) find that the dominant factor behind the overall growth of the real estate finance market has been demographic patterns. The demand for new residential housing follows the growth of population and wealth of which are accompanied by an increase in urbanisation and housing investment.

Regulatory arbitrage also contributes significantly to the level of competition in the real estate markets. Carmichael & Pomerleano (2002) cite heavily the experience in Australia, which shows that finance companies and building societies are competing against banks and insurance companies in providing mortgage lending. The effect of differing regulatory framework on the behaviour of these financial entities was more pronounced in the 1970s where bank lending rates were capped and inflation was rising sharply. In this environment, Carmichael & Pomerleano (2002) note that NBFIs' specialising in real estate financing found it attractive to bid away depositors from banks and offer mortgages at unregulated interest rates, which had won them the largest market share in residential housing lending. The evidence led Carmichael & Pomerleano (2002) to conclude that the growth of NBFIs that is driven by regulatory arbitrage is potentially dangerous for systemic stability and costly in terms of financial failure.

Endut & Toh (2009) drew attention to the role of non-bank credit lenders in Malaysia in the provision of credit to the household sector. Non-bank credit providers such as DFIs have grown in prominence in the provision of credit to this segment of the economy. Nonetheless, the banking system, with its extensive branch network and increasingly flexible financing packages, remains the largest provider of household credit in Malaysia. The banking system acts as the main mobiliser of funds in the Malaysian economy and has been able to meet the increasing demand for credit arising from the growth in household asset accumulation. In the provision of credit to household, Endut & Toh (2009) identified macroeconomic stability, financial sector development and government policies as important in influencing the supply and demand of mortgages and other household credit. Sustained economic growth in Malaysia for the period between 2000 and 2007 has raised household incomes and boosted consumer confidence, which in turn, has induced optimistic expectations of future income. Low inflation rate and low interest rate environment have helped to reduce the cost of borrowing, which have increased the incentive for household to borrow. The emergence of a more diversified and competitive banking system has resulted in downward pressure on interest rates, expanded credit coverage and increased loan amounts. Meanwhile, the existence of Cagamas, which purchases mortgage loans from originators such as banks and other financial institutions, have helped the Government to promote home ownership among households.

Recent developments have shown that nonbank lenders continue to grow despite the persistent economic turbulence, as well as the role these entities have played in the propagation of risks in the recent GFC. In Australia, nonbank lenders remain a major provider of housing loans with their share in the refinancing market increasing from 21% to 28% by the end of 2011 (Australian Associated Press, January 2012). Low interest rate environment, a ban on loan exit fees and demographic factor were cited to be the drivers of the growth of nonbank lenders (Australian Associated Press, January 2012; The Sydney Morning Herald, June 2012). Meanwhile, nonbank lenders in the US are trying to solidify their presence in the mortgage market, which was adversely affected by the recent financial crisis, through lobbying to policymakers and offering loans with attractive rates to middle income earners (New York Times, March 2012). In the United Kingdom (UK), stricter credit underwriting by banks and government supportive policy have created a new push for alternative financing such as peer-to-peer financing and asset leasing for small and medium enterprises (SMEs), as well as financing from community finance institutions (Financial Times, April 2012).

4.2 Methodology

To explain the lending behaviour of NBFIs to the household sector, this paper uses a simple regression analysis on the determinants that have been identified in the literature as follows:

- The growth rate of financing to households by non-bank credit lenders[10]
- The inverse of the growth rate of total financing approved by banks
- The growth rate of nominal GDP

Data availability remains the biggest challenge in conducting empirical research on non-bank credit providers in Malaysia. Data collection is done on an annual basis hence only annual data are available. This has restricted the period coverage of this study to 2001 2010.

Variables that can be used to explain the financing disbursement include the average return on assets (ROA), average cost-income ratio and average capital ratio over estimation period to measure the growth in assets as applied in other studies (Barron et al., 1994). However, data limitation impedes the use of such variables. Consequently, in this study, the growth rate of financing to households indicates the trend of financing disbursement by non-bank credit providers in Malaysia over the years. As reflected in Chart 7 in the previous section, the disbursements of financing to households by non-bank credit lenders have seen moderate growth for the past decade and account for approximately 2% of total household indebtedness.

The growth rate of nominal GDP is the only macroeconomic variable used, which hypothetically may explain broadly the financing behaviour of both banks and non-bank credit providers. The growth rate of financing approved by banks is expected to have an inverse relationship with the non-bank credit providers' financing behaviour.

[10] A sample was taken from major non-bank credit providers that include credit co-operative societies, building societies, finance companies and hire purchase credit providers.

An OLS was estimated:

$$NonbankL_t = c + \beta_1 InvApprv_t + \beta_2 GDP_t + \varepsilon_t , \qquad \varepsilon_t \sim N(0,1)$$

Where

$NonbankL_t$	=	the growth rate of financing to households by non-bank credit lenders
c	=	constant
$\beta_1 InvApprv_t$	=	the inverse of the growth rate of total financing approved by banks
$\beta_2 GDP_t$	=	the growth rate of nominal GDP
ε_t	=	error term

4.3 Results

The result of the OLS in Table 3 suggests that the growth of nominal GDP explains the financing disbursement to the household sector by non-bank credit providers. An increase in GDP growth may translate into higher financing to the household sector by the credit providers. Meanwhile, the coefficient on the growth rate of financing approved by banks carries the expected sign but not statistically significant, suggesting that there is a possibility for non-bank credit providers to take up banks' market share in financing to households although it is unlikely to materialise at present.

Table 3

OLS for Financing to Household Sector by Non-bank Credit Providers

Explanatory Variables	t-Statistic
Inverse of growth rate of total financing approved by banks	0.4449 *(0.0109)*
Growth rate of nominal GDP	2.4092* *(4.5378)*
Adjusted R-squared	0.3048
Durbin-Watson statistic	1.7550
Number of observations	10

Notes: (1) Figures inside parenthesis are the coefficients of the corresponding statistic
*(2) * Significant at 5% level of significance*

While the result may not be statistically robust given the data limitation, it provides an indicative picture of lending behaviour of non-bank credit providers over time. Short time series data availability has also limited the possibility of identifying determinants of the lending behaviour of non-bank credit providers. This study lends support to the need for better data capture on the shadow banking system and gives credence to the current initiatives undertaken by BNM in enhancing further its surveillance framework including improving the data capture on the activities and entities of the shadow banking system in Malaysia that may give rise to systemic risk to financial system stability. The initiatives are discussed in the next section.

5.0 Surveillance framework of the shadow banking system in Malaysia

5.1 Surveillance framework

The regulation of shadow banking should not be skewed towards limiting the size of the shadow banking per se[11] because shadow banking, as discussed earlier, is the other component that completes the overall financial system. Regulation also should not be static or uniformed across all jurisdictions as there is no unique way to monitor the ever-evolving shadow banking system. Realising this challenge, the FSB has proposed seven high-level principles in developing an effective monitoring framework and stylised steps on monitoring the shadow banking system (Table 4).

Table 4

Proposed Monitoring Framework of the Shadow Banking System

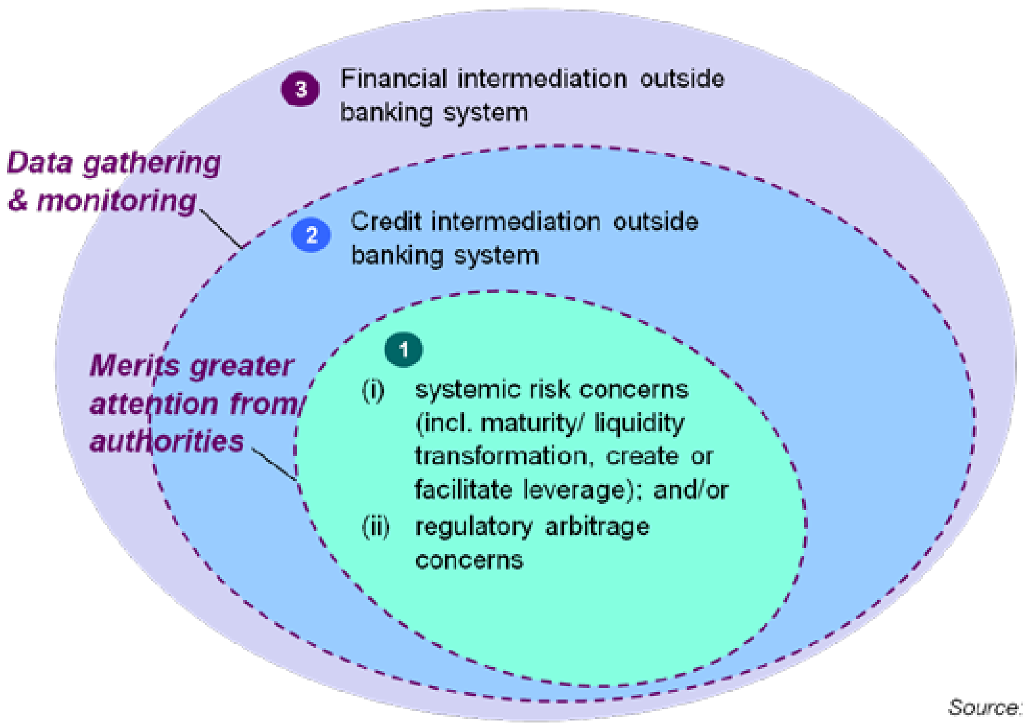
High Level Principles	Stylised Steps to Strengthen Monitoring
Authorities should cast their surveillance net wide and have and appropriate system-wide oversight in place.	Scanning and mapping the overall shadow banking system
Identification and assessment of risk emanating from shadow banking should be conducted on a regular basis	Narrowing focus to aspects that pose systemic risk or arbitrage concerns
Authorities should have the power to collect all necessary data and information	Conduct detail assessment on those identified aspects
Monitoring framework should be flexible, adaptable and forward-looking	
Authorities need to be mindful of possible avenues for regulatory arbitrage	
The monitoring framework must take into consideration the structure of the financial system, current regulatory frameworks and international practices	
Authorities are advised to exchange appropriate information within and across relevant jurisdictions on a regular basis	

Source: FSB (2011)

Surveillance framework for shadow banking in Malaysia was developed based on the FSB's approach with necessary adjustments according to the local shadow banking system. Chart 8 illustrates the current surveillance framework undertaken by BNM.

[11] See for example Schwarcz (2012).

Chart 8: Surveillance framework for shadow banking



Source: BNM

Entities that meet the definition of shadow banking are grouped based on their activities. Circle 1 contains entities that raise potential systemic risk concerns through their high level of interconnectedness with the banking system, which includes, inter alia, banks' funding exposures to the shadow banking entities, deposit placement with banks and ownership of financial institutions, apart from maturity and liquidity transformation activities. These entities also possess sizeable balance sheet in general that raises substitutability concerns. Moreover, several of them have the financial muscle to move the markets via their substantial participation in capital and money markets. Lack of substitution and high inter-linkages with banks are among the factors that make these entities systemically important that warrant greater surveillance from authorities.

Circle 2 encompasses entities that are involved in the extension of credit, either directly or as part of the credit intermediation chain. Most NBFIs are grouped in this circle, making it an integral part of the monitoring framework. Meanwhile, Circle 3 encompasses entities that do not fall under the shadow banking definition yet facilitate the flow of capital between end-supplier and end-user of funds, which is part of the financial intermediation chain at large. Examples of entities that fall under this category are institutional investors that provide equity funding and investment venture capital that may facilitate the conduct of credit intermediation process.

In operationalising this framework, BNM is empowered by the Central Bank of Malaysia Act 2009 to collect appropriate data from shadow banking entities outside BNM's regulatory perimeter. The current monitoring framework is tailored to each circle based on the entities' potential systemic risk to the financial system. Table 5 summarises the enhanced types of information requested according to the entities' risk profile.

Table 5[12]

Types of Information based on Risk Profile

Information Required/Risk Profile	Types of Information
Information to facilitate assessment on financial inter-linkages and market risk position	· Asset allocation at cost and market value, and in local and foreign currencies · Asset concentration in particular industry · Derivatives position and other off-balance sheet data · Exposure to repurchase agreement (repo) market · Borrowings from banks or other financial institutions · Credit exposure via financing granted and investment in private debt securities (PDS) · Analysis on the profile and concentration of contributors of fund
Information on liquidity risk position	· Maturity profile of assets and liabilities · Asset-liability mismatch analysis · Value of proportion of liquid assets held · Cash reserves · Cash flow position · Key components of income and expenditure

Source: BNM

The submission frequency differs for each circle. The current monitoring framework undertaken by BNM is summarised as follows:

1. Non-bank SIFIs in Circle 1 require more intensive monitoring. This is done via quarterly submission of information and data. These entities also have the possibility of future regulation by BNM should their activities pose greater systemic risks to the financial system and the wider economy.
2. The monitoring approach for entities in Circle 2 is conducted through annual submission of required data and information. Nonetheless, the frequency of data submission of an entity will be increased to quarterly should there is a necessity to do so based on the risk assessment of that particular entity.
3. For entities in the third circle that do not meet the shadow banking criteria, surveillance is done via annual submission of data and information.

The seventh broad principle for developing an effective monitoring framework requires authorities to exchange appropriate data and information within and across jurisdictions. While cooperation among regulators in Malaysia has always been present, BNM has embarked on several initiatives to enhance its monitoring framework through strengthened inter-agency cooperation and information exchange arrangements. These include the ongoing enhancements to the Memorandum of Understanding (MoU) with the Securities Commission Malaysia and the establishment of a MoU with the Malaysia Co-operative Societies Commission, which is currently in progress.

[12] The list of information requested is non-exhaustive and will be reviewed periodically.

5.2 Monitoring challenges

One of the key challenges faced is lack of granular and quality information for risk assessment. As discussed earlier, most shadow banking entities in Malaysia are subjected to some form of oversight by various authorities. Nevertheless, there are also entities that remain outside any regulatory perimeter and hence, are not subjected to any form of statistical reporting; implying lack of transparency. Furthermore, lack of transparency in disclosing data and limited publicly available information about the balance sheet activities hamper the understanding of the shadow banking entities, which eventually complicate the assessment of risk and inter-linkages of shadow banking entities with the financial system.

The integrity of information collected from the shadow banking entities also remains an integral issue that warrants attention and immediate action. The concept of information integrity focuses primarily on the reliability of the information, which also plays a central role in information relevance and usability (Boritz, 2004). One of the attributes of information integrity is the granularity of the data. These complications arise from two ends, namely the end-provider of information (i.e shadow banking entities) and the end-user of information (i.e authorities). Authorities are currently plagued by the problem of having an unclear picture of the shadow banking inter-institutional exposures with the financial system and the probability of cascading collapse from the former to the latter, which in turn compromise the quality and integrity of information collected. This is probably due to either authorities lack appreciation of how the shadow banking system really works or the limited dimensions in data collection. Lack of information transparency and reluctance in disclosing data by NBFIs remain the major contributing factors to the small dimensions in data collection.

Another interesting yet challenging area that this paper wishes to highlight is the difficulty in finding the common financial soundness indicators for shadow banking entities and activities. The difficulty arises from the varied nature of the shadow banking system. As discussed in the previous section of this paper, shadow banking entities in Malaysia are clustered in three different circles. Although the circles indicate clearly the traits of entities that are grouped into them, there are still rooms for improvements in the current framework relating to statistical gauges that are specific to each circle. Currently, there are no specific systemic risk determinants that may explain the inter-circle movement among the shadow banking entities.

Conclusion

The shadow banking system can be defined as a system comprising NBFIs that undertake or facilitate credit intermediation process. In Malaysia, the current approach in defining the shadow banking defines the system as a “system of credit intermediation that involves entities and activities beyond the regulatory parameter of BNM”. Similar to their counterparts in Asia, NBFIs in Malaysia play a complementary role in providing access to financing to niche segments in the economy that are usually unable to get the same access from the banking institutions. These entities are interconnected with the banking system through several channels such as deposit placements and borrowings, which make them a potential source of systemic risk to the financial system stability.

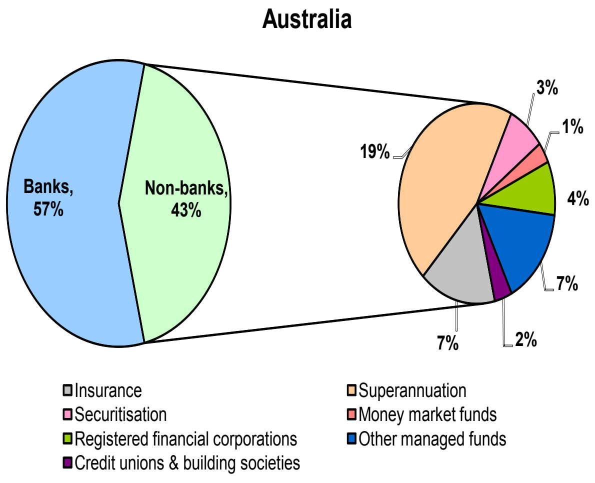
The recent GFC has drawn tentative lessons for authorities worldwide on the need to put greater emphasis on the surveillance of the shadow banking system. A number of initiatives to improve the surveillance on the system undertaken by international standard setting bodies are already under way. Malaysia through its central bank has embarked on several measures on improving its surveillance of the domestic shadow banking system. The current surveillance framework differs according to an NBFI’s potential systemic risk to the financial system. NBFIs that are systemically important in the financial system are required to submit granular data on a quarterly basis to BNM for risk assessment purposes. Entities that are less systemic to the financial system are required to submit relevant information on an annual basis.

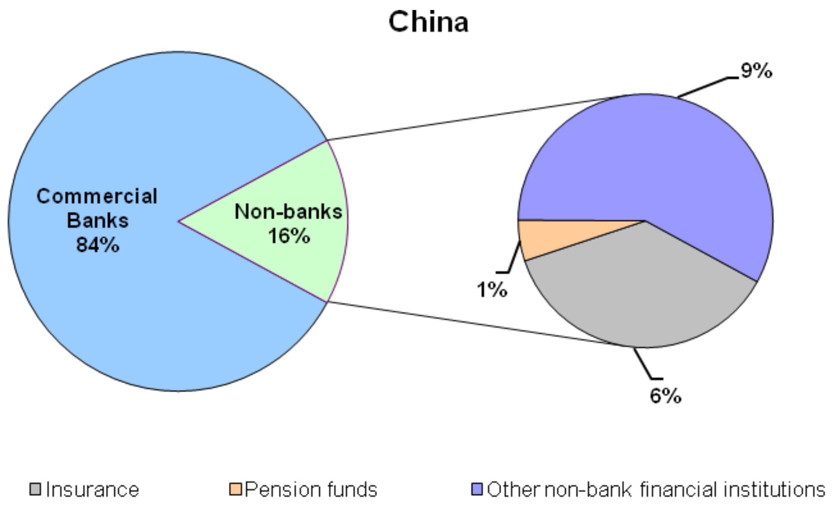
Data limitation remains the biggest challenge faced by financial stability authorities in their surveillance of the shadow banking system. Experience in Malaysia has shown that the lack of granular data impedes the central bank's initiative in developing a more robust surveillance framework. While there are challenges, the accordance of power to collect relevant information from non-BNM regulated NBFIs to BNM by the Central Bank of Malaysia Act 2009 has enabled BNM to undertake rigorous assessments on the systemic implications of the Malaysian shadow banking system to the financial system and the overall economy.

Annex

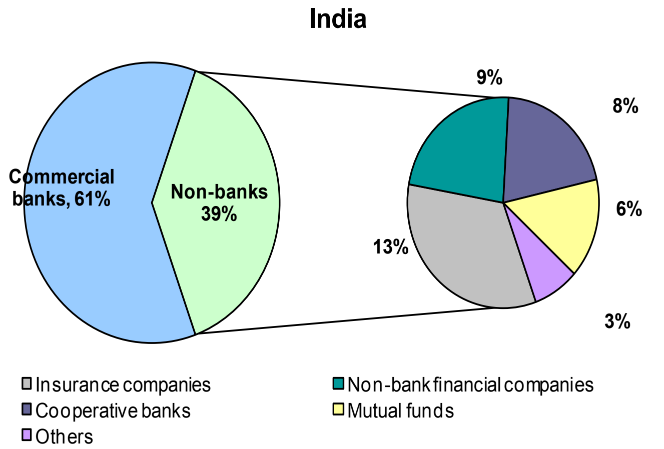
Chart 1

Composition of Financial System Assets for selected Asian economies

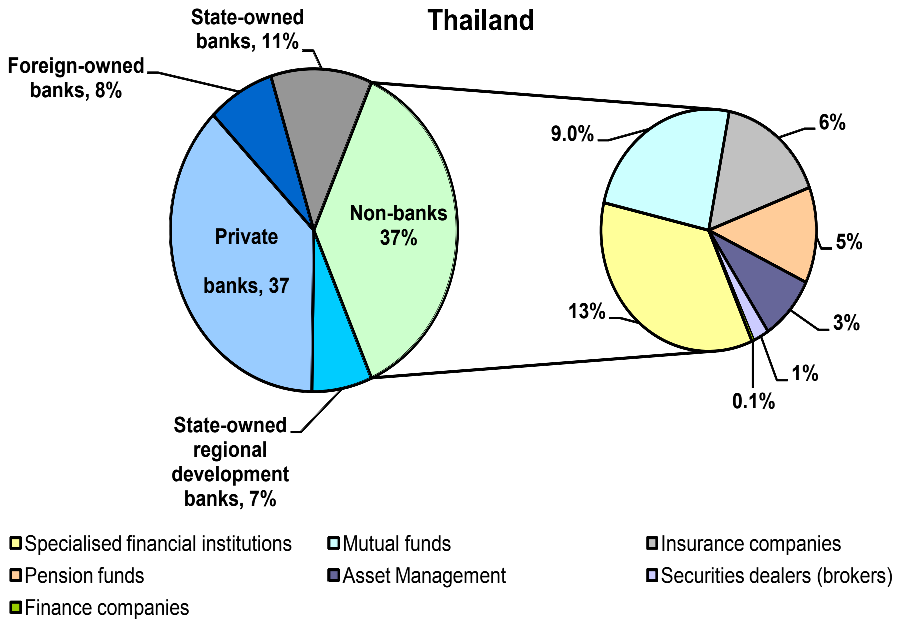




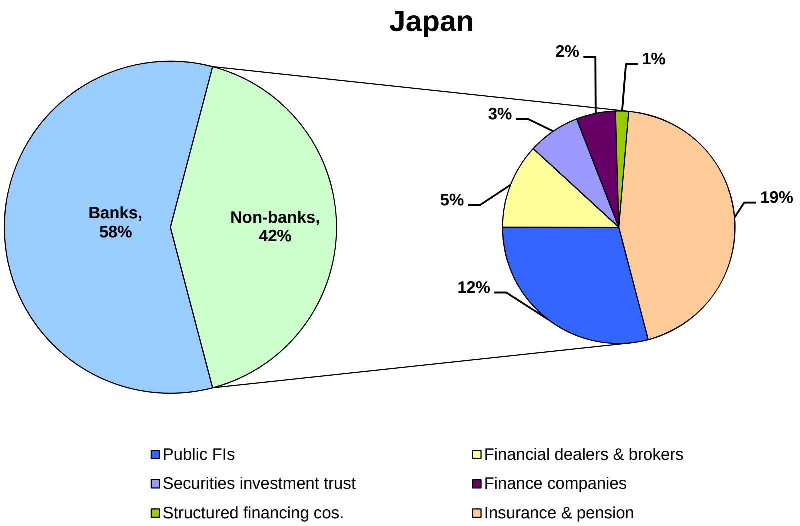
** Other non-bank financial institutions include policy banks, rural commercial banks, rural cooperative banks, foreign banks, credit co-operatives, finance companies affiliated to enterprise groups, trust and investment companies, financial leasing companies, auto financing companies, money brokers and postal savings.*



India
Commercial banks, 61%
Non-banks 39%
9%
8%
6%
3%
13%
Insurance companies
Non-bank financial companies
Cooperative banks
Mutual funds
Others



Thailand
State-owned banks, 11%
Foreign-owned banks, 8%
Private banks, 37
Non-banks 37%
State-owned regional development banks, 7%
9.0%
6%
5%
3%
1%
0.1%
13%
Specialised financial institutions
Mutual funds
Insurance companies
Pension funds
Asset Management
Securities dealers (brokers)
Finance companies



Source: National authorities, IMF Global Financial Stability Reports (various years) and FSB (2011).

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Residential property price index: preliminary results for Chile[1]

Camilo Vio[2]

1. Introduction

Monitoring the dynamic of residential prices, even though is not trivial, has a relevant importance especially in turbulent periods. Recent financial crises, triggered in the US due to a plunge on house prices, have highlighted the importance of monitoring house prices dynamics. In emerging economies, there is a lack of official house price indexes developed by public institutions. Moreover, in Latin America house prices data are only available for some countries, and even when available, time series are usually of short span, with coverage often limited to large metropolitan areas (Cubeddu et al, 2012). Notwithstanding, there are some studies developed by private consulting, whose purpose depends on their customers' needs, and due to the high costs of information gathering, are usually biased to a particular sample of properties.

Particularly, in Chile some studies displayed to estimate house prices were developed by Morandé (1992) using hedonic prices for Ñuñoa district,[3] between 1975 and 1989, Bergoeing et. al. (2002) who expand the prior mentioned work until 1998, which finally Desormeaux and Piguillem (2003) continued until 2003. Later, using two methodologies (repeat sales and hedonic prices), Parrado, Cox and Fuenzalida (2009) estimated house price index between 2001 and 2007, based on information from the Property Register Office (Conservador de Bienes Raíces). Moreover, using hedonic models, both Figueroa and Lever (1992) and Sagner (2009) estimate what factors determine house prices for Santiago.

This document presents alternative and preliminary estimations of the Chilean Residential Property Price Index (RPPI) employing a novel dataset that comes from the Internal Revenue Service, and includes all recorded transactions made within years 2001 and 2011. This dataset, considering its national coverage, allows exploring behaviors of property prices within cities, in order to make a more comprehensive monitoring of the real estate market and establishing connections with past events, due to the length of the data. These estimations include methodologies based on mix adjustment stratification, hedonic model and repeat sales.[4,5] The results presented in this paper are still preliminary and do not constitute an official statistic of the Central Bank of Chile.

This document goes through the following structure. Section 2 raises some international evidence on publication of house prices, section 3 describes the data used for the estimations. Section 4 makes a methodology description, highlighting the advantages and disadvantages of

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[1] All figures presented below, do not represent official statistics from the Central Bank of Chile.

[2] Central Bank of Chile. cvio@bcentral.cl. I acknowledge the comments and suggestions of Luis Opazo, Érika Barrera, Romina Villarroel and Carolina Del Campo. The views and conclusions presented are exclusively those of the author and do not necessarily reflect the position of the Central Bank of Chile or of the Board members.

[3] Ñuñoa is located in the west area of Santiago city.

[4] Some countries that use mix adjustment methodology are, among others, Australia, Greece and Ireland, while the repeat sales method is used in US.

[5] Other methodologies, used to compute Real Estate Index are weighted average, and sale-price appraisal ratio (SPAR).

each method used. Section 5 presents the main results of both methodologies and finally, section 6 exhibits an implementation of a micro analysis across districts.

2. International evidence

The process of constructing a RPPI is not simple. The methodology used can be constraint in large part by the nature of the data available, and on a regular and timely basis (Eurostat, 2011). Moreover, due to the cost of producing the data required, some indexes use part of the transactions – i.e constraint to the main cities – as information for its compute. Furthermore, this index construction is based on the assumption that the information will remain constant in the future. But this cannot be ensured, because changes in the information due to implementation or costs might be run by the sources. This last issue is especially important, because some methodologies demand very detailed data.

Among countries, there is a wide spectrum of methodologies underlying RPPIs. These differ in scopes such as quality and level of detail of the data. Also, the data sources and methodologies are not always well documented, which affect the possibility to make international comparison analyzes. Indeed, Eurostat (2011) states that "[c]omparability between indices can be very limited as a result of the different data sources (…) – mortgage versus cash purchases; urban versus rural prices; the prices of old properties versus new properties; valuation versus advertised price versus initial offer price versus final transaction price. The net result is that the published indices can, in practice, measure very different aspects of the price development in the housing markets."

Most of the selected countries use a hedonic approach to calculate a RPPI. A smaller group uses the most simple methodologies – average and common types –, three of them use a mix adjustment method, and only United States use the repeat sales method (table 1). As was mentioned above, the selection of each country is based on the data available to compute the index and also on the idiosyncrasy of each market.

Table 1

International House Price Index (1)

Mix adjustment	Hedonic	Repeat Sales	SPAR	Average (2)	Common types (3)
Australia	Austria	United States	Netherlands	Belgium	Canada
Greece	Finland		New Zealand	Estonia	Czech Republic
Ireland	France			Russia	Denmark
	Norway			Slovak Republic	Sweden
	Poland			Switzerland	
	Slovenia				
	Spain				
	United Kingdom				

(1) Selected index for countries with more than one, are publish by government agencies. For more details, see Annex 1.

(2) Some countries use a weighted average.

(3) Follows the dynamic of a specific type dwelling's price.

Source: Author elaboration based on information from Silver (2012).

3. Data description

The data used to compute the RPPI is provided by the Internal Revenue Service (Servicio de Impuestos Internos). The information comes from two sources. First, the registry of trades, which has all the information of the properties transaction between two agents, excluded from inheritances and subsidies. Second, information used in Chile to characterize properties, with all their features, in order to charge taxes. These two sets of data are merged in one database, which contain the records of properties transactions – price, date of the trade, among others – and the characteristics of properties – geographic location, construction type, land and structure area, etc. The whole database contains approximately 1,683,000 trades accomplished between 2001 and 2011 whose primary use is residential.[6] After submitting the data to a cleaning process by removing outliers or trades with no price information, over 1,518,000 observations were obtained.

Data cleaning filters

In spite of the high quality of the information, both for its representativeness – it already contains all the trades made – and for its descriptive level, an important impediment is that part of it comes from an administrative form that is afterwards transferred into a digital platform. Given that, there are few chances of recognizing mistakes made during the transfer process.

Filters included in the final dataset, after identifying the transactions of residential properties are the following:

i) Duplicated observations: All duplicated observations are eliminated.

ii) Non valid date, or out of range: Observations whose date of trade does not correspond to the range of information (2001–2011) are eliminated.

iii) Building surface: Observations with a structure size less than 20 square meters are eliminated. This is below the first percentile of the distribution.

iv) Atypical sales price-appraisal ratio: All the observations whose sale price-appraisal ratio is atypical are eliminated. To define its boundaries, box-plot method was used.[7]

Considering the filters described above, the amount of deleted observations reaches a 10% of trades whose primary use is residential.

4. Methodology description

There is a wide spectrum of methodologies to compute a RPPI, which differ depending on the quality of information used to build it, and the main objectives desired to achieve. Furthermore, there are idiosyncratic factors that affect the relevant variables used to build an appropriate property price index. Given that, it is possible to find a wide amount of literature where some empirical comparison is developed for a specific country or city.[8] Considering

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6 Properties whose primary use is residential, represent around 75% of trades between 2001–2011.

7 The Box-plot method considers as a lower bound the percentile 25 less 1.5 times the interquartile range, and as an upper bound the percentile 75 plus 1.5 times the interquartile range.

8 Hansen (2006) performs a comparison among hedonic price measures and repeat sales for the Australian market, using three of the larger cities, Sydney, Melbourne and Brisbane. The same comparison is performed by Shimizu et al. (2010) applied to residential property prices in Tokio. Haan et al. (2007) generate a revision of the SPAR method, comparing it with the repeat sales for Netherlands.

this, the following document will focus on repeat sales, hedonic and mix-adjustment methodologies.

Repeat sales

Repeat sales method, proposed by Bailey et. al (1963), provides an estimation method based on changes of property prices sold more than once. It is usually assumed that the features of every dwelling does not change between sales, and hence, the dynamic of the price can be expressed as:

$$p_{it} - p_{it} = \sum_{t=1}^{T} G_{it}\alpha_t + \eta_{it}\ , \qquad (1)$$

where G_{it} is a temporal dummy that takes the value 1 when the resale was performed, –1 when the previous sale happens, and zero in any other case. η_{it} is the error term.

The main advantage of this method is its high accuracy in terms of controlling the quality of dwellings. Indeed, given that it uses the same property to compute the changes in price, qualitative characteristics that might not be observable or measured, would allow to control the bias associated with compositional changes. Another advantage is that it requires less information than other methods, given that it is possible to compute it using only price and time data.

However, one of its disadvantages is that, given the assumption that features of the dwelling are constant in the sample, any investment made in order to improve the quality of the dwelling, or depreciation due to neglect in the maintenance of the property, is not controlled. A good method to manage this, is to use sub-samples where the quality is assumed as relatively constant. The problem of this solution is that if the sub-sample is too small, changes in prices might not be indicative of the total sample of repeat sales.

Other control methods are proposed by Diewert (2007), and Paredes and Aroca (2008). The first one incorporates the depreciation based on the length between the year of building and the date of sale, while the second one uses a matching method to pick commensurable dwellings according to the closest neighborhood's standard, in order to evaluate differences of prices among geographic regions. Even though this last method is used to compute an hedonic price index, it would be interesting to use it in the composition of repeat sales – i.e. using "similar" dwellings according to certain attributes in order to generate price differences. There is, furthermore, extensive literature on other variations of the estimators through repeat sales models, tending to reduce disadvantages and biases that might appear when using a general model, and to compare price dynamics against other methodologies.

Mix-adjustment

The mix-adjustment or stratification method is based on the measure of price variations of different types of dwellings, classifying the sample in groups of properties according to certain characteristics such as price, location, size, etc. Measures, such as mean or median, are calculated for every group before being combined in the index construction. The construction of its geometric adjustment, is based on the following expression:

$$MP_t = \prod_{i=1}^{n} P_{it}^{w_i}\ , \qquad (2)$$

where MP_t is the adjusted price in *t*, w_i is the weight associated to the *i* group, (which can be computed through the participation of the group in total sales, *turnover* or participation of the group in the stock of dwellings), and P_{it} is the mean or median of group *I*'s dwelling price at time *t*. Finally, *n* is the total number of groups. This method is simple and takes into account differences among property features.

The data specificity level of this method is not high – compared with hedonic measures, for example – only enough to identify and classify the properties into the different groups, and the effectiveness of its measure depends on the stratification used. Generally, this method only controls for compositional changes across the dimensions defined for each group, so one of the assumptions made is that quality changes occur for the whole group, and within each group they remain identical. In turn, this generates a restriction to the effect of controlling quality changes within each group.

Hedonic

Hedonic measures aim to control for compositional and quality changes through econometric techniques. This model, developed by Rosen (1974) is widely used by researchers, however it requires data with a high level of detail on specific characteristics of dwellings. Usually, a log-linear specification of the model is used, and the parameters of the hedonic model can be estimated by OLS regression in the sample data of each time period separately.[9] Thus, the estimating equation becomes as shown:

$$p_i^t = \beta_0 + \sum_{t=1}^{T} \delta^t D_i^t + \sum_{k=1}^{K} \beta_k z_{ik}^t + \varepsilon_i^t, \qquad (3)$$

where p_i^t is the logarithmic of the price of dwelling i, sold at time t, D_i^t is a time dummy which has the value 1 if the observation comes from period τ, and 0 otherwise, z_{ik}^t represents the k characteristics of dwelling i, sold at time t. Vector β contains the implicit values of each characteristic.

After performing the estimation, the price change between the base period and each comparison period t, is represented by the exponential of each estimated dummy coefficient.

According to Hansen (2006), the main advantage of the hedonic model is that it provides direct estimators of pure prices, and can control for changes in composition and quality of dwellings. However, this measure has some limitations: (i) There could be some omitted variables – whether there is no information on them on the dataset, or they are unobservable – which could cause biased changes in pure price estimators. (ii) In its more general specification, they assume constant characteristic parameters through time.[10] (iii) For the purpose of publishing the level of prices, if the time series is extended to T+1, and new data is added, the characteristics of coefficients will change (Eurostat, 2011).

5. Results

The decision of what methodology is better to get a proper RPPI is not simple. There are some details that have to be considered, such as the availability of data, if the time series have to be corrected due to new past information, among others. In order to explore the advantages and disadvantages of the different choices, an index was computed based on

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9 For more details, see Eurostat (2011).

10 However, there are some advanced estimations, which consider time-varying parameters. For example, Rambaldi and Prasada Rao (2010) use a time-varying hedonic model to estimate house price index for Brisbane.

three methodologies – repeat sales, mix adjustment and hedonic. On one side, the advantage of mix adjustment approach "is that it is easy to compute because it is based on simple medians from stratification and uses data that are readily available from most housing transactions database" (Prasad and Richards, 2008). On the other side, the disadvantage of repeat sales and hedonic method is that time series must be corrected in case new past information has to be considered or the value of each characteristic has changed.

For the Residential Property Price Index computed for Chile, based in repeat sales methodology, properties with more than one transaction were used in the sample. The number of dwellings that have more than one transaction between 2001 and 2011 is near 340,000. However, the compute of the index was developed since 2004, in order to avoid undesirable effects of a lower population in the initial period of the sample. Furthermore, in order to exclude outliers, observations resold too rapidly – those whose distance between two sales is less than 180 days – were eliminated.[11]

In the Residential Property Price Index computed through the mix-adjustment methodology, all properties were included, both new and second-hand sales. Eurostat (2011) suggests that the stratification has to be made in order to control for compositional changes of the properties. For purposes of this study, the appraisal value of the property was used to stratify properties into five groups, given by the five quintiles of the distribution of appraisal values for the whole sample.[12] Then, the real price over the constructed area measured in squared meters was calculated for each transaction, and the median value of this index within each strata is obtained. After that, the index is collapsed using the sum of squared meters of constructed area traded on each quarter, as weight for each quintile. Finally, in order to chain the index, the Fisher method was used.[13]

In the computation of the hedonic model – described in (3) –, some categorical variables were created to control for differences in quality. For each category a dummy variable was created, which takes the value 1 if the property belongs to that category for that variable, or zero if otherwise. Considered variables were: Age of the building, separated on nine categories ranged between zero and at least 40 years; and quality of the building, separated in five categories given by the appraisal questionnaire. Due to the lack of information about number of bedrooms and bathrooms, the quality variable can be viewed as a proxy of those, as it includes some information about the material of construction, location, etc. Other quality control has to do with the constructed living space. This variable was included in two terms, one linear and the other quadratic, controlling for nonlinear effects.

The results for the three methodologies are shown in the figure 1, panel A. Also, annual growth is shown in panel B. Correlation between mix adjustment annual growth and hedonic annual growth is 0.73, while between mix adjustment annual growth and repeat sales annual growth is 0.26 and between repeat sales and hedonic, is 0.27. The last two correlations increase to 0.33 and 0.45 respectively, starting in 2007.

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[11] In the compute of Case-Shiller index, they use the same criteria to filter for unusual transactions. S&P (2009).

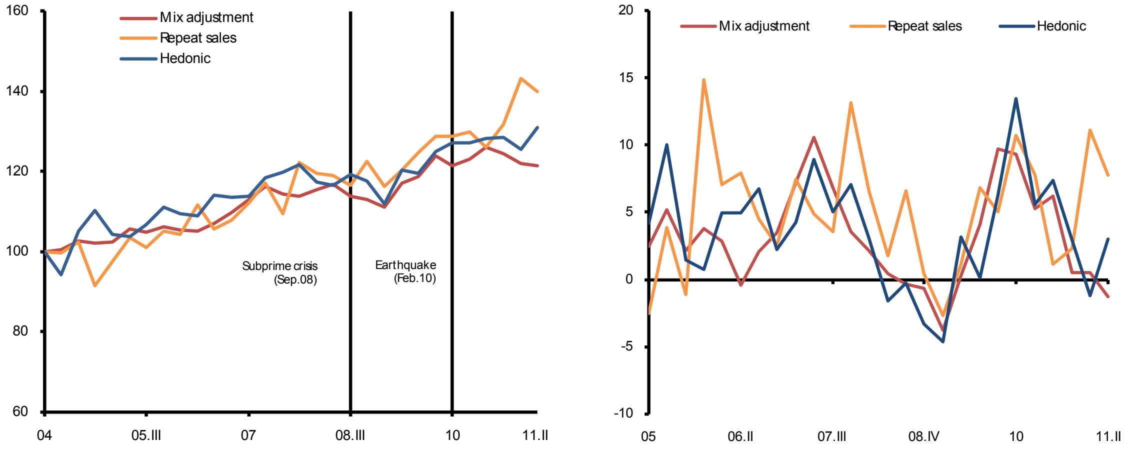
[12] Appraisal of every property is developed by the Internal Revenue Service, filling a complete questionnaire where detailed characteristics are reported. Given that a unique document is completed for each property, and the same parameters are considered to value it, it could be considered as an objective measure.

[13] Results does not change much when using the sum of squared meters sold the previous year as weights, and also when using Laspeyres method to chain the index.

Figure 1

Panel A: Residential property price index (index, base mar.04=100)

Panel B: Annual growth (percentage)



Source: Author’s calculation.

6. Monitoring recent developments in residential market

Based on the three methodologies described above, persistent and generalized growth in house prices across the country has not been observed.[14] However, in order to get a more general view, some particular effects still have to be analyzed. First, due to the geographical distribution and economic activities of the principal cities in Chile, markets have some characteristics that throughout time remain heterogeneous.[15] Second, on February 2010 the occurrence of an earthquake affected significantly three regions of the country, while other areas were softly or not affected at all.

Furthermore, evidence on US housing shows that dynamics of house prices among MSAs are heterogeneous, not only for annual growth but also for the period where a structural change on growth rates is found (Ferreira and Gyourko, 2011). Using the same methodology as Ferreira and Gyourko (2011), a micro analysis of residential property prices dynamics among districts[16] was developed. A hedonic index for each city was computed, using some characteristics of the dwelling – size of the structure, quality and age of the building.[17] The implementation was made for 47 districts in Chile – those with more than 9.000 sales in the sample – from a universe of 346, which represents around 70% of sales between 2001 and 2011 (more than a million of observations).

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[14] Cubeddu et al. (2012) make an analysis of vulnerabilities for Latin America. They found few signs of misalignment in the mortgage and the real estate sector, and house prices in most markets are near equilibrium levels.

[15] For example, the north area of the country is very intensive on mining industry, and the south area has more activity on agriculture. Therefore, during a boom on a specific industry, impact on the region which is more dependent on that industry would increase.

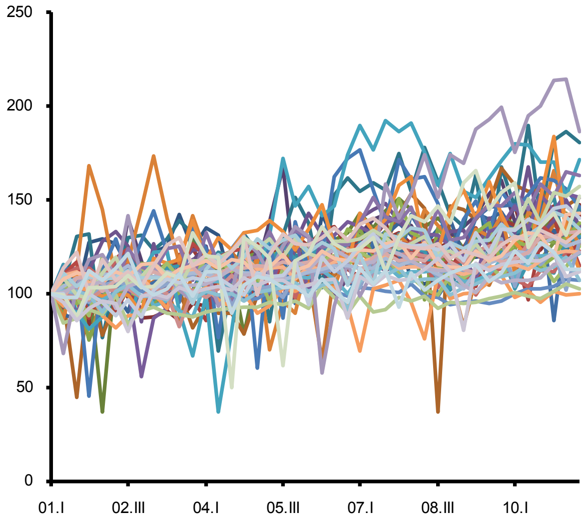
[16] A district is the basic and minor politic-administrative division in Chile. Might be understanding as a group of neighborhoods, and generally, the biggest cities have more than one district (i.e., in Santiago, there are more than 30 districts).

[17] The reason to compute a hedonic index is that within each district there are a short number of transactions, therefore it is not possible to compute an index based on repeat sales or mix adjustment method.

Results show that even though there is some heterogeneity in price dynamics across cities, persistent and generalized growth is absent (figure 2, panel A). This differs on what Ferreira and Gyourko (2011) found for metropolitan areas in US before subprime crisis, where many of them presented persistent growth beginning at different time periods.

Figure 2

Residential property price index across location
(index, base mar.04=100)



Source: Author calculations based on Ferreira and Gyourko (2011).

Furthermore, an analysis in order to obtain the timing of the start of housing boom was also developed. This analysis is based on searches of structural changes on annual growth index prices. Therefore, for each one of the 47 districts, a dummy regression was estimated, considering a dummy variable to account for the magnitude of the change in the growth, based on the following equation:[18]

$$PG_{d,t} = a_d + D_d 1\left[q_{d,t}\ ^3\ q^*_{d,t}\right] + e_{d,t}\,, \tag{4}$$

where $PG_{d,t}$ is the annual housing price growth in each district, $D_d 1\left[q_{d,t}\ ^3\ q^*_{d,t}\right]$ is a set of relative quarter dummies, which take the value 1 for *t*>*t**, a_d is a district fixed effect, and $e_{d,t}$ is the error term. The analysis was developed between the first quarter of 2006 and the third quarter of 2009. In order to obtain the structural change, for each district if the dummy coefficient of the highest R-squared of the regression is significant, then there is a structural change on growth of that district house prices.

Results show that there are five districts with structural changes, which occurred on the third quarter of 2009 (table 2). Therefore, while there are no signs of a generalized boom, it is needed to continue with the micro analysis in order to account for further booms, and to understand which are the factors influencing those growths.

[18] This is the same equation used by Ferreira and Gyourko (2011).

Table 2

Real House Price Growth (*)

(percent)

	02.I–09.II	**09.III–11.II**
Santiago	–0.6	5.1
Ñuñoa	0.8	4.0
Las Condes	0.5	8.5
La Reina	2.8	10.2
La Florida	1.6	6.2
Vitacura	1.3	7.4

(*) Average annual growth.

Source: Author calculation based on Ferreira and Gyourko (2011).

Annex 1

Selected International House Price Index		
Country	**Institution**	**Periodicity (*)**
Australia	Australian Bureau of Statistics	Quarterly
Austria	Oesterreichische Nationalbank	Quarterly
Belgium	Statistics Belgium & SPF Economie	Quarterly
Canada	Statistics Canada	Monthly
Czech Republic	Czech Statistical Office	Quarterly
Denmark	Statistics Denmark	Quarterly
Estonia	Statistics Estonia	Quarterly
Finland	Statistics Finland	Quarterly
France	National Institute of Statistics and Economic Research (INSEE)	Quarterly
Greece	Bank of Greece	Quarterly
Ireland	Department of Environment, Heritage, and Local Government. Central Statistics Office (CSO)	Quarterly
Netherlands	Central Bureau voor de Statistiek (CBS)	Monthly
New Zealand	Reserve Bank of New Zealand	Quarterly
Norway	Statistics Norway	Quarterly
Poland	National Bank of Poland	Quarterly
Russia	Federal State Statistics Service	Quarterly
Slovak Republic	National Bank of Slovakia	Quarterly
Slovenia	Statistical Office of the Republic of Slovenia	Quarterly
Spain	Instituto Nacional de Estadísticas (INE)	Quarterly
Sweden	Statistics Sweden	Quarterly
Switzerland	Swiss National Bank	Quarterly
United Kingdom	Nationwide	Monthly
United States	Federal Housing Finance Agency (FHFA)	Monthly

(*) The most frequently reported.

Source: Author own elaboration based on information from Silver (2012).

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Constructing a real estate price index: the Moroccan experience

EL MAHMAH Assil

I. Introduction

The real estate sector became a centre of attention over the last few years, given the extent of its effects on financial and real spheres and its implications for monetary policy decisions and financial stability.

In the absence of reliable indicators for the Moroccan properties prices, The Central Bank of Morocco and the Land Registry Office began in 2010 a long process of constructing a quarterly real estate price index (REPI) based on the Office's Databases, which contain detailed information on all property transactions registered at the national level.

This first experience at the national level represents one of the pioneering attempts for the African continent. It aims to improve the transparency and well functioning of the property market, to refine the analysis of inflationary risks and to monitor real estate risk in the banking system.

However, the construction of such a tool faces many difficulties related mainly to the nature of this asset. Indeed, the housing market shows great heterogeneity, making the adoption of a uniformed approach extremely challenging since prices of different properties are influenced by intrinsic characteristics such as the surface area, number of rooms, age, geographical location…etc. In addition, a property represents a durable asset that rarely changes its owner, making the assessment of prices fluctuations difficult. This large discrepancy between the purchase and resale of the same property complicates the construction of a price index.

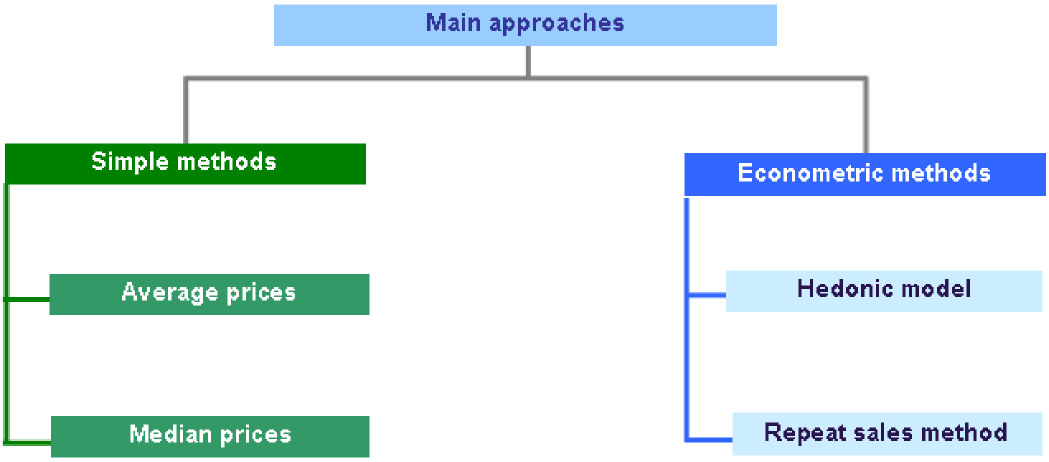
In order to limit the effect of the above-mentioned constraints and depending on the nature and richness of the databases, several approaches for developing real estate price index used at the international level are presented and discussed in the first part of this document. The second part describes the available data at national level as well as tests and treatments applied, while the third part focuses on the methodological approach adopted for the construction of the index. Finally, the results of the national index are presented and analyzed in the last part.

II. Different methods of compiling Real Estate Price Index

In order to construct a real estate price index, several approaches are adopted internationally, which can be classified into two categories: Simple techniques (simple or weighted average and median price) and econometric techniques (hedonic method and the repeat sales). In each country, there may be many indexes developed using different methods and by different institutions (Annex 1).

Figure 1:

Main approaches used internationally to calculate real estate price index



A. Simple method

This method measures the simple average, weighted average or median of real estate prices during a given period. Monitoring such indexes does not allow to distinct between price and quality changes. Moreover, the unrepresentative nature of real estate transactions over time can bias the price trends, especially when transactions relate to different ranges of properties between one period and another. This method is used in several countries, including Germany, Australia, Spain and the Netherlands, because of its simplicity and as it does not require detailed data on the characteristics of real estate.

B. Hedonic method

This approach is based on the principle that the price of a property depends on its characteristics and its location. Only changes in property prices with similar characteristics from one period to another reflect the changing conditions of supply and demand in the property market. Considering the heterogeneity of properties traded in the real estate market, the implementation of the hedonic method requires the estimation of the effect of a number of characteristics on property price, through econometric equations specified for each elementary area relatively homogeneous and for each type of property.

Then, the coefficients from these equations, considered fixed over the period of calculation of the index, are used to eliminate the quality effect, in order to obtain the variations of the "real" prices that reflect supply and demand changing conditions in the market. For each elementary area, the index of property prices is defined as the ratio between the value of a fixed reference property in a current period and its value in the base period index. The implementation of this approach requires, therefore, the existence of a database that contains the characteristics of property with a long history of real estate transactions to estimate the effect of quality.

The advantage of this method is that it can track over time the real value of a sold property. Also, it allows the valuation of property in view of their characteristics. However, it requires a detailed description of the property's characteristics over a period of time.

C. Repeat sales method (RSM)

The repeat sales method, considered as a variant of the hedonic method, overcomes the problem of heterogeneity of real estate. It consists of constructing a price index based on properties which have been sold more than once during the period under study. It assimilates price fluctuations to the average changes observed on repeat sales. This method, which excludes new property, is difficult to apply at a minute level of strata, because of the relatively small number of such sales. Thus, the lack of data on the characteristics and the technical difficulty of the hedonic method are the main reasons for adopting the repeat sales method.

III. Data processing

A. Source and nature of data

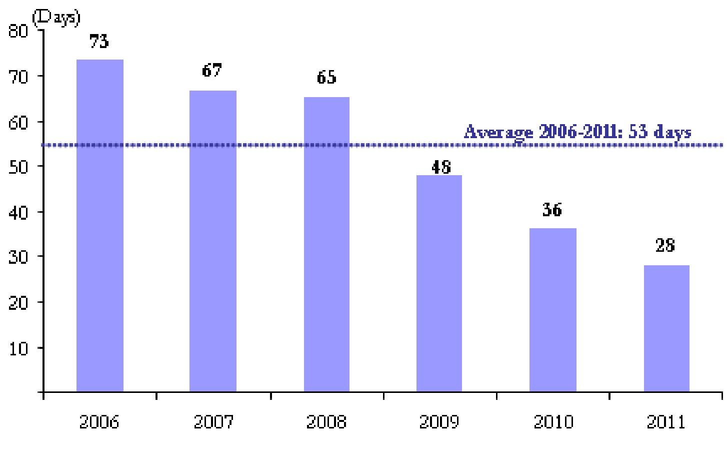
Data used to construct the real-estate price index are drawn from the database of the Land Registry Office. This Office, which has 75 regional branches at the national level, records the transfer of ownership of property and land titled to the benefit of the purchaser. It has the characteristics and the prices indicated in the properties deeds. In addition to the global coverage of national territory, the recent computerization[1] of their database and its update in real time are the main strengths of this database. This latter contains information on more than 3 million registered properties, including those who have never been sold.

The analysis of the databases of this Office and the tests performed on different variables allowed the identification of useful information for constructing a real estate price index on the basis of the exhaustiveness and the quality of available information.

- **Time data integration:** The buyer must record the transaction on his property within 18 months at the Land Registry Office. The analysis of the database showed that the delay between the date of the act and the recording date of the sale transaction is in continuous decline. Indeed, it decreased from 73 days on national average in 2006 to 28 days in 2010. This period could be shortened further in the future and exhaustiveness of the databases could be improved through awareness-raising actions by the Office.

Chart 1:

Delays between the date of the act and the recording date of the sale transaction



- **Date of transaction:** The date of each real estate transaction (Act Date) is available at the database of the Land Registry Office. For missing data, it has been

[1] It should be noted that the process of computerization of the regional services has not started at the same time, which will result in the need to define a base year that is the same for all the selected cities.

supplemented from the date of registration (registration date) at the Office using the following formula:

Date_Act =Date_ register – DM

Where DM is the yearly average difference by city, between the date of registration and date of transaction, calculated based on the available observations.[2]

- **Price of transactions:** Only registration fees collected by the Land Registry Office, representing 1 percent of the price of each transaction, are entered in the database of the Office and not the price of real estate transaction. Thus, prices used in this work are calculated based on the revenues received by the Office.

- **Types of sales:** Total sales, which represent over 92 percent of transactions recorded at the Office, are only taken into consideration in this work. The partial sales are excluded, because the share of property sold is not known and we cannot estimate the total price of the property concerned.

- **Category decomposition:** This variable, which indicates the nature of property registered, distinguishes nearly 60 different types of property. The Office uses an internal reference to codify the nature of the property subject of the transaction. It is this standard that was adopted for this work.

- **Categories of real estate:** The categories of properties sold were determined by grouping similar consistencies (Annex 3), in order to establish classes as homogeneous as possible. Theses will probably have similar price trends within each strata and a number of observations sufficient to guarantee strong results. Six categories were identified: Apartments, Houses, Villas, Urban lands, Business premises and Offices.

Table 1:

Categories of real estate

Type	Category	Definitions
Residential	Apartment	a dwelling located in a collective building and comprising one or several rooms
	House	a single or several-story individual dwelling with no garden
	Villa	an individual dwelling with a garden
Land	Urban land	a plot of land located in the urban area
Commercial	Business premise	space fitted for commercial activity
	Office	working premises

- **Characteristics of property:** Except for the surface area, identifying the characteristics of real estate involves intense work. Thus, the characteristics identified are: the existence of a garage, garden, pool, courtyards, balconies, roof, basement, number of floors for homes and villas, and the floor number for apartments. Other important features for the application of the hedonic method do

2 This method allowed us to recover more than 11 percent of the entire database.

not exist in the databases of the Office, especially the number of rooms, age of property, built area, etc.

- **Geographic coverage:** The choice of the geographical coverage for compiling the real estate price index has focused on the most dynamic cities in each region over the period 2006-2008. The cities selected cover the entire country and represent approximately 86 percent of transactions on average over the period 2006-2008 (Annex 3 for details).

Table 2:

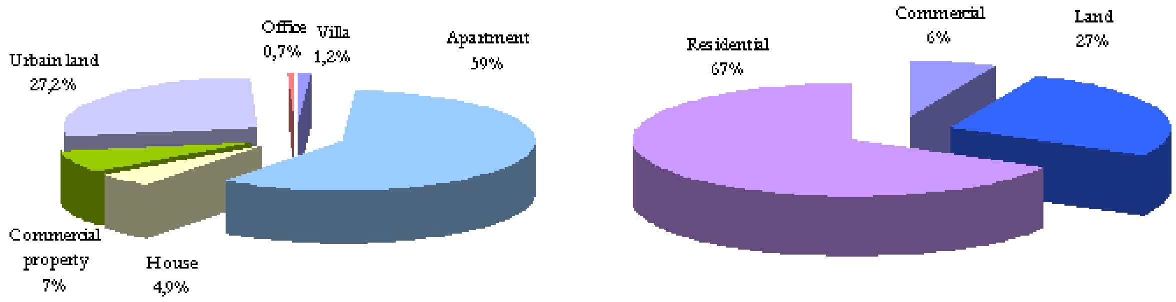
Geographical distribution of selected cities

Region	code	selected cities	Coverage rate (percent)
Le Grand Casablanca	1	Casablanca, Mohammadia	**78,2**
Rabat – Salé – Zemmour - Zaër	2	Rabat, Salé, Temara	**76,4**
Tanger - Tétouan	3	Tanger, Tétouan	**76,4**
Fès - Boulemane	4	Fès, Sefrou	**77,5**
Gharb - Chrarda - Bni Hssen	5	Kénitra, Sidi Kacem	**69,6**
Chaouia - Ouardigha	6	Berrechid, Settat	**86**
Meknès - Tafilalet	7	Meknès, El Hajeb, Ifrane	**97,2**
Doukkala - Abda	8	El Jadida, Safi	**85**
Souss – Massa - Draâ	9	Agadir, Inzegane Aït Melloul	**95,8**
Marrakech – Tensift - El Haouz	10	Marrakech, Essaouira	**100**
L'Oriental	11	Oujda, Berkane, Nador	**65**
Tadla - Azilal	12	Beni Mellal, Fquih Ben Saleh	**100**
Taza - Al Hoceima - Taounate	13	Taza, Al Hoceima	**97,4**
Laâyoune – Boujdour - Sakia El Hamra	14	Laâyoune	**81,1**
Oued Ed-Dahab - Lagouira	15	Dakhla	**70**
Guelmim - Es-Smara	16	Guelmim	**100**
National	-	-	**86percent**

- **The breakdown of transactions:** It shows that residential property represents 66 percent of all sales, with the predominance of apartments. Urban lands represent nearly 27 percent of the domestic market, while transactions on commercial property make up around 7 percent.

Chart 2:

Breakdown of real estate transactions



B. Data processing

This database has been subject to special treatment in order to eliminate incomplete observations, data incorrectly entered and inconsistent transactions. Missing data issue has been overcome, especially concerning the variable of "date of transaction", which is directly involved in the calculation of the index,[1] by calculating the average lapse between the date of registration and the date of the transaction. Similarly, the extreme values of price per m² are rejected on the basis of the Box Plot method,[2] to reduce their impact. Thus, after this phase of pre-treatments, 586 000 transactions were selected on the basis of 700 000 observations.

Considering the large volume of data to be processed each quarter for the development of the real estate price index, the data mining process has been automated allowing a logical and efficient data processing. It can also reduce the time development of the index when changing or updating a file.

In order to respect the requirements of the ISO9001 standard for validating computer applications for data processing, two data processing programs were developed separately with two different software (Stata and SPSS), to compare the results obtained and to ensure the reliability of treatment.

IV. Methodological approach

The mean and the median of real estate prices are the most common methods used internationally. However, it is subject to serious bias because it does not distinguish between price fluctuations and changes in the composition of properties sold from one year to another. At the same time, data available at national level, despite their importance, are insufficient for estimating the effect of quality, which is the starting point for applying the hedonic method. Based on the assumption that when a property is sold twice, the quality of the property remains constant, the method adopted is repeat sales method (RSM). Even if there is a problem of selection bias, since the property sold twice are supposed to represent all of the properties, this method was chosen because of its flexibility, transparency and its relevance to the nature of available data at national level.

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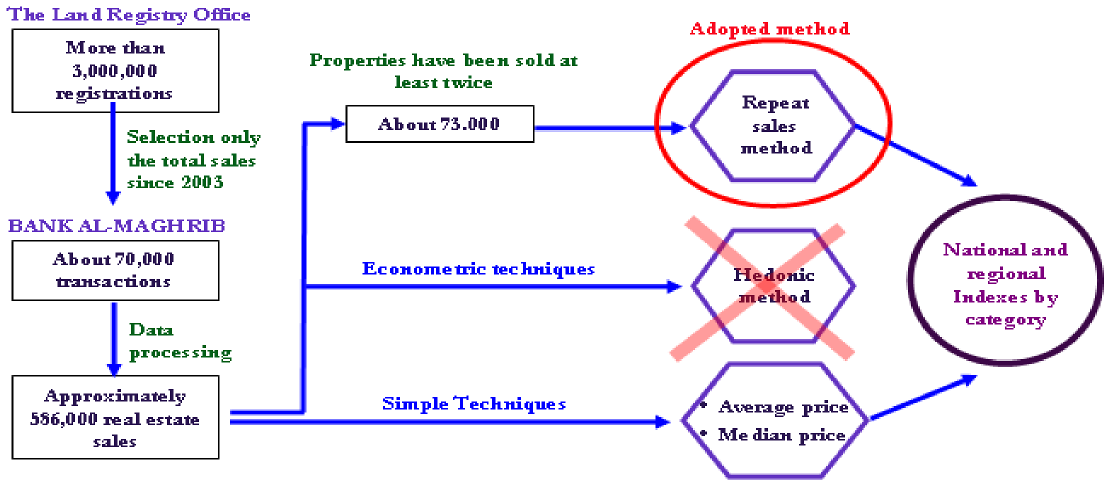
1 The Office has made seizure of this variable obligatory from September 2009.

2 Data are considered outliers if their value is outside of this interval: **[Average price per m² ± 1.5 * (Q3-Q1)] with Qi is the ith quartile price per m².**

Figure 2:

Methodological approach adopted for the construction of the REPI



A. Difficulties in the development of the real estate price index

The establishment of a real estate price index at the national level is a very difficult task. In fact:

- The heterogeneity of property makes it difficult to adopt a unique approach to pricing. Several characteristics of a property are involved in the formation of its price, including the size, number of rooms, age and geographical location.
- The wide variation in property prices, which originates in the heterogeneity of real estate. In addition, distortions in the development of average prices over time are always possible: if during a quarter, transactions concerned mainly new properties in good conditions while in the next quarter, they involve properties not well maintained. This can result in price changes that don't reflect the actual trend.
- The lack of some important characteristics, such as the number of rooms, age of property or the built area. This also makes the price per m² widely dispersed for some type of properties.
- The difficulty of distinguishing the actual price changes of the quality that evolves over time.
- The existence of two distinct markets: the new and the old one (According to the census of 2004, over 56 percent of Moroccans are owners of their homes and about 50 percent of houses in Morocco have over 20 years, while 26 percent are over 50 years). This database does not distinguish between new homes and existing homes, because the information needed to set the age of the properties does not exist.

B. Reasons for choosing the repeat sales method

The choice of this method is justified by the following reasons:

- The information available in databases of the Office does not allow testing the hedonic method because of the unavailability of the main characteristics of properties (number of rooms, age of the property ...).

- The repeat sales method, unlike the simple methods that involve significant biases due to the heterogeneity of real estate, has the advantage of limiting the effects of this heterogeneity by making the price index based on the same property.
- The variable "surface area" is not involved in the calculation of the index, which will limit the bias of data entry errors of this variable. Moreover, the variable "transaction price" is more controlled at the Office, because tax income is calculated on this basis.
- This method requires no information on the characteristics of each property and therefore is not subject to specification errors.

In addition to excluding the new housing market and the difficulty in applying the method to a high level of strata, the following criticism can be brought to the repeat sales method:

- **The lack of exhaustiveness of the sample of properties sold**, because this method dismisses the property having been exchanged once. Therefore, the available sample is reduced to a number of observations, which can generate a selection bias. In our case, 73 000 transactions were selected by the repeat sales method. However, this exhaustiveness problem can be reduced over time because each edition of this index includes all real estate sold for the second time.
- **Updating the index every quarter requires the adjustment of its history**, because any new resale of a property is related to the first sale of the same property. Similarly, late registrations of properties sold are also taken into account in the following editions.

C. Calculation method

For the repeat sales method, only the price change and the number of transactions are included in the construction of the index. It creates an index sensitive to the market dynamics, taking into account the time distribution of transactions. Thus, each repeated sale (couple of transactions on the same property) is used to calculate a price change. The index is then constructed on the basis of these individual transactions. Formally, the estimating equation is:

$$\log\left(\frac{P_{it}}{P_{i\tau}}\right) = \sum_s b_s D_{is} + \varepsilon_{it\tau}, \quad s = 1, \dots, S$$

with

$$D_{is} = \begin{cases} 1 \text{ if } s = t \\ -1 \text{ if } s = \tau \\ 0 \text{ else} \end{cases}, \text{ with } t > \tau$$

When

When	$P_{i\tau}$	:	Price of the property at the time τ , date of the first sale.
	P_{it}	:	Price of the same property at the time t, date of the second sale.
	b_s	:	coefficient to estimate for the period s
	$\varepsilon_{it\tau}$	:	Error term
	S	:	Number of Quarters contained in the study period.

Where $\tau = t - 1$, price development is assimilated to average price movements on repeat sales observed between t and $t - 1$.

Once estimated, the coefficients b_s used to construct the index on a base of 100 for the quarter ***t :***

$$I_t = 100\exp(\hat{b}_t - \hat{b}_t).$$

D. Calculation of the global index and regional indexes

The application of RSM to a region and a category of property provide the desired real estate price index. Similarly, the national price index for a given category is calculated from the national database on this relevant category. The index obtained does not differ from the one which is defined as the average of the different regional indexes weighted by the number of transactions, because the repeat sales method implicitly includes the weight (number of transactions) of each region in the global index. Thus, regions with the most transactions have a greater impact in the global index.

The national real estate price index is also obtained by applying the RSM to the national database on all property types.

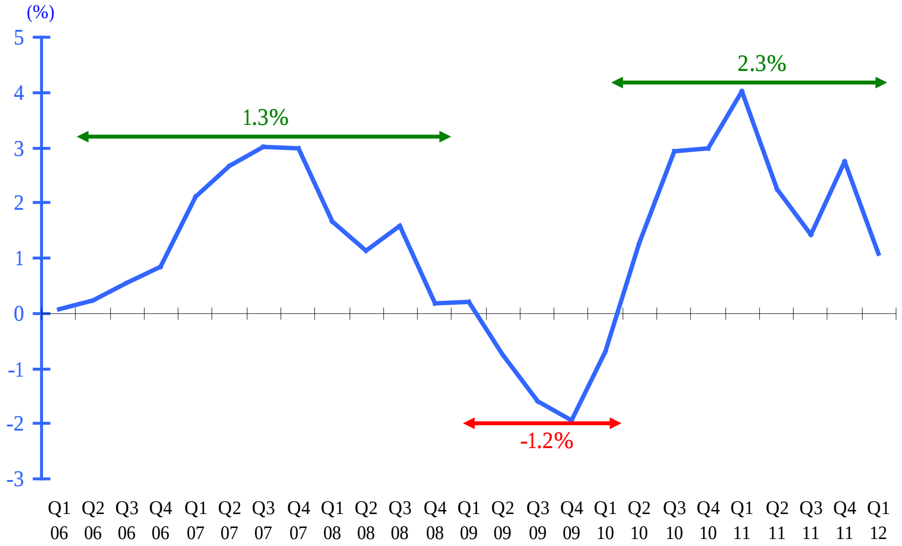
V. Result analysis

A. Price developments

The development of a real estate price index in Morocco, year on year, revealed three distinct periods: Between 2006 and 2008, property prices have registered an upward trend, with an average growth rate of 1.3 percent. Thereafter, prices began a downward trend until the first quarter of 2010, with a decrease of 1.2 percent on average. From the second quarter of 2010, prices have rebounded, their average growth rate having risen to 2.3 percent.

Chart 3:

Real estate price index



With particular regard to the latest results of the first quarter 2012, property prices grew by 1.1 percent, year on year, after 2.8 percent in the fourth quarter of 2011. This reflects an increase in prices of all real estate categories (Annex 4).

Chart 4:

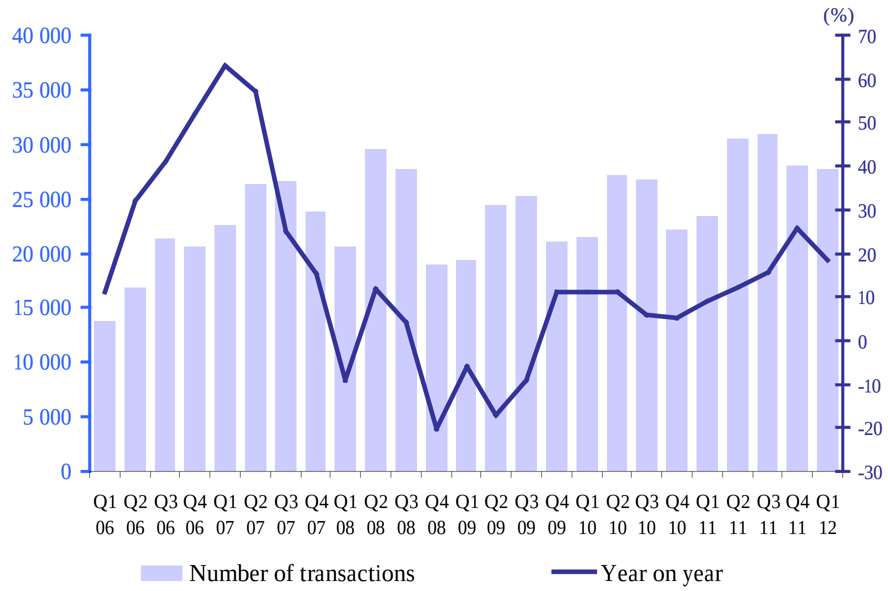
Real estate price index by category

B. Number of transactions

The development of property sales registered at the Land Registry Office has generally three phases. Indeed, the number of transactions increased from 13,800 in the first quarter of 2006 to nearly 26,600 units in the third quarter 2007, reflecting higher sales of residential property, land and commercial estate by 41 percent, 54 percent and 68 percent on average. Then, there was a downward trend, falling to nearly 19,000 sales in the end of 2008, due to the regression of these categories, respectively by 10 percent, 19 percent and 15 percent. From 2009, sales showed an adjustment reaching 28,000 in the fourth quarter 2011, up 13 percent average.

Chart 5:

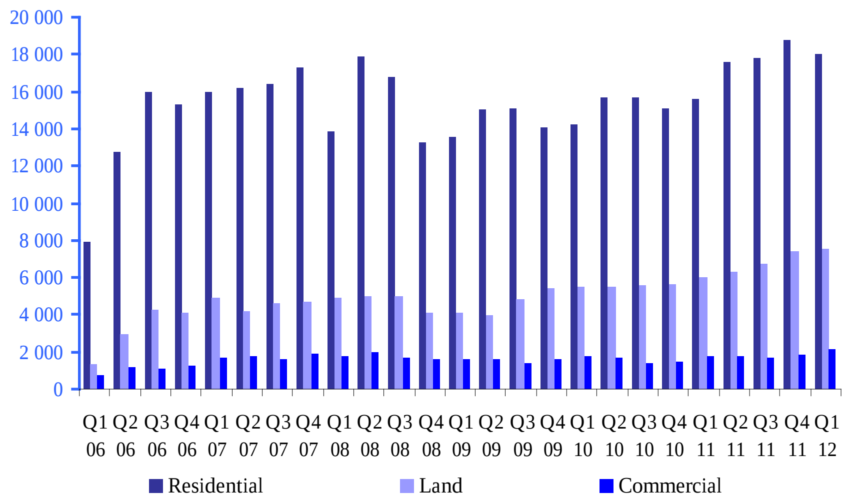
Number of real estate transactions



In the first quarter 2012, the number of residential property transactions fell at a quarterly rate of 3.8 percent to 18,022. This decrease particularly concerned apartments and villas with a decline of 4.1 percent and 5.8 percent, respectively. However, the volume of transactions on commercial and land property moved up 17.8 percent and 1.4 percent, respectively. Year on year, all real estate categories recorded higher sales, except for villas and offices whose sales dropped 18 percent and 1.1 percent, respectively.

Chart 6:

Number of Real estate transactions by category

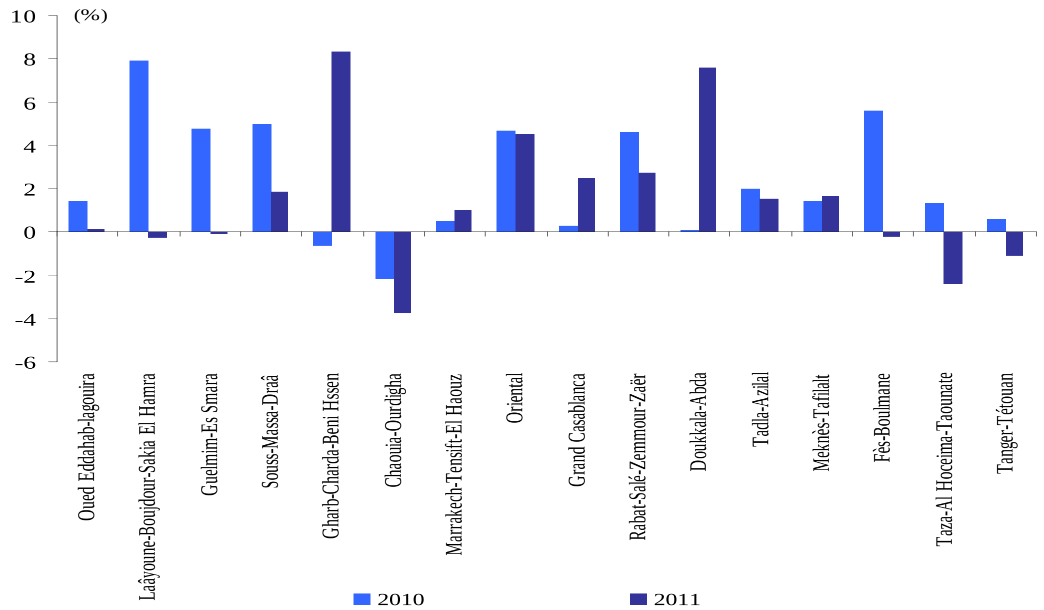


C. REPI by region

In 2011, the increase ranged from 1 percent in the region of Marrakech-Tensift-El Haouz to 8.3 percent in Gharb-Chrarda-Beni Hssen, while the price decline was mostly observed in large cities of the regions of Tangier-Tetouan, Taza-Al Hoceima-Taounate and Chaouia-Ourdigha. In other regions, prices did not change markedly.

Graph 7:

Annual change in prices by region

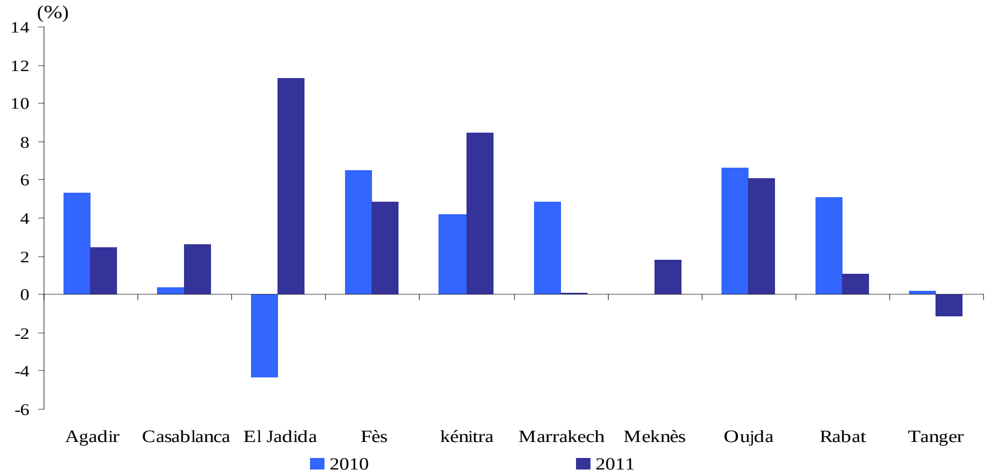


D. REPI by city[5]

By city, property prices broadly increased in 2011. Indeed, with the exception of Tangier, where they fell 1.1 percent, and Marrakech, where they virtually stagnated, prices in other cities increased within a range of 1.1 percent in Rabat and 11.3 percent in El Jadida.

Chart 7:

Annual change in prices by City



E. Importance of tracking property prices

The construction of the REPI allowed the analysis of property price fluctuations to evaluate and to understand their effects on the macroeconomic framework in general. Several studies have been conducted in this area, intending to analyze the impact of these price fluctuations on economic activity and inflation, with the aim to test a possible synchronization between the two cycles.

Taken recently into consideration in the informational system of Bank Al-Maghrib, the integration of real estate prices in the analytical device strengthens the monitoring and evaluation of monetary policy and financial stability. Indeed, fluctuations in property prices are sources of potential uncertainties about the development of aggregate demand and inflation, and ultimately on monetary policy decisions. Considering that real estate constitutes the privileged household investment, it should take a strategic position in the financial stability analytical framework.

Moreover, the significant proportion of real estate loans to total loans reinforces the importance of developments in the property market and their implications for the stability of a financial system dominated by banks. Indeed, nearly a third of the credits granted by the banking system are intended to the property sector, hence the emergence of a high risk for banking institutions that see their business broadly focused around a single sector. Thus, fluctuations in the prices of these assets could potentially threaten the functional equilibrium of banking institutions.

5 The selection focused on the 10 most dynamic cities in terms of number of property transactions.

Chart 8:

Year-on-year change in the REPI and core inflation

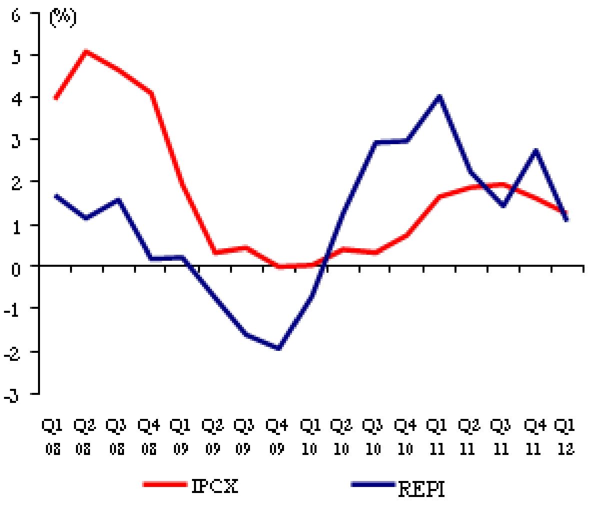


Chart 9:

Change in the REPI and real estate loan interest rates

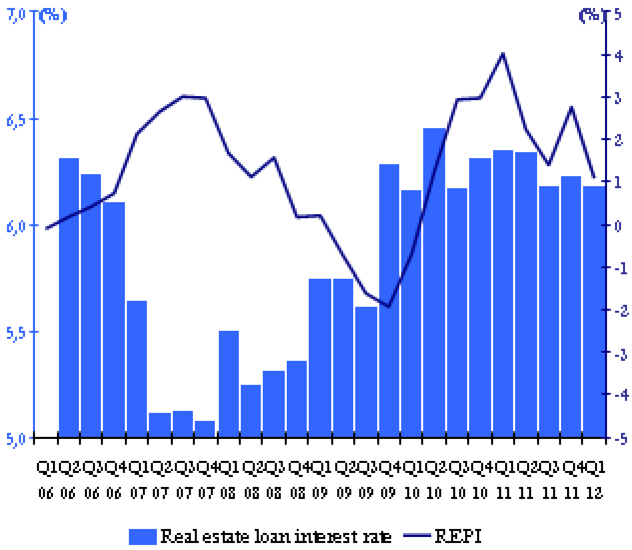
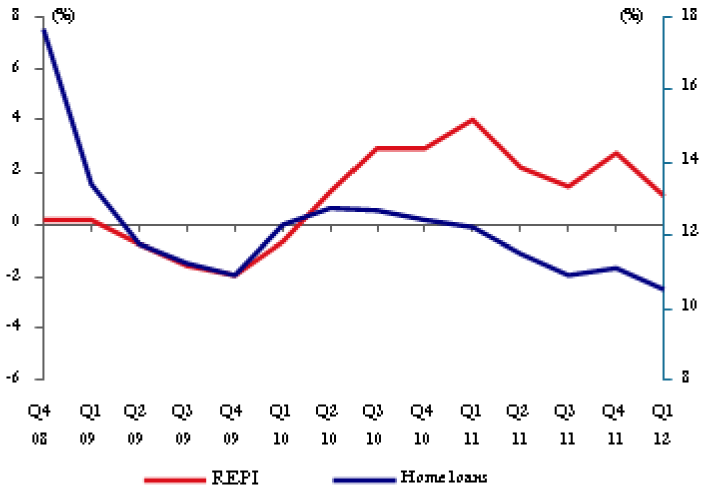


Chart 10:

Year-on-year change in the REPI and home loans



VI. Conclusion

The real estate price indexes (REPI) were jointly constructed by Bank Al-Maghrib and the Land Registry Office on the basis of the latter's data. These quarterly indexes, which have a base value of 100 in 2006, are calculated following the repeat-sales method that controls the heterogeneity of properties. This method does indeed take into account only the properties sold at least twice during the period under review.

The REPI capture changes in residential property prices nationwide, by region and by major cities in the three major types, namely residential property, urban lands and commercial property, as well as in the six categories: apartment (a dwelling located in a collective building and comprising one or several rooms), house (a single or several-story individual dwelling with no garden), villa (an individual dwelling with a garden), urban land (plot of land located in the urban area), business premises (space fitted for commercial activity) and office (working premises).

These indexes are calculated on the basis of data taken 35 days after the quarter under review, which implies an update of historical data. This update may be important because of the lag between transactions and registrations and/or the integration of property that was sold at least twice during the quarter. This methodologically rigorous approach, however, requires setting a minimum threshold of transactions for its calculation, which does not allow developing indexes for certain cities, regions and/or quarters.

Moreover, to improve the information system, the central Bank of Morocco and the Land Registry Office have started in 2012 the project for developing an index that tracks changes in new property prices, excluded by the RSM. However, due to the unavailability of information on the age of the property, the making of such an indicator faces several challenges.

Annex 1:
Different methods used internationally for compiling real estate index

Simple methods

Country	Institute	Data source	Category	Method	Frequency
France	The National Federation of Real Estate	Prices displayed in real estate agencies	existing homes	Average price per m² by category	Quarterly
Canada	Bank of Canada	Survey (Estimated prices)	bungalows and two-storey houses	National average price	Quarterly
Australia	Australian Bureau of Statistics	registered transactions	Houses	Regional average price	Quarterly
Belgium	STADIM	available data	existing homes	Average price by region and by city	Quarterly
Germany	National Institute of Statistics	notaries sales contract	existing homes	Average price by region	Annual
Spain	Ministry of Construction	available data	existing homes	Average price per m²	Monthly
Netherlands	The Netherlands Association of real estate agencies	available data	existing homes	Median price	Monthly

Econometric methods

Country	Institute	Data source	Category	Method	Frequency
France	INSEE	notaries sales contract	existing homes	Hedonic method	Quarterly
United Kingdom	Halifax	Transactions financed by HBO	existing and new homes	Hedonic method	Monthly & Quarterly
	Office of the deputy prime minister	Survey (Estimated prices)	existing and new homes	Hedonic method	Monthly
	Nationwide Building Society	Prices displayed in real estate agencies	existing and new homes	Hedonic method	Monthly
USA	S&P	available data	existing and new homes	repeat sales method	Quarterly
	Freddie Mac & OFHEO	available data	existing homes	repeat sales method	Quarterly
	Commercial department	Survey (Estimated prices)	New homes	Hedonic method	Quarterly
Hong Kong	Hong Kong property review	available data	existing homes	Hedonic method	Monthly
Sweden	National Institute of Statistics	available data	existing homes	Hedonic method	Quarterly
Switzerland	Cantonal Bank of Zurich	notaries sales contract	existing and new homes	Hedonic method	Quarterly

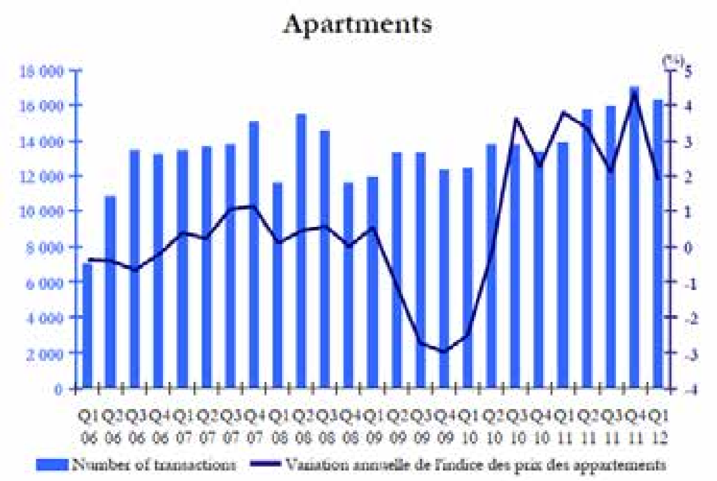
Annex 2:
Definition of properties types

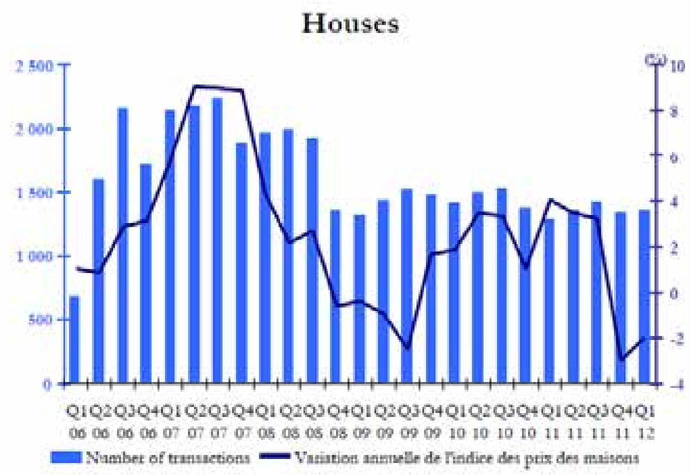
Category	Consistence	Category code
Land	Land	1
	Agricultural dry land	1
	Irrigated agricultural land	1
	Bare land	1
	Agricultural land	1
	Irrigated planted land	1
	Land intended for building	1
	Planted land	1
Villa	Villa	2
	One-story villa	2
	Two-story villa	2
partment	Studio	3
	Duplex	3
	Apartment	3
	Duplex apartment	3
	Very small apartment	3
	Room	3
House	Land with a building	4
	Building	4
	Dwelling house	4
	Ground floor	4
	Underground story	4
Business premises	Commercial building	5
	Building for industry or crafts	5
	Shop	5
	Snack	5
	Store	5
	Business premises	5
Office	Office	6

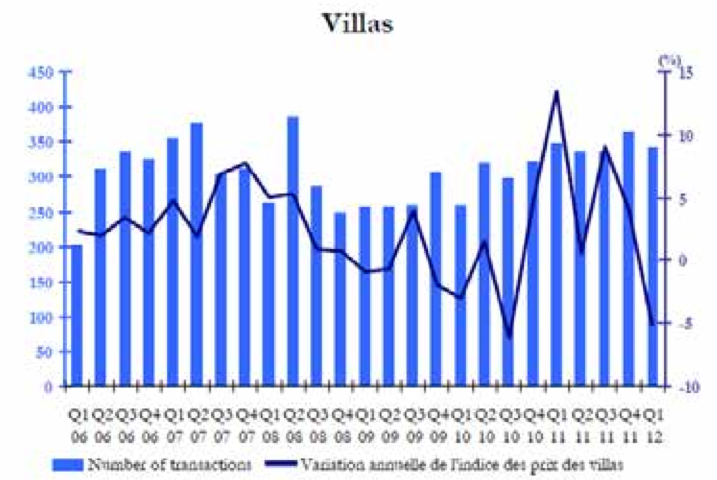
Annex 3:
Structure of real estate transactions by city in 2006-2008

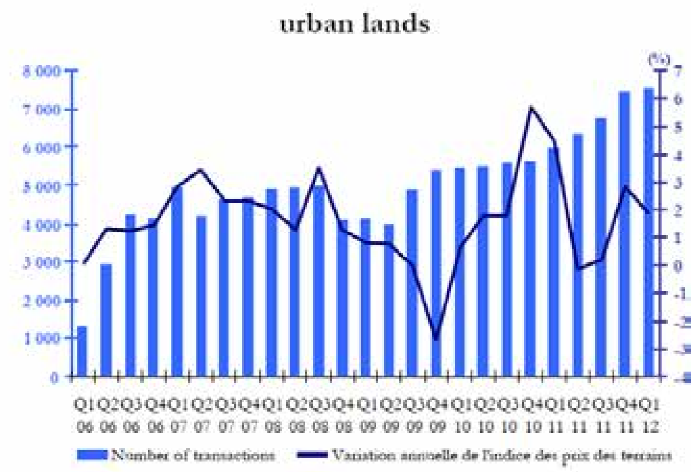
Region	City	Number of registrations				
		2006	2007	2008	Average	Rank
CHAOUIA OUARDIGHA	BERRECHID	9 523	6 811	16 242	10 859	1
	SETTAT	8 011	13 379	9 343	10 244	2
	KHOURIBGA	4 659	8 191	4 676	5 842	3
	BENSLIMANE	6 782	4 509	5 343	5 545	4
DOUKKALA-ABDA	EL JADIDA	12 018	11 688	14 763	12 823	1
	SAFI	7 857	8 922	8 757	8 512	2
	SIDI-BENNOUR	7 101	5 870	4 801	5 924	3
	SIDI SMAIL ZMAMRA		1 209	5 254	3 232	4
FES-BOULEMANE	FES	26 904	32 034	28 546	29 161	1
	SEFROU	3 478	4 124	4 077	3 893	2
	KARIA BA MOHAMED	702	917	915	845	3
	BOULMANE		1	78	40	4
GHARB CHRARDA - BENI HSSEN	KENITRA	17 980	17 946	17 363	17 763	1
	SIDI-KACEM	7 678	8 141	8 620	8 146	2
	SIDI SLIMANE	4 166	5 040	5 047	4 751	3
	SOUK ELARBAA	3 048	2 369	2 845	2 754	4
GRAND CASABLANCA	CASABLANCA	92 941	104 639	95 886	97 822	2
	MOHAMMEDIA	7 331	8 244	8 303	7 959	2
GUELMIM-ES-SMARA	GUELMIM	518	544	418	493	1
LAAYOUNE-BOUJDOUR-SAKIA-EL-HAMRA	LAAYOUNE	1 240	1 998	2 193	1 810	1
MARRAKECH-TENSIFT-AL HAOUZ	MARRAKECH	17 278	11 939	13 741	14 319	1
	ESSAOUIRA	3 013	4 065	4 340	3 806	2
	AL HAOUZ	2 311	3 250	5 131	3 564	3
	EL KELAA	1 860	2 301	2 326	2 162	4
	BENGUERIR	831	2 029	1 528	1 463	5
	CHICHAOUA	456	764	916	712	6
MEKNES-TAFILALET	MEKNES	17 758	21 750	24 700	21 403	1
	EL HAJEB	2 354	4 533	5 532	4 140	2
	IFRANE	1 535	2 962	2 173	2 223	3
	KHENIFRA	1 665	1 742	1 922	1 776	4
	ERRACHIDIA	1 136	1 174	1 350	1 220	5
	MIDELT	712	731	810	751	6
ORIENTAL	OUJDA	12 508	15 768	17 456	15 244	1
	BERKANE	5 469	7 751	6 373	6 531	2
	NADOR	2 501	2 667	3 161	2 776	3
	TAOURIRT	698	731	725	718	4
OUED ED-DAHAB-LAGOUIRA	DAKHLA	868	1 030	958	952	1
RABAT-SALE-ZEMMOUR-ZAËR	TEMARA	15 102	21 781	25 650	20 844	1
	SALE	17 960	15 894	26 028	19 961	2
	RABAT	10 888	11 966	13 076	11 977	3
	KHEMISSET	7 036	9 362	8 407	8 268	4
	ROMMANI	3 321	2 914	3 274	3 170	5
SOUSS-MASSA-DARAA	AGADIR	14 486	17 789	16 928	16 401	1
	INEZGANE AIT MELLOUL	7 216	6 532	3 660	5 803	2
	TAROUDANT	2 611	3 819	3 104	3 178	3
	TIZNIT	2 581	2 847	2 220	2 549	4
	OUARZAZATE	904	1 184	1 299	1 129	5
TADLA-AZILAL	FQUIH BEN SALAH	5 599	7 899	8 277	7 258	1
	BENI-MELLAL	5 518	4 940	5 418	5 292	2
	AZILAL	613	533	516	554	3
TANGER-TETOUAN	TANGER	18 628	24 809	32 088	25 175	1
	TETOUAN	6 302	6 929	8 168	7 133	2
	LARACHE	4 033	5 418	5 220	4 890	3
	MDIQ FNIDEQ		204	1 437	821	4
TAZA-HOCEIMA-TAOUNATE	TAZA	5 209	6 355	5 716	5 760	1
	TAOUNATE	1 135	1 218	1 318	1 224	2
	AL HOCEIMA	817	822	1 158	932	3
	GUERCIF		0	1 281	641	4

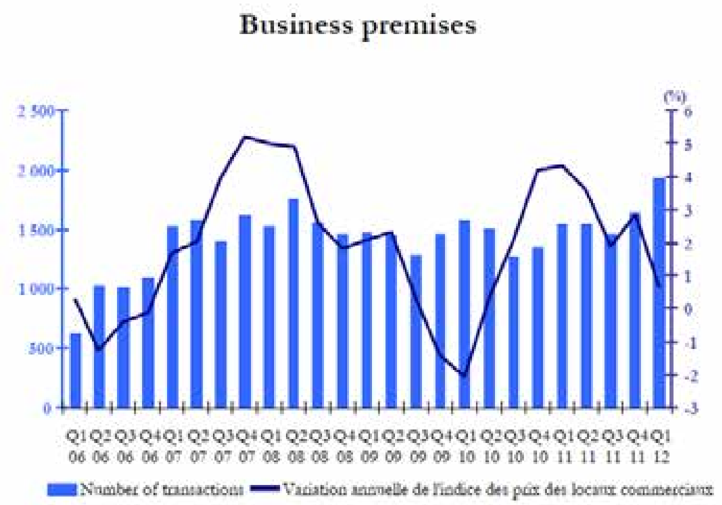
Annex 4:
Results of the real estate price index by category

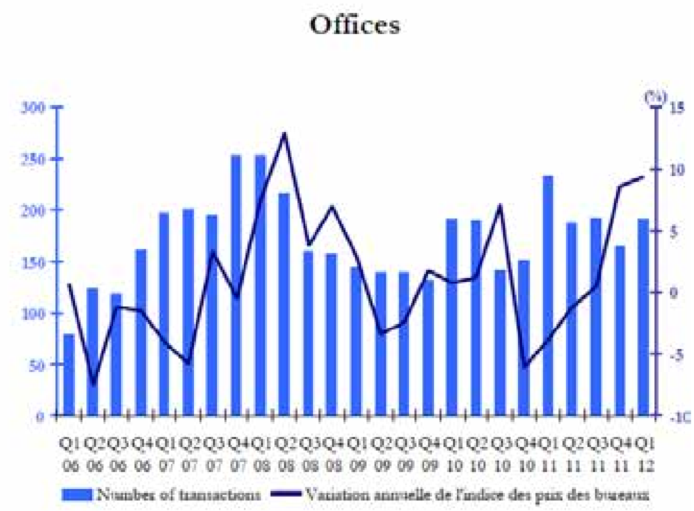












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Constructing a house price index for Turkey[1]

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I. Introduction

The primary goal of the Central Bank of the Republic of Turkey (CBRT) is to achieve and maintain price stability through the framework of inflation targeting policy. Accordingly, predicting the future course of inflation in a precise manner is a crucial objective to maintain this goal. Therefore, monitoring developments in house prices is an important factor underlying monetary policy decisions aimed at maintaining price stability. A true measure of house prices is also an important concern for promoting financial stability.

Within this framework, constructing a house price index (HPI) for Turkey had long been one of the considerations of the CBRT. The implementation of inflation targeting regime since 2006 has reinforced that intention as the CBRT also has to be aware of any factor that may have an impact on price stability. Moreover, the global financial crisis in 2008, and the enactment of mortgage law in 2007 also made it clear that a house price index was needed for Turkey.

This paper intends to present our experiences of compiling and constructing an HPI by using the Stratified Median Price Method. Within this context, we first stress the importance of monitoring house prices from the perspective of central banks. Secondly, the methodology including data sources, scope and analysis are explained.[3] Finally, we discuss our results and provide an analysis of empirical relations between interest rates, housing loans and the index.

Developing such a measure is a challenging task in practice. The main challenge is the heterogeneous nature of the housing market. No dwelling is the same of the other, differing according to various characteristics relating to physical attributes or to locations. Moreover, the characteristics of the houses transacted in the market may change over time. Another challenge is the illiquidity of the housing market in the sense that sales of houses are not frequent. In addition, it is not easy to observe the price of a dwelling before the sale is realized and the actual sale prices are usually not reported. In the face of such challenges, we take into account available sources, approaches and methodologies to be able to construct the most representative index.

There are four main methods suggested for constructing a house price index in the literature: Repeated Sales Method, Hedonic Regression, Sales Price Appraisal Ratio Model and Stratification. Considering the data availability and statistical applicability, we decided to use stratified median price method for constructing an HPI for Turkey.

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2 Statistics Department, Central Bank of Turkey. Corresponding author: Özgül Atılgan Ayanoğlu (E-mail: ozgul.ayanoglu@tcmb.gov.tr) The views expressed in this paper are those of authors and do not necessarily reflect the views of the Central Bank of Turkey or its staff.

3 Prasad and Richards (2006 and 2008) on stratification and documents of Australian Bureau of Statistics (2006 and 2009) on developing a house price index for Australia using stratification constituted guidance for our study.

The structure of the paper is as follows. In the next section, we emphasize the importance of monitoring house prices for central banks. Then, we introduce our methodology in section 3. Section 4 presents our results and section 5 concludes the paper.

II. The importance of monitoring house prices for central banks

Monitoring house prices is of significant interest for central banks from a number of perspectives. Changes in house prices play an important role in the transmission mechanism of monetary policy and may have a significant impact on aggregate demand and inflation. The housing market can influence monetary transmission through three channels, the interest rates, the asset prices and the credit channel.

The interest rate channel has a direct effect on consumption and investment decisions and ultimately economic activity and inflation. Expansionary monetary policy in the form of lowering interest rates will increase the demand for housing which leads to higher house prices. The resulting increase in total wealth will in turn raise household consumption and aggregate demand. The fact that a number of countries experienced an environment of historically low interest rates and rapid increase in house prices during the last decade highlights the important role of the monetary policy on the housing market.

The asset price channel relates to the wealth effect generated by increasing house prices leading to higher consumption possibilities, causing pressure on consumer prices. Another perspective regarding the impact of house prices is that, rising house prices may stimulate housing construction expenditures and thereby increase aggregate demand. The recent economic crisis designated that the developments in asset prices, especially housing prices, could have significant negative effects on the real economy.

In the years leading to the crisis in the United States, interest rates had been at historical lows as the Federal Reserve Bank had cut interest rates significantly to avoid going into recession in the early 2000s. Low interest rates reduced borrowing costs and created easy credit conditions encouraging households to invest in housing, leading to house price increases. Easy credit conditions coupled with the expectations that house prices would continue to rise, encouraged speculation and some households even started to buy second homes in order to profit from house price increases triggering a housing boom. Expectations of continuous rise in house prices led the investors to undertake adjustable-rate mortgage loans and the eagerness of the banks to get higher interest earnings led them to extend loans to sub-prime borrowers with low credibility which were securitized. The above mentioned reasons caused the sub-prime mortgage market develop fast.

From the second quarter of 2006, the housing market began to cool down with prices starting to drop. Borrowers found it difficult to sell houses or refinance through mortgage. As a result of the slowdown in the housing boom coupled with slowly climbing interest rates, large numbers of sub-prime mortgage clients were unable to repay their loans. Consequently, defaults over such loans started and securities backed with sub-prime mortgages lost most of their net worth and financial health leading to a global financial crisis.

The recent crisis showed that large increases in asset prices can be a threat to price stability. Since the crisis, there has been an increasing recognition among economists and policymakers that central banks should monitor asset prices as well as goods prices (Blanchard et al., 2010).

Before the recent financial crisis, the common view both in academia and in central banks was that achieving price and output stability would promote financial stability. Thus, almost all central banks in both advanced and emerging countries adopted monetary policy frameworks with price stability as the primary objective (IMF Monetary and Capital Markets Department, 2010). However, an important lesson learned from the crisis is that, in an environment in which prices of goods and services follow a stable path, increasing asset prices stands as a violating factor to financial stability. An exclusive focus of monetary policy on achieving price stability is inappropriate in a world where asset-price misalignments and financial imbalances are increasingly prevalent (Bean, 2003). Central banks should view price stability and financial stability as highly complementary and mutually consistent objectives, to be pursued within a unified policy framework (Bernanke and Gertler, 1999). As a matter of fact, the opinion that central banks having risks in their financial system should not totally ignore the bubbles in asset prices is gradually becoming widespread in global platforms.

The credit channel has fairly similar effects. Whenever demand is encouraged by an expansion in credits, house prices go upwards increasing the housing wealth which induces consumption expenditure.[4]

The recent financial crisis has also raised the question of whether a central bank should be concerned about housing price inflation. In practice, many central banks target the inflation rate measured by the consumer price index (CPI) and housing in the form of rental prices is an important component of the consumption basket.

Under these observations and theoretical considerations,[5] it is evident that constructing a house price index will be of great importance for many institutions, prominently central banks, which pays attention to price stability.

III. Methodology

a) Data sources and scope

In the housing market, prices of properties become available when they are actually sold but actual transaction prices are usually not reported. Therefore, a proxy price which is both reliable and able to reflect the actual price is needed. As a starting point of finding an appropriate proxy for price, banks and real estate appraisal companies were inquired as possible data sources. A pilot study was carried out for Ankara and valuation reports which are prepared by real estate appraisal companies at the time of approval of individual housing loans extended by banks were compiled and analyzed. Analysis of the compiled data demonstrated that appraised value for a dwelling can be used as a proxy for price in the absence of reliable administrative records for transaction prices. In addition, the study designated that valuation reports could be rich data sources since they contain detailed qualities of the dwellings as well as information about the location of the dwellings. On the other hand, we observed that valuation reports prepared by real estate appraisal companies did not have standard formats. As a result, two critical decisions have been made after the pilot study. First, banks have been determined to be the primary data source. Second, appraised values of dwellings are determined to be used as a proxy for price.

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4 Unlike many other assets, housing can be used as collateral for loans. When house prices rise, there is an increase in the amount of collateral at home owners' disposal. This can also pave the way for houses to be used as collateral in extension of further credits since the lenders are usually prepared to lend more when there is more collateral (Benito et al., 2006). The increase in the value of assets that can be used as collateral also enhances the borrowing possibilities of individuals. The self-feeding mechanism created in this way may lead to bubbles in the housing market. In case macroeconomic conditions begin to reverse, the mutuality between two markets may intensify the worsening of the economic situation (IMF, 2006).

5 Fenwick (2009) sums up the importance of house price indices as follows: He states that calculating an HPI is crucial as it is a macroeconomic indicator signaling the path of inflation - gaining particular importance under inflation targeting regime-, a measure of wealth, a variable that can be used to measure the risk of financial stability, a variable that can be used as a deflator in the calculation of national accounts and an input that can be used in the calculation of other price indices.

From the viewpoint of the CBRT, the presence of an official valuation of a dwelling is sufficient to be included in the data scope. Therefore, the actual sale of the property and utilization of the loan is not required and all appraised houses are included in the scope.

The appraised values of houses are reported on a monthly basis via a standard format determined by the CBRT (See Appendix 1). While designing the standardized reporting format, a selection was made among the variables existing in the valuation reports. They were chosen according to their importance in constructing a representative index taking into account the alternative methods that could be used in the future. The format consists of a wide set of variables including quality characteristics of the dwellings. In addition to the variables provided by the banks, some other variables required for calculation of the index are produced out of the collected variables. Unit price, which is calculated by dividing the value of a property by its gross area of use, is one of those variables.

The set of valuation data is classified according to the year of construction and mainly two types of indices are produced based on this classification. To construct the House Price Index for Turkey (THPI), all valuation reports are used; whereas, to construct the New Housing Price Index for Turkey (TNHPI), valuation reports for houses built in the current and previous years are used.

b) Compilation and data control

As mentioned in the previous part, data required for constructing the HPI are provided by the banks extending housing loans. Banks transfer the data of the related month in the first 10 business days of the following month by using the predetermined reporting format to the CBRT. At the first stage of constructing the index, the data are exposed to certain controls. After the initial controls by the banks, the data are transferred electronically to the CBRT. A second control is conducted by the CBRT while transferring data to the database. Banks are informed of the data that violate the control criteria and are asked to make necessary corrections. After the elimination of erroneous data, remaining data is used in the calculation. At the second stage of constructing the index, the data set is exposed to extreme value analysis by using the Tukey's Hinges method. According to this method, unit prices which qualify the following equation are accepted as extreme values and excluded from the analysis;

$$m^2 \ unit \ price < Q_1 - 3 \times (Q_3 - Q_1) \ or \ m^2 \ unit \ price > Q_3 + 3 \times (Q_3 - Q_1)$$

where

Q_1 = Lower Quartile and Q_3 = Upper Quartile

c) Stratified median price method

As monitoring house prices is of significant interest to central banks, constructing a robust indicator of developments in the housing market is crucial. However, measuring house prices accurately is a very complicated exercise due to certain characteristics of the housing market. First of all, the housing market is quite heterogeneous in nature. It is composed of units which are totally unique to themselves. That is, no dwelling is the same of the other, differing according to various characteristics relating to physical attributes or to locations. Secondly, the market is illiquid in the sense that sales of houses are not frequent. Moreover, it is not easy to observe the price of a dwelling before the sale is realized and the actual sale prices are usually not reported. Considering these complexities, we tried to capture the most representative index by trying to obtain the most realistic values of the dwellings as well as building up a sample that has a high representation for reflecting the general features of the region for which the index is calculated.

In the literature, there are 4 main methods used in the calculation of house price indices (Eurostat Handbook on Residential Property Price Indices, 2011): Repeated Sales Method, Hedonic Regression, Sales Price Appraisal Ratio Model and Stratification. Each of these methods has certain advantages and disadvantages. In addition, depending on the differences in their calculation methods, each of them may require data sets differing in terms of both sample size and content of the data. One of these methods is the repeated sales method, which compares the sale prices of the same dwellings from different regions sold at least twice during the period covered by the dataset. The index is formulated by taking the ratio of the first sale price to the second one. The hedonic method rests upon the formation of a regression model in which the dependent variable is the price of houses and the explanatory variables are those representing the quality of the dwellings which have considerable impact on the prices. The sales price appraisal ratio model defines two prices: the appraised value determined by considering the qualities and the actual transaction price. The index is calculated by taking the ratio of these two prices.

The "Stratified Median Price Method", which has been preferred for constructing the HPI for Turkey is based upon the idea of dividing the heterogeneous housing market into homogeneous strata. Strata are defined considering the balance of homogeneity of housing characteristics and the number of observations required for producing a reliable median unit price. The median unit price for each stratum is then weighted to reach the overall price index.

As in the hedonic model, there is an emphasis on the characteristics of the dwellings that have impact on the price. However, the focus on this method is on forming homogeneous strata in terms of both price and quality. Since homogeneity is a crucial concept for this method, the criterion according to which homogeneity is determined constitutes a considerable part of the analysis.[6] Country experiences and guidelines such as *Eurostat Handbook on Residential Property Prices Indices (2011)* provide different insights in terms of the criteria to be selected. According to Eurostat Handbook, area of the structure, area of the land, the location of the property, the age of the structure and the type of the structure are the most important price determining characteristics of properties.

In our study, the variable chosen in forming the strata is geographical location, where the housing market is divided into regional units. The reference point for such a grouping is NUTS. The first regional unit is NUTS Level 2 while the second one is NUTS Level 3 which represents the provinces. The last unit corresponds to towns, constituting the core unit for strata. Monthly data availability is also taken into account in determining the strata. In case of insufficient data[7] for the towns, provinces are accepted as strata. Similarly, in case of insufficient data for provinces, NUTS Level 2 units are accepted as strata.[8]

Another significant aspect of this method is the measure of median price. The HPI relies on the assumption that the median unit price of appraised houses is indicative of the median unit price of all houses sold. The median unit price denotes the median price calculated by using a quarterly dataset of unit prices including the reference month, the preceding month and the succeeding month by excluding the extreme values in each stratum. Since the

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6 Despite all the advantages of this method over other methods such as requiring a less complicated data set spanning over a shorter period, it also has certain drawbacks. Since the qualities of the dwellings are not depicted as clear as in the hedonic model, the method may have deficiencies in reflecting the compositional changes taking place in the dwellings of the selected sample. This deficiency may also lead to a bias in the index in that the disruption caused by the compositional change cannot be corrected since its impact cannot be detected. Moreover, the method is prone to the number of data collected for each stratum. For periods in which sufficient data cannot be collected, the median price may not represent the intrinsic characteristics of that stratum, leading to a situation which cannot be corrected without continuous tracing of the strata.

7 50 observations are accepted to be sufficient for each stratum.

8 When a unit is accepted as the stratum, median for that unit is calculated using the whole data gathered for that unit. Therefore, due to insufficiency of data, it is possible to observe NUTS-Level 2 units which are accepted as strata in the calculation of the index.

distribution of the unit prices in a stratum is positively skewed, the median value produces a more robust indicator than the mean value (EUROSTAT, RPPI Handbook, 2011). Moreover, it is more likely that median prices filter out the outliers and reflect the central tendency better than mean prices. For these reasons, a median based measure tends to be less volatile than a mean based measure (McDonald and Smith, 2009).

d) Data analysis and construction of HPI

The most important and challenging part of the method of stratified median price is forming homogenous strata having similar price distributions i.e. possessing analogous house properties. According to Hansen (2006) it is possible to generate good estimates of short-term price movements from median prices, if the medians are taken from an appropriately stratified data sample that is designed to address the key problems of compositional change. For the Australian case, Olczyk and Lane (2008) group suburbs that have similar price levels and price movements in order to stabilize the city-wide movements over time and capture the pure price evolution of the housing stock.

Within this context, we observed that the geographical units of Turkey could form the strata. Therefore, a geographical unit is determined as a stratum if the number of observations is sufficient and the distribution converges to a normal distribution to calculate the median price.

The THPI is calculated by weighing the median unit price of each stratum which is defined as the geographical unit having sufficient number of data by using stratified median price method. The stratum may be a town, a province or a territorial unit according to the number of observations and the distribution of the data. For constructing the overall index; at the first stage the weighted average of the median unit prices for each town is taken to constitute median unit prices for provinces. At the second stage, the median unit prices of the provinces are weighted to constitute the median unit prices of the territorial units. Finally, the overall index is computed by taking the weighted average of median unit prices of the territorial units. For constructing the TNHPI, the median unit prices of the provinces are weighted to constitute the unit price for the whole country directly.

Considering the geographical scope, the THPI, which is constructed on a countrywide basis, covers data pertaining to all appraised houses in 73 provinces and 26 NUTS[9] Level-2 regions covering those provinces. Eight provinces are excluded from the scope due to insufficient number of observations. While constructing the TNHPI, data pertaining to the valuations of new houses in 26 provinces where there are sufficient observations are used.

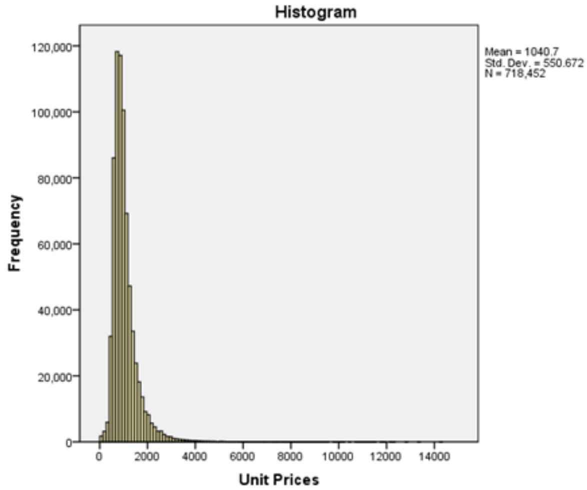
Whether to use the unit price or the appraised value itself is also an important issue that has to be taken into account for constructing the HPI. "The simplest measures of house price changes are based on some measure of central tendency from the distribution of house prices sold in a period, in particular the mean or the median. Since house price distributions are generally positively skewed (predominantly reflecting the heterogeneous nature of housing, the positive skew in income distributions and the zero lower bound on transaction prices), the median is typically used rather than the mean"(EUROSTAT,RPPI Handbook, 2011).

We observed that the distribution of the data set used in constructing the HPI for Turkey is skewed to the right almost for each stratum. An example of a right skewed distribution of house prices can be seen in Figure 1. Moreover, the defined strata have more homogenous distributions in terms of unit prices in comparison to the appraised values. As a result of the

[9] Nomenclature of Territorial Units for Statistics (NUTS) is the regional unit classification designed for Turkey in compliance with the European Union Regional Statistics System to develop a comparable statistical database.

aforementioned distribution analysis, we decided to use the unit price rather than the appraised value, and the median unit prices rather than the mean unit prices.

Figure 1. Whole data set



We aimed to obtain the optimum stratification that ensures both homogenous groupings and sufficient number of observations for each stratum in each period. While analyzing the data, we noticed that the distribution approximates to normal distribution when there are 50 or more observations for each month. Following Olczyk and Lane (2008), who constructed visual quality measures while refining the stratification for Australian House Price Index, we used histograms and boxplots in the decision making process of constructing strata. The histogram of the number of observations received from Town A, which is determined to be a stratum, can be seen in Figure 2, whereas Figure 3 shows the same kind of a histogram for Town B, which is not determined to be a stratum. As Figure 3 displays, we received less than 40 observations from Town B in each month. Therefore, Town B does not satisfy our sufficient number of observations criterion.

Figure 2. Data from Town A

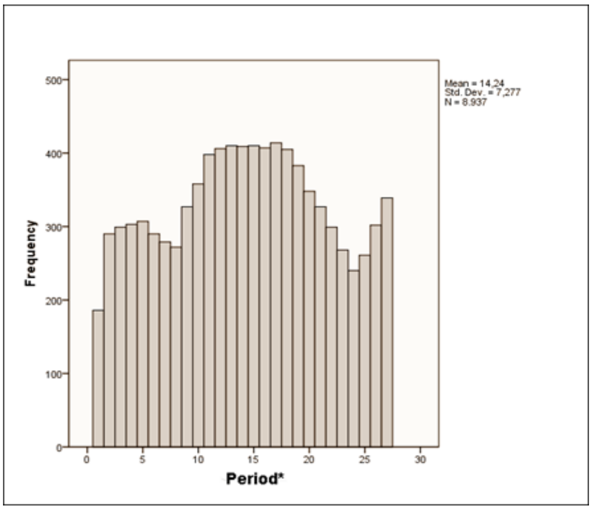
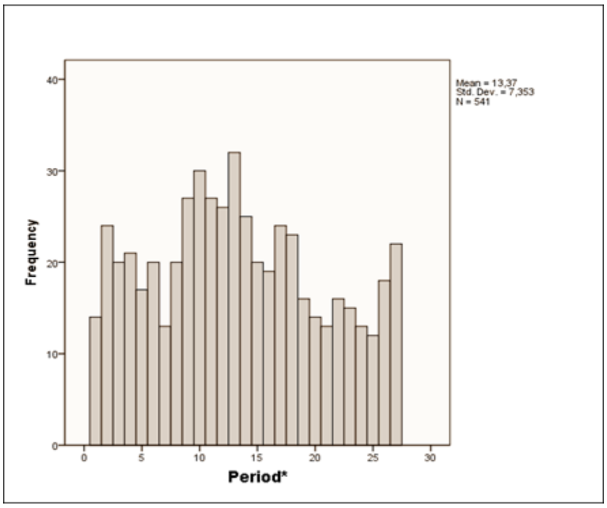


Figure 3. Data from Town B



*Indicates months starting from January 2010

Examining the boxplots of unit prices for each geographical unit, we explored the distributional properties of each unit and the variations in medians and interquartile ranges. From the box-plot presentation in Figure 4, a steady median unit price for Town A is observed for each month, whereas as seen in Figure 5, Town B shows a volatile unit price distribution which is a long way off a normal distribution. In the case of Town A, it can easily be seen that, range of the data, median of the data as well as the range of the first and the third quartiles are all close to each other in each period. However, in the case of Town B, the median, the first and the third quartiles change from period to period. For this reason, we decided that if a town has at least 50 data in each period and converges to normal distribution then it becomes a stratum, otherwise it does not.

Figure 4. Unit Price for Town A

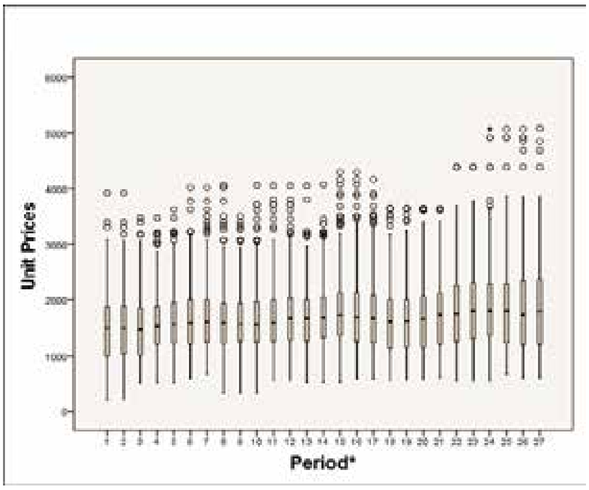
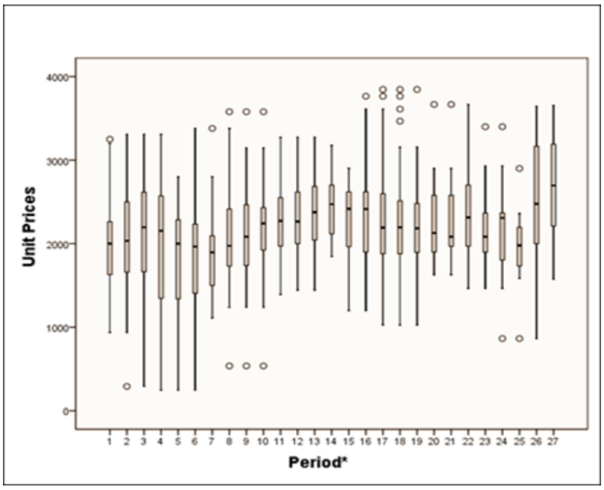


Figure 5. Unit Price for Town B



*Indicates months starting from January 2010

After deciding on the strata on geographical basis, we investigated whether each cluster has smaller and more homogenous strata in itself. Because the data include the information of number of rooms we tried to subgroup the data accordingly. For instance, for Town A, houses are separated into 3 groups for each period; houses including less than 4 rooms form Group 3, houses including 4 rooms form Group 4 and houses including more than 4 rooms form Group 5. It can be seen from the histograms depicted in Figures 6-11 that the number of data in each group differs from each other considerably and majority of the observations appear in Group 4. The box-plot presentations support the view that the structure of the distributions highly depends on the number of observations. It can be observed from the box-plot presentation for Group 4 that the median, the first and the third quartiles of house prices exhibit a relatively stable structure, whereas they show a volatile structure for the other two groups. Therefore, since the house prices are not evenly distributed between the groups and prices do not represent a normal distribution for each group, we decided not to create sub-strata by adding another dimension to the stratification procedure such as the number of rooms.

Figure 6. Data for Group 3

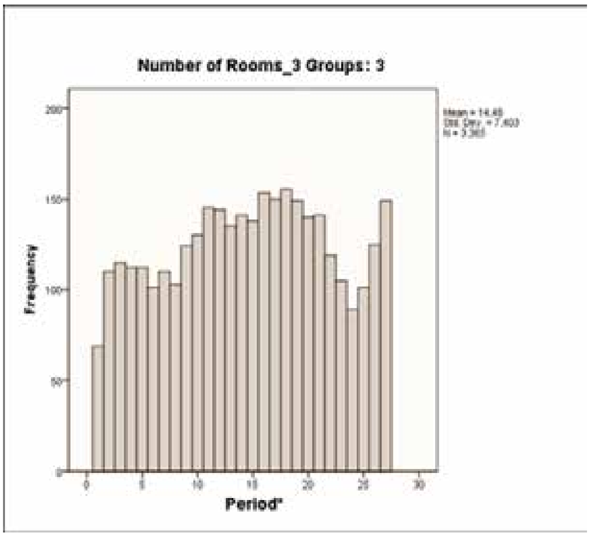


Figure 7. Appraised Value for Group 3

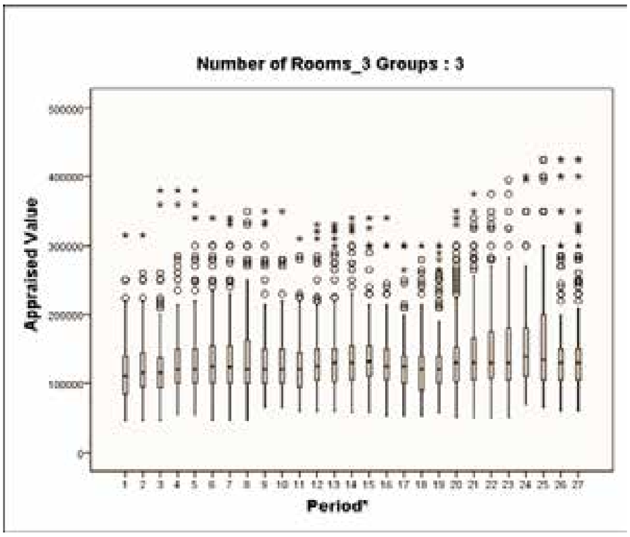


Figure 8. Data for Group 4

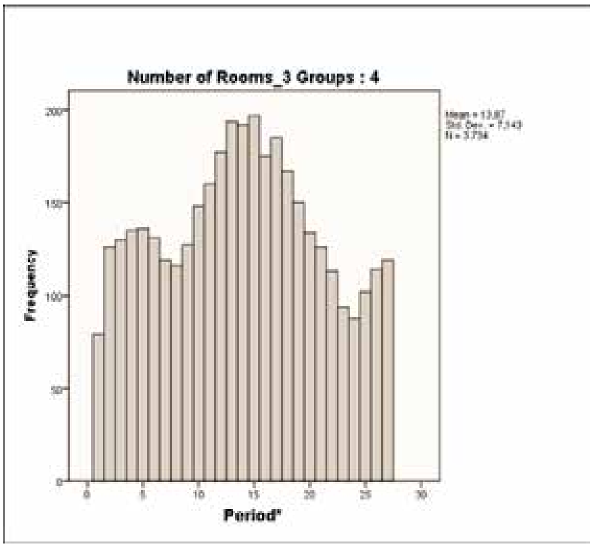


Figure 9. Appraised Value for Group 4

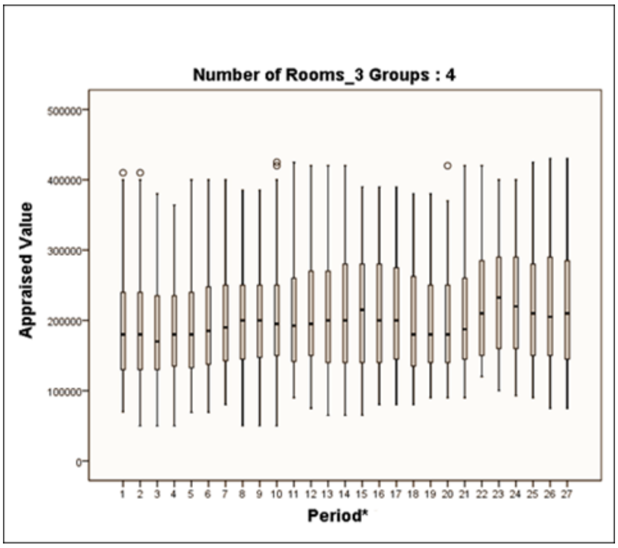


Figure 10. Data for Group 5

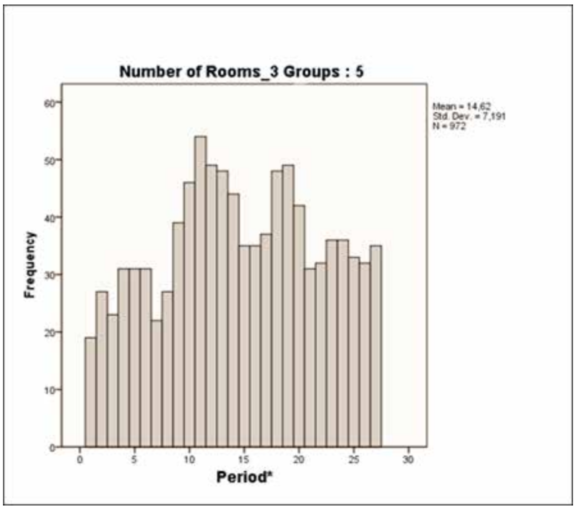
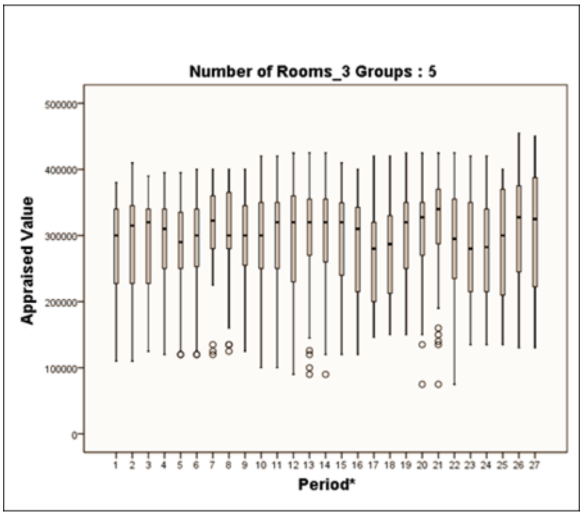


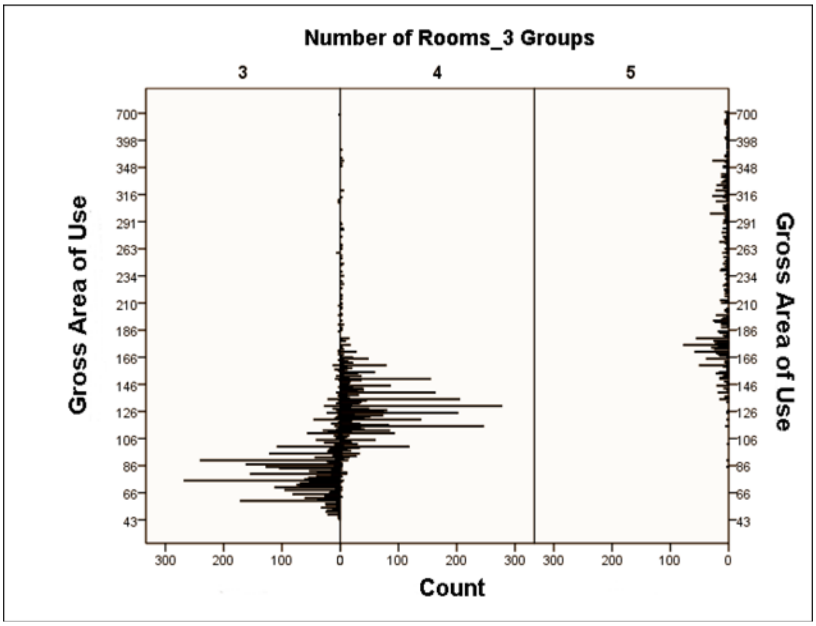
Figure 11. Appraised Value for Group 5



*Indicates months starting from January 2010

Following the decision of using median prices and defining the strata on geographical basis, another issue that comes into question is to whether to use the unit price or the appraised value itself. Unit price is calculated by dividing the appraised value of a dwelling by its gross area of use. By this way it covers the effect of the gross area of use to the price. Moreover, there is a high and positive correlation between the gross area of use and the number of rooms which can be observed from Figure 12 below. As seen in the figure, there is a meaningful discrepancy in the gross area of different groups based on the number of rooms. In other words, as the number of rooms gets higher, the area gets larger.

Figure 12. Gross Area of Use and Number of Rooms



Due to the high correlation between the gross area of use and number of rooms, unit price also covers the effect of number of rooms. As it can be seen in the box-plot presentations below in Figures 13 and 14, the difference between the medians of the unit prices for each subgroup according to the number of rooms becomes insignificant in the case of unit price compared to the appraised value. Figure 15 below also displays that unit price distribution for each subgroup formed based on number of rooms resemble each other.

For these reasons, we decided to use unit price rather than appraised value of dwellings in constructing the index.

Figure 13. Appraised Value and Number of Rooms

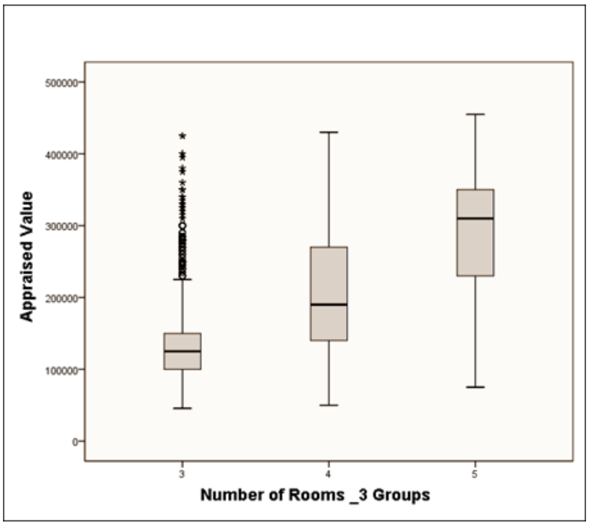


Figure 14. Unit Price and Number of Rooms

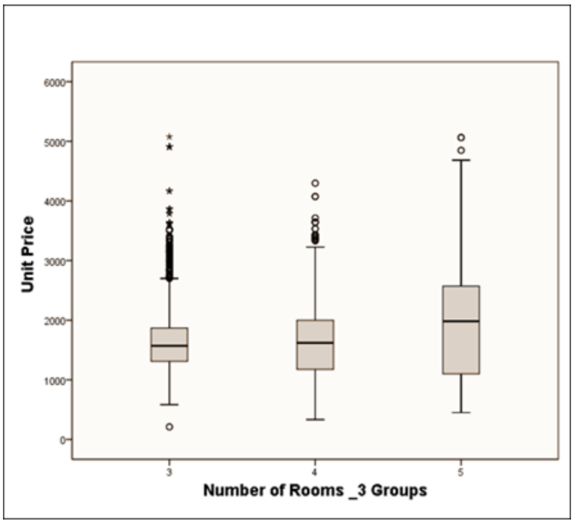
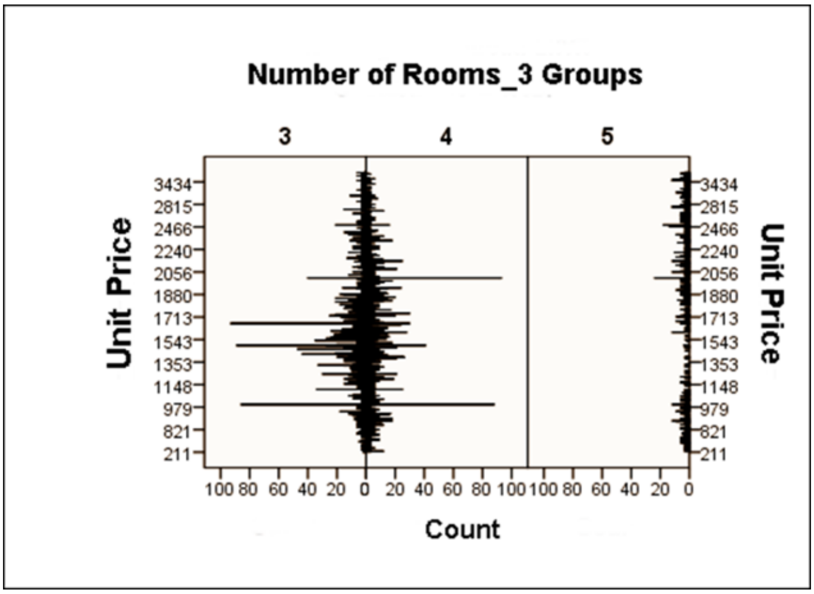


Figure 15. Unit Price and Number of Rooms



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e) Weighting and calculation

Weighting

Another important issue for constructing the index is determining the weights to be used. Data on house sales registered by the General Directorate of Land Registry and Cadastre (LRC) are used as weights for aggregating the strata in constructing the THPI, whereas building occupancy permit statistics issued by TURKSTAT are used for weighting in computing the TNHPI.

Weights used to produce the THPI are updated each year with the weights calculated using the number of houses sold in the related stratum in the previous year. In calculating the indices for the very first years of the series, 2010 and 2011, house sales data for 2011 are used as an exception.

On the other hand, building occupancy permits issued in the two consecutive years preceding the reference year are used to calculate the weights for constructing the TNHPI.

Calculation

The House Price Index (2010=100), which measures changes in the house prices compared with the base year, is calculated using the Chain Laspeyres Index method. The reason for the implementation of the chain index method is that the weights are updated each year.

Calculation of the Index for the Base Year:

$$I_{(t,0)} = ((\sum w_{(i,0)}\ p_{(i,t,0)} / (\sum\sum w_{(i,0)}\ p_{(i,k,0)})/12 * 100$$

$I_{t,0}$: index for the reference month of the base year, ωi0: weight for stratum i in the base year,

$p_{i,t,0}$: price for stratum i for the reference month in the base year, pik0: price for stratum i for the month k in the base year.

$p_{i,k,0}$ **:** price for stratum i for the month k in the base year.

$w_{i,0}$**:** weight for stratum i in the base year

Calculating the Chained Index:

$I_{(t,y)} = ((\sum w_{(i,y)}\, p_{(i,t,y)} / \sum w_{(i,y)}\ p_{(i,12(y-1))}) * I_{12(y-1)}) * 100$

$I_{t,y}$: index for the reference month,

$\sum w_{i,y}$: weight for stratum i in the current year

$p_{i,t,y}$: price for stratum i for the reference month,

$p_{i,12(y-1)}$: price for stratum i for December the previous year,

$I_{12(y-1)}$: index for December the previous year.

IV. Results

The indices we constructed consist of the THPI, the TNHPI and indices developed on the basis of NUTS Level 2. Additionally, indices for all houses and new houses are calculated for three large provinces, namely İstanbul, Ankara and İzmir. The base year for indices is 2010. All series starting from January 2010 are announced on a monthly basis.

a) House Price Index for Turkey (THPI)

Figure 16. THPI and Square Meter Prices

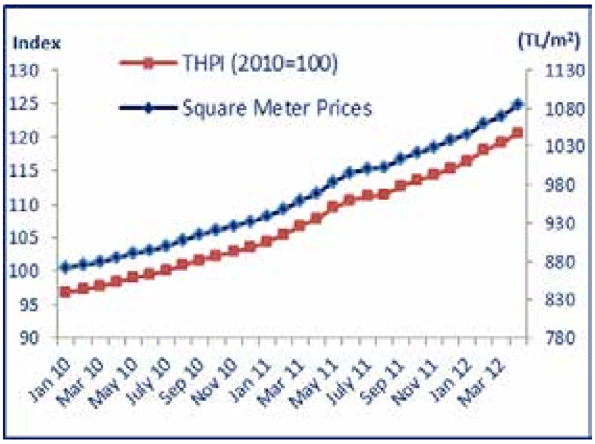
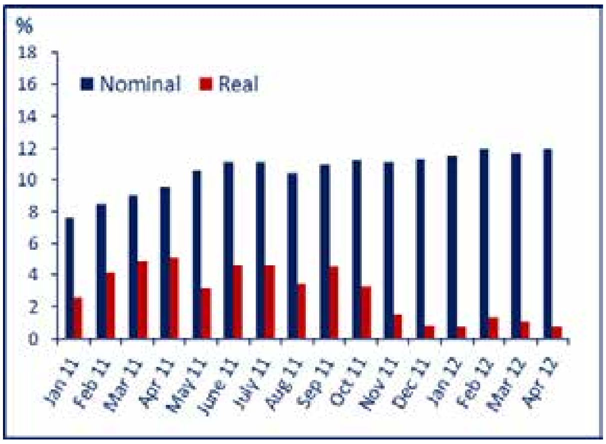


Figure 17. THPI Annual Percentage Changes



As it can be seen from Figure 16, the THPI has shown an increasing trend from the beginning. From January 2010 to April 2012, the index increased by 24.4 percent. However, the increase expressed in real terms[10] in the same period is 4.6 percent. The unit price calculated for the whole country was 872.0 TL at the beginning of 2010 and it increased to 1085.1 TL in April 2012.

[10] The real change is computed by using the CPI (2003=100).

b) New Housing Price Index for Turkey (TNHPI)

Figure 18. THPI and TNHPI

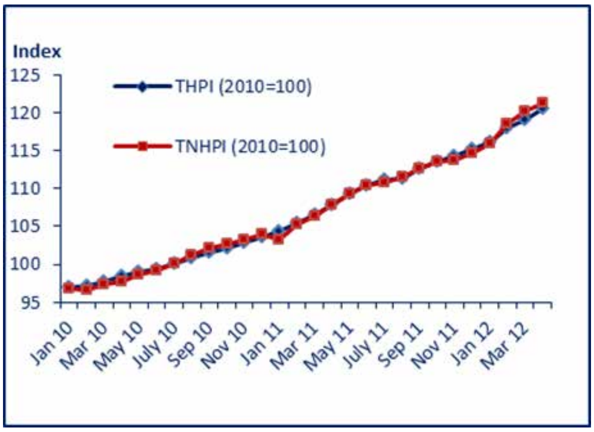
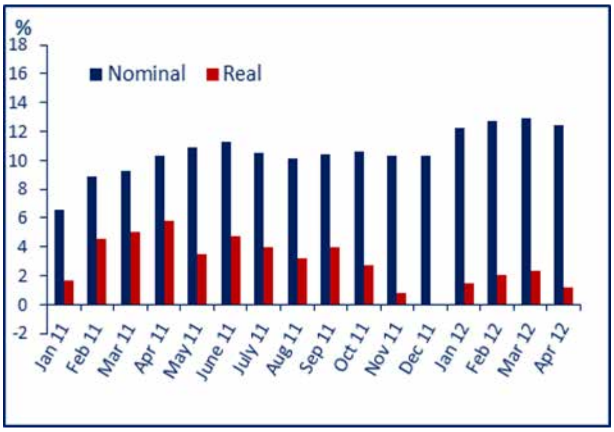


Figure 19. TNHPI Annual Percentage Changes



The TNHPI has also shown an increasing trend similar to the THPI but it shows a slightly more volatile pattern (Figure 18) mainly due to the structure of the new housing market. From January 2010 to April 2012, TNHPI increased by 25.3 percent. The real increase in the same period is 5.3 percent.

c) House price indices for three large provinces

Figure 20. HPI for Three Large Provinces

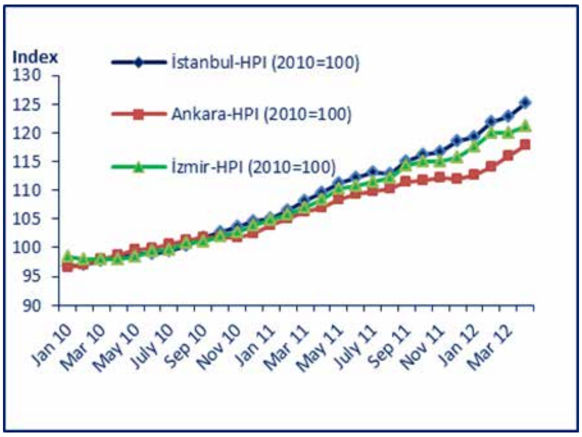
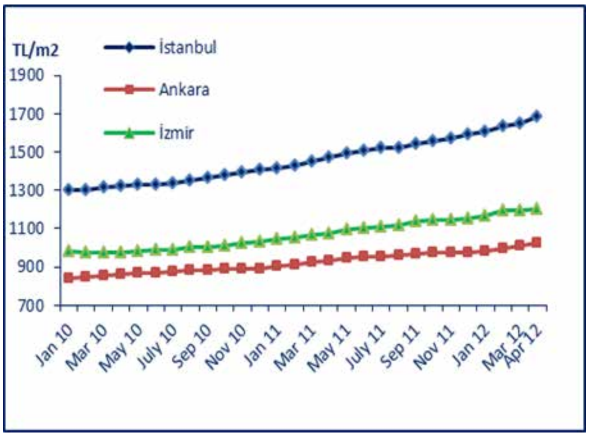


Figure 21. Square Meter Prices for Three Large Provinces

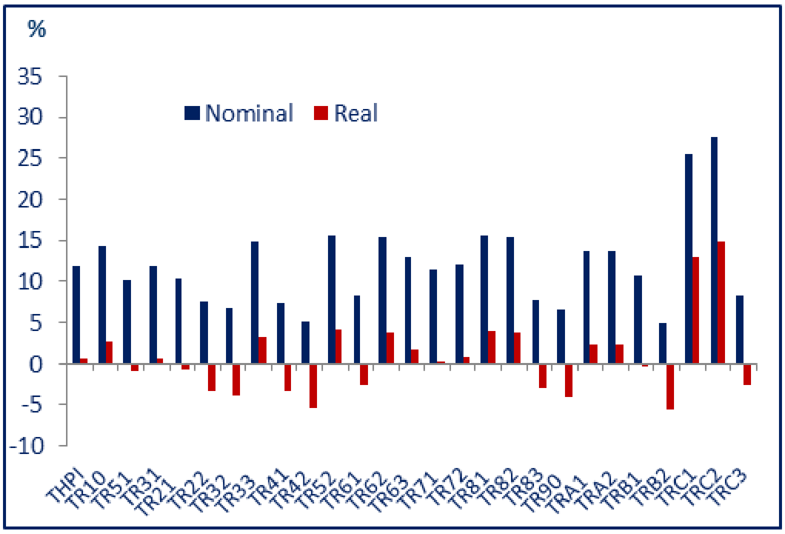


Istanbul, Ankara and Izmir are the three largest provinces of Turkey. As it can be seen in Figure 20, the index for Istanbul shows more or less the same pattern with the countrywide index. This is because Istanbul has the biggest share in the total number of observations and has the highest weight in calculating the index for the whole country. In the period from January 2010 to April 2012, the highest increase has been observed in the house price index of Istanbul. It can also be observed from Figure 21 that the square meter prices in Istanbul are much higher than those in Ankara and Izmir.

d) House price indices for NUTS Level 2

Despite the fact that median prices are calculated by using a quarterly dataset of unit prices including the reference month, the preceding month and the succeeding month, the number of data for some provinces is not sufficient to produce a robust median. In such cases, the NUTS Level 2 units become strata and the median price is calculated by using the aggregated data of all provinces covered in that unit. Indices developed on the basis of NUTS Level 2 are calculated for 26 regions and five of the regions are strata themselves.

Figure 22. Annual Percentage Changes of HPI at NUTS-Level 2 (April 2012)*



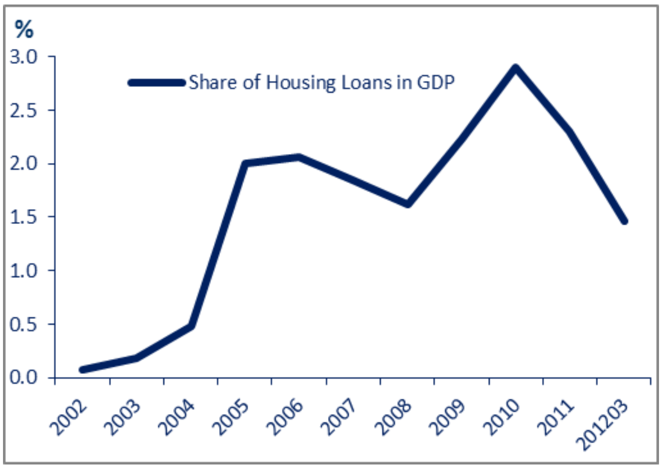
*See appendix for Level 2 definitions.

As it is seen in Figure 22, there is an annual price increase in real terms in fourteen of the NUTS Level 2 units, while there is an annual real price decrease in others by April 2012.

e) Interest rates, housing loans and HPI

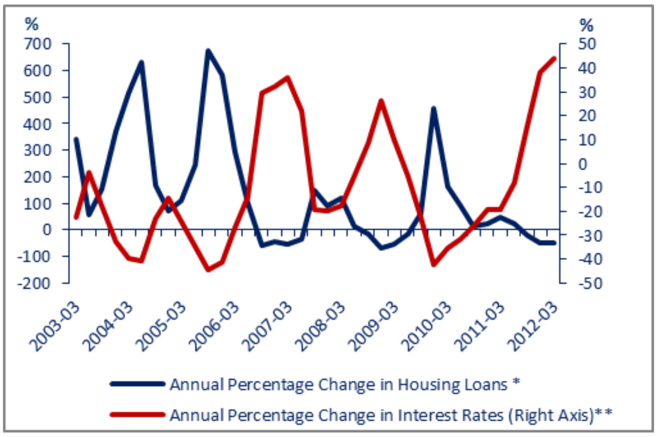
Decreasing inflation starting from 2002 has led to the realization of deferred consumption and investment, causing an increase in household demand for housing loans. Consequently, housing loans have increased considerably until the year 2011. The accelerated growth of housing loans since 2002 can be observed from Figure 23. The share of housing loans in GDP has been increased from 0.1 percent in 2002 to 2.1 percent in 2006. It showed a decreasing trend and dropped to 1.6 percent in 2008. After the recovery in economic activity, an increasing trend followed and the share of housing loans reached to 2.9 percent in 2010. Reserve requirement ratios started to be used as an active policy tool by the CBRT and have been increased starting from the end of 2010 leading to a decrease in supply for loans. The policy of increasing the reserve requirement ratios, coupled with the decision of Banking Regulation and Supervision Agency on limiting the loan amount to 75 percent of the value of the house at the beginning of 2011 resulted in a decrease in the share of housing loans in GDP to 2.3 percent in 2011.

Figure 23. Share of Housing Loans in GDP



The inverse relationship between the housing loan interest rates and the amount of housing loans extended can be observed from Figure 24. An increase in interest rates leads to an increase in borrowing costs causing households delay their consumption and investment decisions. In such periods the households are less inclined to get housing loans. On the contrary, a decrease in interest rates leads to a decrease in borrowing costs triggering the realization of deferred consumption and investment resulting in an increase in demand for loans.

Figure 24. Interest Rates and Housing Loans

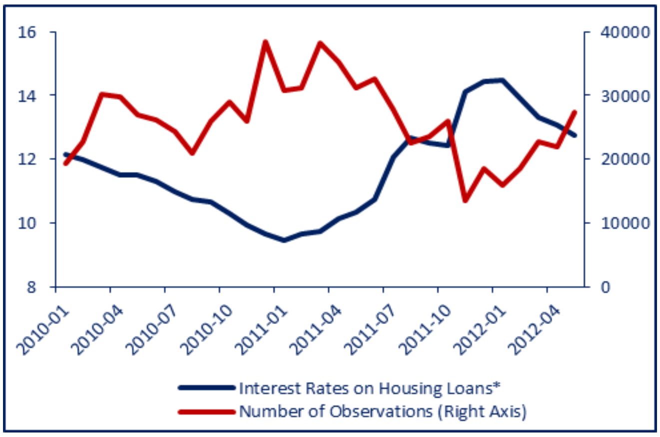


*Quarterly extended housing loans, The Banks Association of Turkey

**Quarterly average interest rates on housing loans, CBRT

Figure 25 is also supportive of the inverse relationship between the housing loan interest rates and the demand for housing loans. The number of observations denotes the number of valuation reports prepared at the time of approval of individual housing loans. Considering that the number of observations is an indicator of demand for housing loans, it can be observed from the graph that, as the interest rates increase the demand for housing loans decreases.

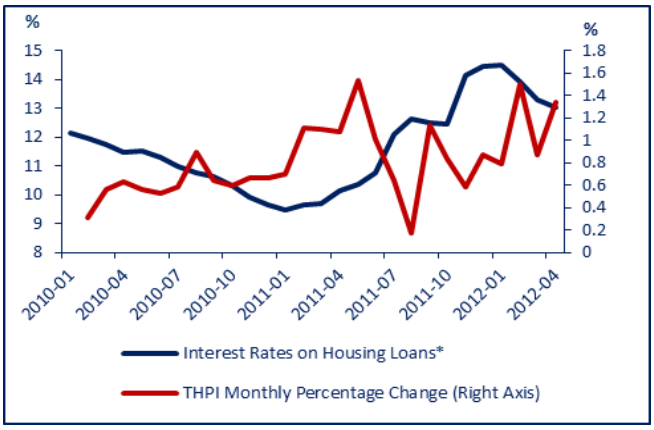
Figure 25. Interest Rates and Number of Observations



*Monthly average interest rates on housing loans, CBRT

The effect of interest rates on house prices can be observed from Figure 26. Monthly growth rate in the house price index is inversely related with the interest rates in the period from January 2010 to April 2012. In the periods of lower interest rates, the decline in borrowing costs encourages households to get housing loans and invest in housing, leading to higher house prices. On the contrary, when the housing loan interest rates go up the demand for housing loans decrease leading to lower house prices.

Figure 26. Interest Rates and HPI



*Monthly average interest rates on housing loans, CBRT

V. Conclusion

It is widely acknowledged that monitoring changes in house prices constitutes a significant component in the decision making process of monetary policy. Moreover, the recent global financial crises showed that asset price bubbles can threaten financial stability and thereby may have an impact on price stability. Therefore, in the absence of a countrywide index, constructing a house price index for Turkey has been of great importance for the CBRT.

The CBRT launched an HPI to monitor house prices starting from January 2010. In this paper, we present our experiences of compiling and constructing an HPI emphasizing the methodology used.

Out of several approaches for constructing an HPI existing in the literature, we decided to use stratified median price method considering the data availability and statistical applicability. By implementing this method, housing market is divided into strata that will lead to form more homogenous groups than the entire population. The aim is to overcome the heterogeneity problem of housing market and eliminate the effect of compositional change that may be observed in the data set from period to period.

For the implementation of the method we needed a proxy price due to the absence of reliable administrative records for transaction prices. As a proxy, we used appraised values assigned by real estate appraisal companies at the time of approval of individual housing loans.

Another consideration has been whether to use mean or median values of unit prices. We observed that rather than the mean value, the median value better reflects the central tendency where unit prices of houses show positively skewed distribution. This finding is also consistent with the related literature. Moreover, it is more likely that median value filters out the outliers and tends to be less volatile than the mean value. Therefore, we preferred using the median value to be able to produce a robust measure of house prices.

Indices constructed consist of the THPI, the TNHPI and indices developed on the basis of NUTS Level 2. Additionally, indices for all houses and new houses are calculated for three large provinces. Both THPI and TNHPI show an increasing trend from the beginning of the series. However this is mainly due to the existing high inflation rate in Turkey. In real terms, house prices increase slowly, and there seems no evidence of a house price bubble so far.

Improving the stratification by introducing new variables to construct more homogenous strata is among the first plans for future work. It is also intended to explore the feasibility of other methods, mainly the hedonic regression method, whenever a sufficiently long series of data becomes available.

VI. Appendix

Standard Data Reporting Format	
1	Bank Code
2	In-Bank Tracking Number
3	Party Preparing the Valuation Report
4	Tax Id Number of the Valuation Company
5	Date of Valuation Report
6	Province
7	District
8	Quarter/Village
9	Sheet Number
10	Plot Number
11	Parcel Number
12	Block Number
13	Floor Number
14	Single Space Number
15	Type of Title
16	Type of Dwelling (Detached or Apartment Block)
17	Quarter
18	Avenue
19	Street
20	Site Name
21	Construction Level of the Dwelling
22	Security
23	Parking Lot
24	Swimming Pool
25	Elevator
26	Heating System
27	Number of Total Floors
28	Quality of the Construction
29	Year of Construction
30	Structure of the Construction
31	Saloon
32	Room
33	Kitchen
34	Bathroom
35	Balcony
36	Gross Area of Use
37	Appraised Value
38	Amount of Loan
39	Date of Loan Extension
40	Notes

Nomenclature of Territorial Units for Statistics (NUTS) Level 2 in Turkey	
Level 2	**Provinces**
TR 10	İstanbul
TR 21	Edirne, Kırklareli, Tekirdağ
TR 22	Balıkesir, Çanakkale
TR 31	İzmir
TR 32	Aydın, Denizli, Muğla
TR 33	Afyonkarahisar, Kütahya, Manisa, Uşak
TR 41	Bursa, Eskişehir, Bilecik
TR 42	Bolu, Kocaeli, Sakarya, Yalova, Düzce
TR 51	Ankara
TR 52	Konya, Karaman
TR 61	Antalya, Burdur, Isparta
TR 62	Adana, Mersin
TR 63	Hatay, Kahramanmaraş, Osmaniye
TR 71	Nevşehir, Niğde, Aksaray, Kırıkkale, Kırşehir
TR 72	Kayseri, Sivas, Yozgat
TR 81	Zonguldak, Bartın, Karabük
TR 82	Çankırı, Kastamonu, Sinop
TR 83	Samsun, Çorum, Amasya, Tokat
TR 90	Artvin, Giresun, Gümüşhane, Ordu, Rize, Trabzon
TR A1	Erzurum, Erzincan, Bayburt
TR A2	Ağrı, Ardahan, Kars, Iğdır
TR B1	Bingöl, Elazığ, Malatya, Tunceli
TR B2	Van, Bitlis, Hakkari, Muş
TR C1	Kilis, Adıyaman, Gaziantep
TR C2	Diyarbakır, Şanlıurfa
TR C3	Batman, Mardin, Siirt, Şırnak

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Overview of models and methods for measuring economic agent's expectations

Tine Janžek, Petra Ziherl

Expectation examination approaches

Modern economic theory recognizes that the main difference between economics and natural sciences lies in the forward-looking decisions made by economic agents. Expectations play a key role in every segment of macroeconomics. In consumption theory the paradigm life-cycle and permanent income approaches stress the role of expected future incomes. In investment decisions present-value calculations are conditional on expected future prices and sales. Asset prices (equity prices, interest rates, and exchange rates) also clearly depend on expected future prices. Today we can distinct two major expectation paradigms and concepts, where the second became the mainstream approach for further development of expectation examination:

Adaptive expectations (AE) represent a hypothesis in economics which states that people form their expectations about what will happen in the future based on what has happened in the past. For example, if inflation has been higher than expected in the past, people would revise expectations for the future. Adaptive expectations played a prominent role in macroeconomics in the 1960s and 1970s. For example, inflation expectations were often modelled adaptively in the analysis of the expectations-augmented Phillips curve. The rational expectations revolution began with the observations that adaptive expectations, or any other fixed-weight distributed lag formula, might provide poor forecasts in certain contexts and that better forecast rules might be readily available.

Rational expectations (RE) state that agents' predictions of the future value of economically relevant variables are not systematically wrong in the sense that all errors are random. Equivalently, this is to say that agents' expectations equal true statistical expected values. An alternative formulation is that rational expectations are model-consistent expectations, so the agents inside the model assume the model's predictions are valid. In modern econometrics a silent consensus has been established that at the theoretical level the rational expectations hypothesis proposed by Muth (1961) has gained general acceptance as the dominant model of expectations formation. His thesis provides a theory-consistent framework based on a theory in which subjective expectations of individual decision makers are set to their objective counterparts, assuming a known true underlying economic model.

1. Development of expectation theory

Economic expectations are crucial in determining economic activity as they affect economic decisions of consumers, politicians, businesses and economic experts. One of the first records of how important the expectations are can be found in Keynes (1936), who emphasised their role in the amount of output, employment and savings. He divided the expectations into two types. First type is the short term expectations, which are concerned with the price the producer expects to get for its product at the time he starts the production process. The second, the long term expectations, are connected with what the entrepreneur can hope to earn in the future if he purchases his products as an addition to his capital equipment. The behaviour of each individual company is determined by its short term expectations, which largely depend on the long term expectations of other parties. The amount of employment in certain firm depends on these various expectations. However, a change in expectations will only have full effect on employment over considerable period.

Samuelson (1948) showed that observation of consumption, price and income, combined with basic assumption of consumer theory, implies restrictions on the consumption bundles that this person would choose when having different budget sets with varying relative prices.

Muth (1961) argued that the economy generally does not waste information and that expectations depend on the structure of the entire system. Expectation as informed predictions of future events is the same as the predictions of the relevant economic theory. According to his opinion dynamic economic models do not assume enough rationality.

Another author who contributes to the concept of rational expectations as one of the central assumptions for many macroeconomic models is Lucas (1972). He studied the relation between the rate of change in nominal prices and the level of real output, a variant of Phillips curve. Demand shifts or monetary disturbances cause price movements. However, money expansion has no real consequences in case all agents and their expectations behave optimally. When placed in a setting in which the information conveyed to traders by market prices is inadequate to permit them to distinguish real shifts from monetary fluctuation. In this way monetary fluctuation leads to real output growth or fall.

McFadden (1974) showed that decisions made by people in random sample, combined with assumptions on the population distribution of preferences, enable estimation of probabilistic choice models. They can then be used to predict population choice behaviour in other settings.

Kahneman and Tversky (1979, 1981) worked on the uncertainty phenomena under which bounded rationality and expectations are formed, to explain divergences of economic decision making from neo-classical theory. Their prospect theory, which they illustrate with gambling and insurance business, distinguishes between an early phase of editing and a subsequent phase of evaluation. The editing phase consists of the preliminary analysis of the offered choices, while the former evaluates the prospects and chooses the one with the highest value.

The function of the editing is to organize and reformulate one's options as to simplify the subsequent evaluation choice. It can be affected by many things: one's attitudes towards uncertainty and money, information or misinformation regarding probabilities and outcomes and many others. In addition, people generally discard components that are shared by all prospects under consideration, which leads to inconsistent preferences when the same choice is presented in different forms. Gains and loses are defined relative to some neutral reference point, usually one's current assets. However, there can be a discrepancy between these two points, for example recent changes in wealth to which one has not yet adopted. A change of reference point can alter the preference order for prospects. The frame is controlled partly by formulation of the problem and partly by the norms, habits and personal characteristics of the decision maker or even to a level of aspiration. The way the frame is built represents a critical factor in the analysing of the decisions. Inconsistent responses to the same problems can be framing effect with contradictory attitudes towards risks connected with gains and losses. In other words, changing reference frame can determine whether a certain outcome is evaluated as a gain or a loss.

Gigerenzer (1991) argues that Kahneman's and Tversky's results do not reflect respondents' use of certain heuristic rules but are formed by the manner in which statistical information was presented to them. Asking questions in terms of frequencies can reduce the magnitude of the biases described by Kahneman and Tversky. Another argument is that their heuristics are vaguely, atheoretically formulated, what limits their explanatory power as generators of biases. Furthermore, according to Gigerenzer some of the biases characterized as errors may be inappropriate. Nevertheless, Tversky and Kahmeman tried to explain formation of expectation in real life and put doubt on the assumption of rational expectations.

Despite the prevail and domination of RE models in modern economics, an empirical evidence confirmed that expectations formation is closely linked to point and density forecasting and as such is subject to data and model uncertainty. Assuming that individuals know the true model of the economy is no more credible than claiming that economic forecasts made using econometric models will be free of systematic bias and informational inefficiencies. This has led many investigators to explore the development of a weaker form of the rational expectations hypothesis that allows for model uncertainty and learning.

Evans and Honkapohja (2001) presented the updated approach to expectation examination in form of “adaptive learning”. It is a dynamic concept that combines RE with a certain aspects of AE. The rational expectations approach supposes that economic agents have a great deal of knowledge about the economy. In empirical work economists, who postulate rational expectations, do not themselves know the parameter values and must estimate them econometrically. It appears more natural to assume that the agents in the economy face the same limitations on knowledge about the economy. So the concept of adaptive learning assumes that agents adjust and revise their forecast (expectations) rules as new data becomes available over time.

Manski (2004) concludes that most empirical research today concern choice problems in which decision makers act with partial information. Common assumption is that persons form probabilistic expectations for unknown quantities and maximizes expected utility, i.e. people’s expectations are objectively correct given the information they posses.

These recent findings together with contemporary adaptive learning models, where experimental and survey data on expectations play an important role in providing better insights into how expectations are formed, emphasized the role of the survey expectations.

2. Survey expectations

Economists would ask people about their preferences and expectations when choice data alone do not suffice to reveal the formation of decisions with partial information. The collection of data on expectations of individual has its roots in the development of survey methodology in the years before Second World War, when economists began to understand the importance of future events on current decisions (Peseran and Weale, 2006). Use of sample surveys made it possible to collect information way beyond what was covered by administrative sources and full enumeration censuses.

The earliest systematic attempt to collect information on consumer expectations was the study in 1944 conducted by Unites State Department of agriculture. It tried to measure consumer sentiment. Currently the survey is run by the University of Michigan, with many other similar surveys conducted across OECD countries. Key aspect is that some of its questions have qualitative responses, e.g. respondents are simply asked whether they expect to be better off or worse off.

Household surveys were later complemented with business survey on the state of economic activity. Before Second World War countries did not have any formal indicators of sentiment. One of the first surveys with questions about the expectations of output growth, price increase in the near future, their recent movement and evolution of business environment was done by the *Institut für Wirtschaftsforschung* in Munich in 1948. This survey structure has since been adopted by other countries.

In 1946 Joseph Livingstone started a survey about expectations of inflation in which a number of economists participated. Data collected were related with the macro-economy as a whole. Another feature of the survey is that the respondents (as experts) were asked to give point estimates of their expectation. Later the Livingston Survey has broadened in scope to collect information on expectations about a range of economic variables. The survey is now conducted by the Federal Reserve Bank of Philadelphia. Several similar surveys of macroeconomic forecasts are also produced in USA.

However, economists were very sceptical of survey data at the beginning. In the 1950s and early 1960s they even reported negative evidence on the usefulness in predicting consumer purchase behaviour of expected household finances from such data. Juster (1966) proposes that surveys of consumer intentions to buy provides inefficient predictors of purchase rates as do not provide accurate estimates of mean purchase probability. Such surveys cannot detect movements in mean probability among non-intenders. Purchase probabilities have larger explanatory power of cross-section variance as their variable enables the formation of subgroups with systematically different purchase rates.

Dominitz and Manski (1997) designed a survey specifically to elucidate information on income uncertainty, and thereby produced an indication of subjective income uncertainty of households. They concluded that the best way of collecting data on the subjective distribution was to ask people about the probabilities that their incomes over the next twelve months would be below each of four thresholds, with the thresholds chosen in the light of reported current income. Respondents were also asked to report the lowest and highest possible amounts their household incomes might be.

In the last 20 years the surveys has increasingly been used to research probabilistic expectations of significant personal events (job loss, life expectancy, future income, etc). For example, the Survey of Professional Forecasters asks the respondents to provide probabilities within particular ranges, instead of point estimators.

3. Expectation measures in surveys

To sum up, there general measurement methods of economic expectation have been established over time (Stangl, 2008): qualitative measurement with category-rating scales (usually three-category scale), quantitative measurement with point forecast (e.g. 2% inflation rate) and measurement of economic expectation with subjective probabilities of particular events.

Qualitative measures are quite popular since it is easier and quicker to give qualitative response for respondents as they do not necessary need to consult their accounting records and the wording is simpler for the phenomena which may be too complex to be described in quantitative values. Therefore, such responses are less often a source of inaccuracies or inconsistencies.

On the other hand, three category scales are very limited. Available options may not be compatible with respondents' real opinions, which often gather answers towards central category and thus imprecision and information loss. In addition, there is almost no information on the dispersion of economic expectations, which is most commonly used as a proxy of uncertainty. These problems can be to high extent solved by point forecasts or quantitative information on outstanding orders, profits or turnover. However, because of the confidentiality issues or time constraints, companies usually do not report it.

Pesaran and Weale (2006) suggest two conversion methods for converting the proportions of qualitative answers into quantitative measures for the purpose of econometric expectations' analysis. The main conversion techniques are:

1. the probability approach of Carlson and Parkin (1975).
2. the regression approach of Pesaran (1984) and Pesaran (1987).

Their method assumes that respondents have a common subjective probability distribution over the future development of a variable and that they report a variable to go up or down if the median of their subjective probability distribution lies above or below a threshold level.

The upper and lower thresholds which mark the so-called indifference limen are derived from the respondents' aggregate answers and the time-series properties of past realizations of the macroeconomic variable under consideration. Most crucially, they assumed that the answers are normally distributed with symmetric thresholds and they imposed that the average value of past realizations and the average value of expectations must be equal, which is typically referred to as the unbiasedness of expectations.

As an alternative to the Carlson-Parkin Method, Pesaran (1984) developed the Regression Method. The basic idea is to use the relationship between realizations (measured by official statistics) and respondents' perceptions of the past (which is additionally queried in many surveys) and to estimate the indifference limen on the basis of this observable data. In order to quantify the respondents' expectations about the future development of the variable under consideration, Pesaran (1984) used these estimates and imposed them on the qualitative expectations data. Thus, in contrast to the aforementioned methods, quantitative expectations calculated by the Regression Method are a function of a specific regression model, rather than a function of a specific probability distribution.

Despite the apparent advantages in using quantitative surveys, qualitative surveys are widespread and considerable attention is paid to them in the real-time economic debate. It is therefore important also to consider their performance as measures of the state of the macro economy. There are three macroeconomic areas where qualitative surveys play the major role for obtaining the data to assess the expectations: inflation, output growth and consumer sentiment/consumer spending. The question of the link between expectational data and inflation has received more attention than the one between expectational data and output movements, partly because of the importance attached to inflationary expectations in a number of macroeconomic models, such as the expectations-augmented Philips curve and the assumption that a real interest rate can be derived by deducting inflationary expectations from the nominal interest rate. The studies of consumer sentiment were the first surveys to collect information on expectations. Dominitz and Manski (1997) provide a brief account of early attempts to assess their value. They explain how the surveys acquired a poor reputation because they seemed to have little capacity to explain future consumption.

Subjective probability distribution of future events is also an option in the survey. The results enable to calculate the variance, which incorporate individual uncertainty and heterogeneity of expectations. Mansky (2004) proposes another three advantages. First one is that probability is a well-defined absolute numerical scale for responses that enables interpersonally comparable responses. Furthermore, algebra of probability can be used to examine the internal consistency about different events. Last but not least, subjective probabilities can be compared with event frequencies, which allow the conclusion about the correspondence between subjective beliefs and reality.

Nevertheless, probabilistic questions are time demanding and tend to cause high cognitive load to respondents. Consequently, only these kinds of questions are applicable to only people familiar with probability distributions. Another point for consideration is general tendency of respondents to be optimistic, observed in variety of survey research.

Stangl (2008) proposes new measure of economic expectations. The visual analog scale (VAS) is a qualitative measurement method, but it overcomes most of the problems with traditional ones. Visual analog scales are rating scales on which a respondent ranks the preferences along a continuous line or scale. They are easy to understand and to handle by the respondents. VAS was first used in medical research as commonly used measures of feeling and pain intensity.

Application of VAS in other surveys has been difficult so far due to costly operationalization. With the burst of Internet surveys VAS has become easy to administer. Respondents can express the direction of their attitude as well as the magnitude on a 1 to 100 point scale, which put VAS close to interval scale measurement. By using graph scales it does not increase cognitive load for the respondent and information collected is much broader. The distributional shapes of responses and various measures of dispersion allow detect cyclical turning-points earlier.

Stangl tests VAS for reliability for three reasons: the measure has not been used before, the Internet and self-administration may negatively affect the scale reliability and for the reason VAS responses overestimates people's discriminatory power relating to the subjects of interests. She also argues that VAS business expectations contain two components: heterogeneity of business expectations and uncertainty about the future economic development. Overall, VAS is found to be reliable and valid information on economic expectations.

Another of her findings is related to thresholds. They are asymmetrical around zero as the respondents weight future losses stronger than gains. This means that expected positive changes of economic situation have to be on considerably higher level before companies report expected improvement in comparison with expected negative changes that would make them report anticipated deterioration. This is also in line with Kahneman and Tversky (1981).

Moreover, macroeconomic uncertainty broadens the indifference interval what leads to a shift towards neutral category within the three category scale. According to Stangl (2008) results indicate that the higher is the macroeconomic uncertainty the earlier respondents turn to neutral category and the longer they remain within this state. The higher is the uncertainty, the more extreme is the response to future losses compared to the response to future gains.

The respondents in Stangl case were experts; economists and executives in managerial positions. VAS should therefore be further tested in general population to be accepted as the measurement method of economic expectations.

4. Methods for estimating expectations

Henzel and Wollmershäuser (2005) state that in empirical work expectations on future macroeconomic variables can be treated in two ways: one is to set-up a theory on how private agents form their expectations and the second way to introduce expectations into empirical models is through direct measures of expectations derived from surveys of house-holds, firms and other economic agents. The advantage of survey data is that expectations are given exogenously in the context of a model, and that the nature of the expectations' formation process can be investigated separately.

Kjellberg (2006) considers the following three methods as the most common for capturing expectations:

- futures method which utilizes financial market prices and derives market-based expectations implicitly from prices of traded futures contracts;
- the vector autoregression (VAR) forecast method which estimates a VAR-model and uses the out-of-sample forecasts of the model to proxy expectations of a variable;
- the survey method, which measures expectations by asking a sample of people about their expectations of a variable.

In his study he thoroughly compared different approaches performing a systematic comparative analysis of the methods where he tried to evaluate their suitability for the purpose of economic forecasting. He estimated expectations using Federal funds rate target (FFRT) and Federal funds rate (FFR). The FFRT is controller and used by the Federal Reserve Bank (FED) to implement U.S. monetary policy and it is an important macroeconomic and financial variable that is monitored by markets all over the world. FFR is the traded market rate that the FED, by open market operations, keeps close to their stated target rate (FFRT). They are typically very close.

His study revealed that despite of the fundamental difference among the methods used, the survey measure and the futures measure turned out to be highly correlated (value of the correlation coefficient is 0,81) which indicates that they manage to capture the same phenomenon, that is true expectations. The survey method consistently overestimated the realized changes in the interest rate. The VAR forecast method on the other hand showed little resemblance with the other methods.

5. Conclusion

Expectations and their measures remains an important subject, especially in contemporary times of global financial crisis and instability of financial markets. The economic subjects strive to reduce uncertainty by conducting different surveys and analyses, to produce reliable forecasts that would enable more accurate foreseeable future and stabilize the economy. Measuring and examination of expectations as a branch of economic science has received a major attention in the last two decades, but remains an ongoing development. With increased use of stochastic methods in economics and econometrics, estimation of expectations overcame the corporate environment, where companies surveyed the market to assess the demand for their products, and set itself as an important part of macroeconomics and economic policies.

Theory of rational expectations has established as a preferred hypothesis that represents the basis for the further development of the expectations' theory. Today the theory has evolved with the inclusion of adaptive learning, where present expectations dynamically change by implementation of additional available information. One of the approaches to examine this phenomenon is by using vector autoregression models (VAR) with a certain amount of lag within the impulses.

Besides technical econometric approaches modern authors have pointed out an increased importance of survey measures. A lot of attention has been put towards different types of surveys for different purposes: inflation forecasting, output forecasting, agents' sentiment forecasting etc. In recent years a lot of efforts have been put towards quantification of qualitative surveys and improving the qualitative measures. Future empirical evidence will test the robustness and efficiency of the current efforts.

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Forecast evaluation of economic sentiment indicator for the Korean economy*

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1. Introduction

Survey data measuring economic agents' sentiment provide useful information to assess the current state of the economy and forecast short-term economic development. Besides the information itself that business and consumer surveys provide, the survey data have many advantages. They have an informational lead in that the data are available ahead of hard economic data like GDP and industrial production that are usually published with delays of 1 or 2 months. In addition, the survey data are generally available at monthly frequencies and hence suitable for reflecting volatile economic developments. Therefore, the survey data such as business survey index (BSI) and consumer survey index (CSI) are widely used as a key complement to quantitative statistics.

The BSI and CSI data consist of multiple component series that concern diverse facets of economic activity in different sectors of the economy. The demand to incorporate most of the information contained in multiple indicators into a single indicator has led to the construction of a composite indicator. The single composite indicator is useful to reflect economic agents' overall perception of economic activity. The European Commission (EC) has calculated an economic sentiment indicator (ESI) since 1985 at the EU and the euro-area level as well as at the individual EU member state level; see European Commission (2006) for a detailed description of the EC's ESI. Previous research on the construction and evaluation of composite confidence indicators include Stock and Watson (2002), Bruno and Malgarini (2002), Gayer (2005), Gayer and Genet (2006), Gelper and Croux (2007). Moon (2011) develops the ESI for the Korean economy that has officially published since June 2012. We extend Moon (2011) by adding the forecast evaluation of the ESI for the Korean economy. To evaluate the predictive content of the ESI with respect to GDP, Granger-causality tests (Granger, 1969) and a probit model are used. Related literatures that examine the forecast performance of the leading indicators in identifying turning points include Estrella and Mishkin (1998), Krystalogianni *et al*. (2004), Croce and Haurin (2009), and Coşar (2012) among others.

The rest of the paper is organized as follows. Section 2 describes the construction of the ESI for the Korean economy. In Section 3, we evaluate the forecast performance of the ESI with respect to GDP growth and cycle. Section 4 concludes with some remarks.

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2. Construction of the Korean ESI

2.1 Data

To construct the Korean ESI, we use the monthly BSI and CSI data from 2003 to 2011 published by the Bank of Korea (BOK). While the monthly series of the BSI data are available from January 2003, those of the CSI data are only available from July 2008 as the BOK had conducted the survey of consumers on a quarterly basis before then. The BOK has conducted the survey of consumers on a monthly basis since July 2008 when Statistics Korea (SK), a national statistics office that had conducted a separate survey of consumers, transferred its monthly compilation of the CSI to the BOK. Accordingly, we estimate the monthly series of the CSI data from January 2003 to June 2008 using temporal disaggregation, a process of deriving high frequency data from low frequency data. For the CSI components that exist both in the BOK and SK surveys, the monthly data are estimated so that the disaggregated series from the quarterly data of the BOK keep track of the movements of the SK's monthly data as a reference indicator. For the CSI components without a corresponding reference indicator in the SK survey, the monthly data are produced based on a smoothing method using ECOTRIM, the software released by Eurostat.

The BSI data consist of 30 component series in the manufacturing sector and 10 component series in the non-manufacturing sector. In each sector, half of the total component series provides the judgment for the current month, while another half represents the outlook for the next month. For the CSI data, 9 component series are considered, setting aside several component series that have recently been added. Hence there exists a total of 49 component series from the business and consumer survey data. Let us use these component series and their variable names interchangeably for convenience. The type of these 49 variables is the index moving around 100, ranging from 0 to 200. Each variable has 108 observations from January 2003 to December 2011.

GDP is used as a reference variable to represent the entire economy. In particular, the growth rate and cycle of GDP are used to consider short-term and long-term characteristics of the economy. However, since the monthly GDP data are not published, they are estimated using the temporal disaggregation by state space method. Then the GDP growth rate is measured by the year-on-year percentage change of monthly GDP series. The GDP cycle is extracted using the double Hodrick-Prescott (HP) filter. The HP filter is applied twice to achieve a smoothed de-trended cycle; removing a long-term trend from the seasonally adjusted GDP and then smoothing the de-trended GDP. The cycles of the 49 variables are extracted in the same fashion as the GDP cycle except for the de-trending procedure because the 49 component series have no trend.

2.2 Selection of the ESI components and weights

The ESI needs to be constructed to track GDP well so that it can be used as a useful complement to GDP. Should the ESI and GDP move differently, it may cause confusion in assessing the current state of the economy. So the ESI must be highly correlated with GDP. By the way, if the ESI tracks GDP with a lead of a few months, then the ESI will also be useful for predicting future GDP developments. Inherently the survey data related to respondents' expectations have the potential to have a leading property. This is because enterprisers and consumers tend to increase their production and consumption if they feel positive about the current and future economic situation. Therefore, the screening procedure is aimed at selecting informative components that are not only closely correlated with GDP but also detect turning points of economic movements earlier than GDP. Cross-correlation analysis and turning point analysis are used here.

Let z_{1t} be the reference variable and z_{it} be the i^{th} variable to compare with. Then the cross-correlation between the reference variable and the i^{th} variable shifted m months is defined as

$$r_{1i}(m) = \frac{Cov(z_{1t}, z_{it+m})}{\sqrt{Var(z_{1t})Var(z_{it})}}$$

for i=1,…,49. If m=0, then it is a contemporaneous correlation between the reference variable and the i^{th} variable. The maximum cross-correlation can be obtained from different choices of positive or negative integer values of m. If the maximum is found for negative m, then it means that the i^{th} variable has the largest correlation with the reference variable when it is shifted m months ahead. Here the sample cross-correlations between the GDP growth rate and each of the 49 variables are calculated. Denote the sample contemporaneous correlation by r_0, the maximum sample cross-correlation by r_{max} and the value of m with r_{max} by t_{max}. A variable having a large r_{max} at the negative t_{max} is considered to have leading behavior.

The leading property is also examined in terms of the cyclical movement. The BUSY software based on the routine by Bry and Boschan (1971) can be used to detect the turning points. It identifies the turning points of the reference variable and then denotes the leading or lagging months of each of the 49 variables by negative or positive values at the reference turning points. However, the turning points produced by the BUSY software are not obvious in some periods, due to a relatively short length of time series. So only the turning points which are obviously identifiable even by the naked eye are considered. Variables with a negative sign at these time points are considered to have the leading property.

The preliminary screening of the individual variables is carried out in each of three sectors: manufacturing, non-manufacturing, and consumer. In each sector, the variables having high levels of cross-correlation and leading characteristics are pre-selected for further investigation. Under these criteria, the 9 variables in the manufacturing sector, 4 variables in the non-manufacturing sector and 5 variables in the consumer sector are pre-selected respectively.

In each sector, all possible combinations of the pre-selected variables are examined. There are 2^k-k-1 possible combinations when there exist k variables within a sector. In each combination, the variables are aggregated by a simple average of the standardized series, not the original series. This prior standardization is necessary to avoid the dominant effects of highly volatile variables on the composite indicator. The tracking performance of the aggregated series in relation to GDP is tested based on the cross-correlation and turning point analyses. The previous two criteria used in the preliminary screening are reapplied.

Among all combinations in each sector, a three-variable set (outlook for exports, capacity utilization and financial situation), a two-variable set (outlook for business conditions and financial situation) and another two-variable set (outlook for household income and spending decisions) are selected as the best combination respectively. Therefore, 7 variables among a total of 49 variables are finally selected to construct the ESI. The cross-correlation analysis and the turning point analysis to these 7 variables are given in Table 1. Overall, the selected variables show the leading property, which is consistent in the fact that these variables reflect anticipations.

Table 1

ESI Components

		Components	Cross-correlation			Turning point	
			r_0	r_{max}	t_{max}	Mean	Median
BSI	Manufacturing	Outlook for Exports	0.783	0.812	1	0.25	0.5
		Outlook for Capacity utilization	0.777	0.777	0	-1.25	-1.5
		Outlook for Financial situation	0.674	0.726	-2	-3.75	-3.0
	Non-manufacturing	Outlook for Business conditions	0.622	0.648	-1	-2.75	-2.5
		Outlook for Financial situation	0.611	0.680	-1	-3.75	-2.5
CSI		Outlook for Household income	0.466	0.534	-2	-4.25	-5.0
		Outlook for Spending decisions	0.591	0.624	-1	-5.75	-6.0

To determine the weights of the selected variables, principal component analysis is used. The first principal component explains about 82% of the total variance of the 7 variables. This means that the first principal component can replace the 7 variables without much loss of information. The coefficient of the first principal component measures the importance of the each variable to the first principal component, irrespective of the other variables. In particular, the relative sizes of importance are determined based on the squared coefficients which sum to 1. Based on the sum of the squared coefficients within the manufacturing and non-manufacturing sectors and the sum of those in the consumer sector, the weights of BSI and CSI parts are determined by 0.75 and 0.25.

Within the BSI part, the weights of the manufacturing and non-manufacturing sectors are determined based on the contributions to GDP growth. The contribution of the non-manufacturing sector to GDP growth is computed by excluding the industries for which the business survey is not conducted (agriculture, financial intermediation, public administration and defense, compulsory social security, education, health and social work, and other service activities). The average of the contributions over 2003 to 2011 is 1.62%p for the manufacturing sector and 0.98%p for the non-manufacturing sector, so the ratio of their relative magnitudes is almost 0.6 and 0.4. This ratio is stable for other time periods. Thus the weights within the manufacturing and non-manufacturing sectors are determined as 0.6 and 0.4.

Since the BSI part has a weight of 0.75 in total, the weights of the manufacturing and non-manufacturing sectors are finally allocated to 0.45 and 0.30. To sum up, the weights of the manufacturing, non-manufacturing and consumer sectors are set by 0.45, 0.30 and 0.25. Within each sector, the individual variables have equal weights as shown in Table 2.

Table 2

Weights allocated to the ESI Components

		Components	Weights	
BSI	Manufacturing	Outlook for Exports	0.150	0.45
		Outlook for Capacity utilization	0.150	
		Outlook for Financial situation	0.150	
	Non-manufacturing	Outlook for Business conditions	0.150	0.30
		Outlook for Financial situation	0.150	
CSI		Outlook for Household income	0.125	0.25
		Outlook for Spending decisions	0.125	

2.3 Calculation of the ESI

After determining the 7 informative variables (or components series) and the corresponding weights, the exact calculation of the ESI is made as follows.

Step 1: Standardize the original component series

$$Y_{i,t} = \frac{X_{i,t} - \overline{X}_i}{S}$$

where $X_{i,t}$ is the i^{th} component series observed at time t, $\overline{X}_i = \frac{1}{T}\sum_{t=1}^{T} X_{i,t}$ and $S = \sqrt{\frac{1}{T-1}\sum_{t=1}^{T}(X_{i,t} - \overline{X}_i)^2}$ for i=1,…,7.

Step 2: Aggregate the 7 standardized series using the weights

$$Z_t = \sum_{i=1}^{7} w_i Y_{i,t}$$

where w_i is a weight of the i^{th} component such that $\sum_{i=1}^{7} w_i = 1$.

Step 3: Scale Z_t to have a mean of 100 and a standard deviation of 10

$$ESI_t = \left(\frac{Z_t - \overline{Z}}{S_z}\right) \times 10 + 100$$

where $\overline{Z} = \frac{1}{T}\sum_{t=1}^{T} Z_t$ and $S_Z = \sqrt{\frac{1}{T-1}\sum_{t=1}^{T}(Z_t - \overline{Z})^2}$.

The ESI value of 100 marks a long-term average over the time period from t=1,…,T. Values greater than 100 indicate an above-average position, while values below 100 indicate a below-average position. The fixed standard deviation of 10 implies that about 68% of the ESI values fall within a range between 90 and 110 assuming approximate normality.

Unlike the ESI, a value of 100 in the BSI and CSI data means the equal proportion of negative and positive opinions. In addition, the BSI and CSI data have often fallen below 100 due to the cautiousness of respondents, even when the economy is booming. The ESI solves this problem by rescaling in Step 3. Moreover, the ESI is easy to interpret because the long-term average of 100 plays a yardstick role for making judgments.

Note that the standardization in Steps 1 and 3 is carried out over the period from t=1,...,T. The end point T is extended every year to include up-to-date information, but does not change within a single year. For example, the ESI values from January to December in 2012 are calculated based on the standardization period from January 2003 to December 2011. But the ESI values in 2013 are computed using a new standardization period extended to December 2012, and the ESI values before 2013 are all revised at once at the beginning of 2013. That is, the revision of the ESI data is undertaken every year. This revision may confuse users, but it is inevitable in order to reflect the recent economic situation adequately. The cyclical component of the ESI is compiled to track the cyclical patterns of economic sentiment, and is calculated by removing seasonal and irregular components from the ESI.

3. Forecast evaluation

3.1 Tracking performance of the ESI

Following the method described in Section 2, the ESI for the Korean economy are computed for the period of January 2003 to May 2012. Figure 1 shows that the ESI and GDP growth move closely together. Note that in Table 3 the ESI has a maximum cross-correlation of 0.726 when it is one month ahead of GDP.

Figure 1

ESI and GDP growth

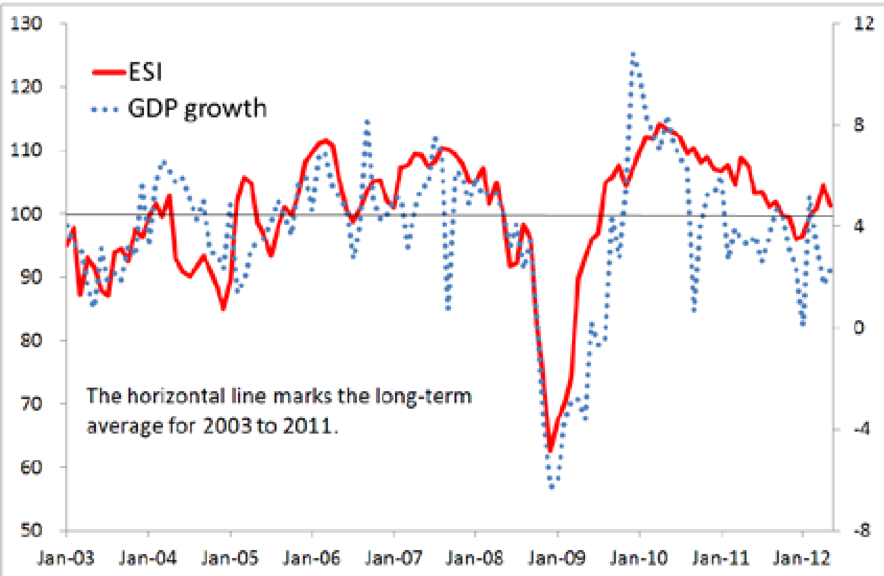


Table 3

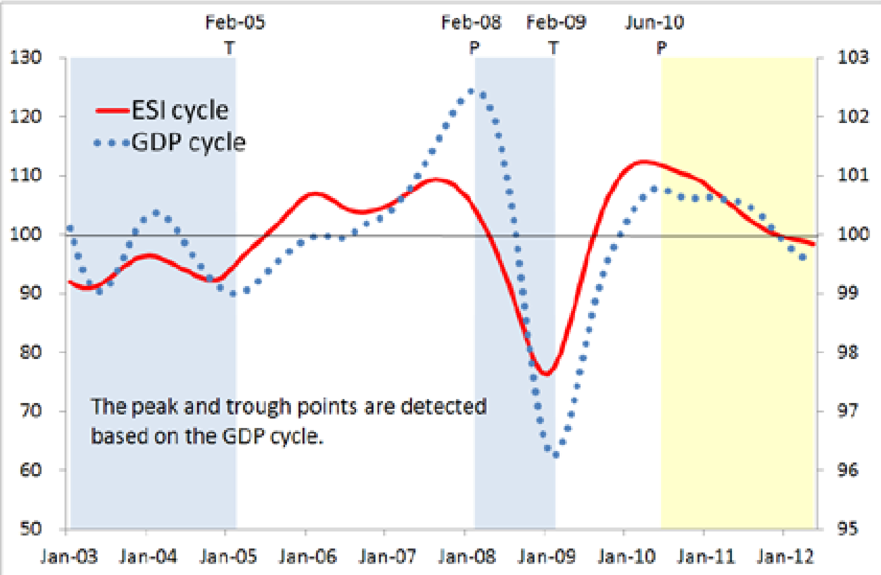
Cross-correlation of ESI and GDP growth

Leading (-) or Lagging (+) Months												
-6	-5	-4	-3	-2	**-1**	0	1	2	3	4	5	6
0.382	0.500	0.575	0.639	0.699	**0.726**	0.713	0.671	0.564	0.431	0.316	0.203	0.124

The movements of the cyclical components of ESI and GDP are shown in Figure 2. Over the period of 9 years, the GDP cycle records two peaks in February 2008 and June 2010, and two troughs in February 2005 and 2009. The cyclical components of the ESI detects turning points 4 month, 6 months, 1 month, and 2 months ahead of the corresponding reference date, respectively, or about 3.25 months early on average. The leading feature of the cyclical movement is also found in the cross-correlation analysis of the cycles. The maximum cross-correlation is 0.852 when the cyclical component of ESI is 3 months ahead of GDP as shown in Table 4. Overall, the ESI tracks GDP well, being well correlated and co-moving with GDP with leads of a few months.

Figure 2

Cyclical components of ESI and GDP



Note: The decelerating phase starting in June 2010 is subject to change as more data are available.

Table 4

Cross-correlation of the cycles of the ESI and GDP

Leading (-) or Lagging (+) Months												
-6	-5	-4	**-3**	-2	-1	0	1	2	3	4	5	6
0.706	0.777	0.827	**0.852**	0.846	0.807	0.734	0.632	0.504	0.357	0.198	0.036	-0.121

3.2 Granger causality tests

In this subsection, the leading behavior of the ESI with respect to GDP growth is further examined using Granger-causality test. To see whether movements in the ESI precede movements in the GDP growth or vice versa, Granger-causality tests are carried out based on the lag lengths of 4, 5, and 6. As can be seen in Table 5, the null hypothesis that "ESI does not Granger-cause GDP growth" is rejected, while the null hypothesis that "GDP growth does not Granger-cause ESI" is not rejected, at a significance level of 5% for all choices of lag lengths, indicating the ESI precedes GDP growth. That is, the ESI shows significant positive contribution to explain future GDP growth, implying that the ESI is helpful in forecasting GDP growth.

Table 5

Granger causality tests

Lag	H_0: GDP growth does not Granger-cause ESI		H_0: ESI does not Granger-cause GDP growth		Results
	F-Statistic	Prob.	F-Statistic	Prob.	
4	2.200	0.074	3.379	0.012	ESI→GDP
5	1.877	0.105	2.592	0.030	ESI→GDP
6	1.355	0.241	2.689	0.019	ESI→GDP

3.3 Forecast using probit model

We use a probit model to further examine the leading property of the cyclical component of ESI with respect to that of GDP and then evaluate the forecast performance of the ESI in identifying the turning points of GDP. Suppose that a binary dependent variable, Y_t, takes on only values of one and zero as follows.

$$Y_t = \begin{cases} 1, \text{ if the economy is in deceleration period} \\ 0, \text{otherwise} \end{cases}$$

Then the estimated probability of being in the deceleration period is of the form

$$P(Y_t = 1 \mid x, \beta) = \Phi(\beta_0 + \beta_1 x_1 + \cdots \beta_k x_k)$$

where $x_1, \ldots, x_k$ are k explanatory variables, $\beta_1, \ldots, \beta_k$ are the corresponding regression coefficients and Φ is the cdf of a standard normal distribution, i.e.,

$$\Phi(a) = \Phi(a) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{a} e^{-t^2/2} dt$$

Here the deceleration period is determined based on the peak and trough points of the cyclical component of GDP. The contemporaneous and lagged values of the cyclical component of ESI are considered as explanatory variables. The number of lags is determined so as to minimize Akaike Information Criterion (AIC) and Schwarz's Bayesian Criterion (SBC). The cyclical component of ESI shifted 1 month ahead (ESIC(-1)) is included in our probit model as an explanatory variable along with its contemporaneous value (ESIC). Table 6 shows that the estimated model has 53% of the explanatory power and all explanatory variables are statistically significant. Note that the sign of estimated coefficient of ESIC(-1) is positive, implying that ESIC(-1) and the contemporaneous GDP cycle tend to move in the same direction.

Table 6

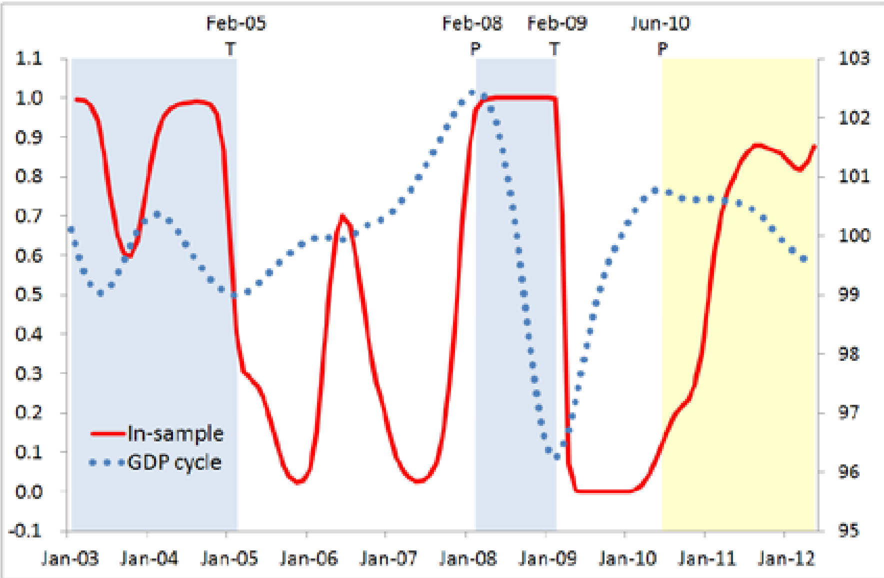
Probit model estimation

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	17.873	3.363	5.315	0.000
ESIC	-1.476	0.274	-5.388	0.000
ESIC(-1)	1.301	0.251	5.182	0.000
McFadden R^2	0.530			

From the estimated probit model, the probability of being in the deceleration period can be computed for each observation of the data, which is called in-sample forecast. The probabilities from the in-sample forecast are plotted together with the GDP cycle in Figure 3. The estimated probabilities are shown to be high in the shaded areas of the deceleration. In particular, the estimated probabilities are close to 1 during the financial crisis from February 2008 to February 2009. Overall, our estimated probit model seems to successfully identify the deceleration phase.

Figure 3

Estimated probabilities and the GDP cycle



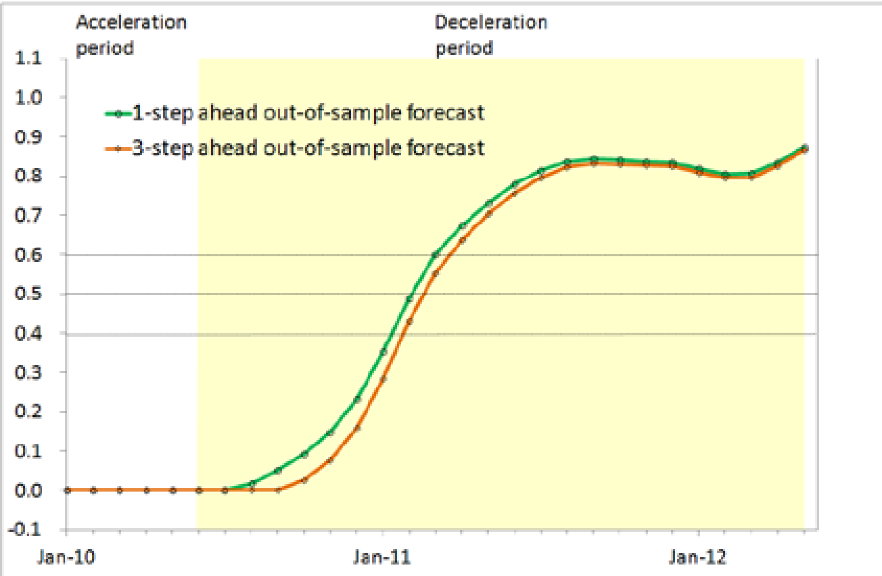
Note: The decelerating phase starting in June 2010 is subject to change as more data are available.

Recursive out-of-sample forecasts are made over the period from January 2010 to May 2012. In particular, the probabilities obtained from the 1-step and 3-step ahead out-of-sample forecasts are presented in Figure 4. The predictive power of these forecasts is evaluated by comparing a percentage of correct classification based on the cutoff value we specified. There are two kinds of correct classifications. One is that the predicted probability is greater than the cutoff and the observed $Y_t = 1$, and another is that the predicted probability is less than or equal to the cutoff and the observed $Y_t = 0$. The fraction of $Y_t = 1$ observations that are correctly predicted is called *sensitivity*, while the fraction of $Y_t = 0$ observations that are correctly predicted is called *specificity*. In this problem, the *sensitivity* is computed for the deceleration phase and the *specificity* for the acceleration phase. Moreover, a percentage of correct classification among total observations is computed.

Table 7 presents the forecast powers for the 1-step and 3-step ahead out-of-sample forecasts based on three cutoff values of 0.4, 0.5, and 0.6. All forecasts correctly identify the phase in the acceleration period from January 2010 to June 2010 for all three cutoff values. But the percentage of correct classification in the deceleration period depends on the choice of the cutoff. It is highest when the cutoff value is 0.4 since the smaller cutoff value is easier to declare the deceleration. Obviously the total forecast power tends to decrease as the cutoff value gets bigger. Comparing the out-of-sample forecast method, the 1-step ahead out-of-sample forecast has a higher forecast power than the 3-step ahead out-of-sample when the cutoff value is 0.6, but almost the same for the other cutoff values.

Figure 4

Probabilities from out-of-sample forecasts



Note: The decelerating phase starting in June 2010 is subject to change as more data are available.

Table 7

Out-of-sample forecast evaluation: probit model

Cutoff value	Phase	Percentage of correct classification	
		1-step ahead	3-step ahead
0.4	Deceleration	69.6	69.6
	Acceleration	100.0	100.0
	Total	75.9	75.9
0.5	Deceleration	65.2	65.2
	Acceleration	100.0	100.0
	Total	72.4	72.4
0.6	Deceleration	65.2	60.9
	Acceleration	100.0	100.0
	Total	72.4	69.0

4. Conclusions

We construct the ESI for the Korean economy in a similar fashion to the European Commission's; that is, we aggregate the standardized BSI and CSI component series by a weighted average and then rescale it to have a mean of 100 and a standard deviation of 10. However, we focus on selecting informative components of the BSI and CSI data and determining the weights so that the composite indicator has a high correlation with GDP growth and a leading feature with respect to GDP cycle.

We evaluate the forecasting performance of the Korean ESI with respect to GDP growth and cycle. The ESI turns out to have a good tracking performance as a leading indicator of GDP.

Using the Granger causality tests we show that the constructed ESI precedes GDP growth, implying the former contains useful information in predicting GDP growth. Also, using a probit model, we show that the ESI is helpful in monitoring and predicting the turning points of GDP. The performance of our probit model could be further improved by adding more relevant economic variables as explanatory variables to the model. Overall, the recently developed ESI for the Korean economy is useful in forecasting short-term economic developments as well as in reflecting economic agents' overall perception of economic activity or conditions.

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Consumer sentiment and confidence indices in Nigeria: a panel data analysis

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1. Introduction

Consumer indicators play important role in providing decision-makers and forecasters with necessary information about current and future economic expectations. Consumer confidence measures were formulated in the late 1940s by George Katona at the University of Michigan as a way to include empirical measures of consumer expectations into models of spending and saving behavior. The approaches of the University of Michigan surveys on consumer confidence have been imitated in many countries across the globe in the last two decades.

The consumer expectations and other expectations surveys plays distinctive role in determining public policies as well as business decisions. This influence is based on the ability of the indices and other indicators to provide an accurate gauge of how consumers will react to changes in the economic environment both at short, medium and long time basis. Empirically, these surveys have shown their capability to measure the various factors that shape consumers' decisions as well as provide timely information about their future intentions. In addition, consumer surveys provide regular assessments of consumer attitudes and expectations and are used to assess economic trends and forecasting. The consumer indicators help to monitor consumers' personal, business, unemployment, government economic policy, price, exchange and interest rate expectations. The surveys are designed to explore why changes in consumer expectations occur and how these changes influence consumer spending and saving decisions.

A question of concern from a forecasting perspective point of view is whether consumer sentiment provides leading information in forecasting household consumption and, in turn, GDP. A number of international studies have provided evidence in this regard. Carroll *et al*. (1994) and Johnson *et al* (2004) shows that the Michigan Index of Consumer Sentiment assists in forecasting consumption for the United States. Acemoglu and Scott (1994) use United Kingdom consumer sentiment data to arrive at a similar conclusion for the United Kingdom. Utaka (2003) also shows a significant association between Japanese consumer sentiment and Japan's GDP.

The answers most consumers give to questions about current and future economic outlooks are generally informed by news and personal experiences over the previous months, some of which may in turn be reflected in data that were already available. This invites the question: do surveys, data analysis and survey findings tell us a great deal more than we already know? In order to address this question, this paper examines the relationship that exists between consumer confidence indicator, short-term interest rate and other selected macroeconomic variables. The paper further estimated the consumer confidence regressions in a structured time series framework by using data from the six geo-political zones of Nigeria. The gap between the observed and the perceived consumer expectations are

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assessed. In addition, we look at whether various sentiment indicators can be explained on the basis of commonly available economic data. We find that much of the movement in sentiment indicators can be explained by variables such as GDP, interest rates, inflation rate, and some other economic variables. The rest of the paper is structured in four sections. Section 2 reviews related literature. The data and the econometric methodology are presented in section 3, while section 4 presents the empirical results of the descriptive and the econometric results. The fifth section presents the concluding remarks of the paper.

2. Literature review

In the last ten years, there has been a lot of literature on firm and households confidence indicators and their usefulness in evaluating and forecasting short and medium terms economic phenomena. The extent to which sentiment indicators can forecast economic activity and short-term economic developments has been a recurring topic in economic and applied statistics research works ever since the Index of Consumer Sentiment (ICS) was introduced in 1952 by George Katona and his colleagues at the University of Michigan. In most of the research works carried out in the last ten years, it has been proved that both confidence and survey indicators are useful in evaluating the current economic development and also used for short-term forecasting purpose. Many academics, applied statisticians and applied economists have proposed the use of linear with time-varying coefficients to evaluate the robustness and the performances of forecasting models based on confidence indicators for both in-sample and out-of-sample characteristics.

Consumer expectations surveys have generally been conducted with the objective of evaluating the relationship between consumer indicators and other macroeconomic variables of interest as well as examining economic trends and prospects. Confidence indicators derived from business and consumer survey results give crucial information on business and consumer assessments of the economic situation and their intentions and expectations for the future.

Mueller (1963) assess the forecasting performance of the Michigan consumer confidence survey and found that lagged confidence variables were significant predictors of durable and non-durable household expenditures. Furthermore, Friend and Adams (1964) found that the ICS was useful for forecasting motor vehicle expenditures; however, they also found that stock prices were a reliable substitute for the survey measure. Later research studies by (Fair 1971; Juster and Wachtel 1972a, 1972b) supported Mueller's claim that sentiment could predict other durables as well. Mishkin (1978), it was argued that the ICS could be interpreted as measuring consumers' subjective assessment of the probability of financial distress, and used a significant relationship between the ICS and household assets and liabilities to support this hypothesis. He argued that the ICS should be a significant predictor of consumer durables expenditure, since durables are illiquid and hence less likely to be purchased by consumers facing financial difficulties. This was discovered when financial variables were not taken into account, but that when they were the sentiment variable became largely redundant. Again, in some literature, a few researchers are more skeptical about the usefulness of the confidence indices in forecasting. Emerson and Hendry (1994) use a Vector Autoregressive technique to state that in general, leading indicators do not additional information in forecasting. In addition, they further strength that leading indicators are frequently revised and open to certain degree of subjectivity in the selection process of the component variables. The discovery is in line with the findings of Weale (1996), in which the initial transformation and refinement of the data is considered as additional sources of ambiguity when dealing with leading indicators. In a similar development, the paper of Stock and Watson (1993) considered the choice of indicators included in the model as the key source of uncertainty in model specification and forecasting.

In contrast, Throop (1992) estimated a five-variable vector error-correction model (VECM) with the changes in the ICS, durables spending, non-durables and services spending, permanent income, and the 6-month commercial paper rate as endogenous variables. He found that changes in sentiment caused changes in durables spending (but not in non-durables and services); in contrast, durables spending did not cause changes in sentiment. When he replaced the ICS with economic variables that he found predicted sentiment (unemployment and inflation), forecast errors were usually lower than in regressions where the ICS (or its current financial conditions component) were used.

In a similar development, Leeper (1992) used a vector autoregression (VAR) framework to assess the relationship between consumer sentiment and activity. His results echoed Mishkin's. Sentiment innovations only improved the VAR's predictions of industrial production and unemployment when financial variables (again, stock prices and T-bill rates) were excluded from the analysis. Later work by Matsusaka and Sbordone (1995) also used a VAR framework, but found that consumer sentiment explained a large proportion of the innovation variance of GNP, after controlling for the Index of Leading Indicators and a measure of default risk. Estrella and Mishkin (1978) used a simple probit analysis including financial variables to assess the usefulness of survey measures for predicting recessions. Again in the literature, there is a suggestion that sentiment variables become redundant when the researcher controls for financial variables, but this finding is by no means consistent across the board. The early work of Hymans and Mishkin tends to favour the interpretation that sentiment indicators summarize prior (or contemporaneous) economic information, a finding echoed by Throop (1992) and Lovell and Tien (2000). Desroches and Gosselin (2002) assess the usefulness of consumer confidence indices in forecasting aggregate consumer spending in the United States. They constructed a simple threshold model that takes into account the magnitude of variation of consumer confidence indexes to forecast consumption expenditures. They concluded that strong variations in confidence matter for consumption, as confidence is a significant predictor of consumption during high-volatility periods.

Cotsomitis and Kwanf (2006) attempts to examine the ability of consumer confidence to forecast household spending within a multicountry framework. They used two confidence indices, namely the Consumer Confidence Indicator and the Economic Sentiment Indicator and find that there is much variability in the in-sample incremental forecasting performance of the confidence indices for the countries canvassed. The results of their out-of-sample tests indicate that these confidence indices provide limited information about the future path of household spending. They added that European economic forecasters and government policy makers should, therefore, be careful when using the CCI and ESI to predict consumption growth in EU countries.

In the work of Gulley and Sultan (1998), they established a link between the Consumer Board Consumer Confidence on various stock prices, bond yields and some currency rates using a GARCH model. Similarly, Jansen and Nahuis (2003) study the relationship between stock market developments and consumer confidence in 11 European countries over the years 1986-2001. They argue that the relationship between stock market and consumer sentiment depends on the expectations about economy-wide conditions rather than the conventional wealth effect. In another investigation, Vuchelen (2004) analyzes whether information content of consumer sentiment can be explained by some economic and financial variables such as unemployment, growth rate, interest rates and exchange rates. He discovered that both interest rates and dollar exchange rate have significantly negative effect on consumer sentiment. Lemmon and Portniaguina (2006) explore time series relationship between investor sentiment and the small-stock premium using consumer confidence as a measure of investor optimism. They discovered that sentiment does not appear to forecast time series variation in the value and momentum premiums. Yasemin and Sadullah (2010) studied the link between Government Spending, Consumer Confidence and Consumption Expenditures in Emerging. They attempts to introduce a new variable to this well-known literature by investigating the existence of a relationship between government expenditure, consumer spending and consumer confidence for a group of emerging market countries. They empirically demonstrated the important role of consumer confidence on government spending and private consumption expenditures. Previous studies usually focus on the relation between consumer confidence and other macroeconomic indicators for developed countries. However, there is hardly any study that models consumer confidence as a function of relative price of petrol, unemployment rate, VAT revenue and other macroeconomic indicators discussed in this work for a country like Nigeria. Empirically, the link between consumer confidence and other macroeconomic variables has not been well established in other studies on CCI in Nigeria.

3. Data and econometric methodology

3.1 Data

The data used for this study are obtained from the surveys of the Consumer Expectations Survey (CES) of Central Bank of Nigeria from Q2 2008 to Q2 2012, the Statistical Bulletin and the National Bureau of Statistics (NBS) publications of the Central Bank of Nigeria. Other data are obtained from the surveys data of the business expectations and inflation attitudes. The confidence data were taken from consolidated quarterly expectations surveys data of both households and firms in the six-geopolitical zones of Nigeria. The sectors covered for the firms include Industry, Construction, Wholesale and Retail Trade, Financial Intermediation, Hotels and Restaurants, Renting and Business Activities and Community and Social Services. In addition, some of the secondary data collected were obtained from various publications of the National Bureau of Statistics of Nigeria the consumer price index and national accounts data. The Consumer confidence index (CCI) collected reflects the short-term trend of activity and major movements in overall economic activity. Most of the data are current and expectations values for next quarter and one year ahead. The data collected were analyzed using the Statistical Packages for Social Sciences (SPSS) Version 20, Eviews and MATLAB software. The choices of the indicators are based on the relevance of the variables to this study. In this paper, the cubic spline interpolation was used to convert the quarterly indicators to monthly series given the paucity of monthly data.

3.2 Method of data analysis

The data collected were analyzed using the software Statistical Packages for Social Sciences (SPSS), Eviews and MATLAB. Given the paucity of monthly data, cubic spline interpolation was used to convert the quarterly indicators to monthly series.

3.2.1 Computation of confidence indices

The three confidence indices are computed on different scales, so the magnitudes of the point changes are not directly comparable.

ABC/Money – consumer comfort index

The Consumer Comfort Index (CCI) is computed by taking the sum of the positive percentages ("excellent" and "good") from each question and subtracting the sum of the negative percentages ("not so good" and "poor") and then averaging them (Langer, 2003).

For each question, Xi = (excellent % + good %) – (not so good % + poor %)

$$CCI = (X_1+X_2+X_3)/3 \quad (1)$$

Conference Board - Consumer Confidence Index

The Consumer Confidence Index (CCI) is computed by taking the positive percentage for each question divided by the sum of the positive and negative percentages. This number is then divided by the base year value. For each question, Xi = [((positive %)/(positive % + negative %))/Base Year Value]*100

CCI = ((X1+X2+X3+X4+X5)/5) (2)

Michigan - Index of Consumer Sentiment

The Reuters/University of Michigan consumer sentiment index was designed after World War II at the University of Michigan by the eminent psychologist George Katona, whose pioneering efforts focused on integrating economic psychology with macroeconomic theory, modeling, and forecasting. Katona maintained that there was a sharp difference between income (the ability to buy) and the willingness to buy (consumer psychology). His argument was that if people feel better off, they will spend more, while if they feel worse off, they will spend less.

Table 1 summarizes the Consumer Confidence Indicators and the other macroeconomic indicators, the corresponding IDs that are used in the tables of this work, and the corresponding sources from which the data are collected.

Table 1

Macroeconomic factors, respective IDs, and data sources

Economic factor	ID	Source
All Share Index	ASI	CBN, Statistical Bulletin
Buying Intension Index	BII	CBN, Statistical Bulletin
Conference Board's Consumer Confidence Index	CBM	Authors' Calculation
Consumer Confidence Index	CCI	CBN, Statistical Bulletin
Crude Export	CEX	CBN, Statistical Bulletin
Exchange Rate	EXR	CBN, Statistical Bulletin
External Reserves	XRS	CBN, Statistical Bulletin
Government Spending	GSP	Federal Ministry of Finance
Gross Domestic Product Growth Rate	GDP	National Bureau of Statistics
Inflation Rate	INR	CBN, Statistical Bulletin
Michigan's Consumer Sentiment Index	CMI	Authors' Calculation
Petrol Price (₦/Litre)	PEP	CBN, Statistical Bulletin
Previous Consumer Index	PCI	CBN, Statistical Bulletin
Private Sector Credit	PSC	CBN, Statistical Bulletin
Unemployment Rate	UER	National Bureau of Statistics
VAT Revenue	VAR	CBN, Statistical Bulletin

Pearson correlation analysis

Pearson correlation analysis is the statistical analysis tool used to study the relationship between the Consumer Confidence Indicators and the other macroeconomic indicators. The null hypothesis of the test for CCI and each macroeconomic indicator is that there is no association between CCI and other macroeconomic indicators.

3.2.2 Unit roots and cointegration

Time series tests, such as Granger causality test, are usually preceded by another test for identifying the integrated order of the variables. Augmented Dickey-Fuller (ADF) test proposed by Dickey and Fuller (1979) and extended by Said and Dickey (1984) is used for the identification of the order of integration of the macroeconomic indicators and the

Consumer confidence indicators used in this work. The null hypothesis is that the time series under study is not stationary and the alternative hypothesis is that the time series is stationary. A time series is stationary if its statistical properties do not change after being time-shifted (Brockwell and Davis, 2002). Critical values recommended by Banerjee et al. (1993) are used for the unit root test.

We employ conventional unit root tests of the Dickey-Fuller test (ADF) (Dickey and Fuller 1979 and 1981), and the Phillips–Perron (1988) test (PP). In addition, we also employ several unit root tests like Dickey-Fuller Test with GLS Detrending (DFGLS), The Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) Test, Elliot, Rothenberg, and Stock Point Optimal (ERS) Test, Ng and Perron (NP) Tests to the consumer confidence indicators and other macroeconomic variables considered (For brevity of this paper only the ADF results are presented in this paper, the other unit root test are available on request). The Johansen (1988) and Johansen and Juselius (1990) procedure was used to estimate the cointegrating relationships of the consumer confidence indicators in the long-run and short-run fluctuations.

Vector Error Correction Method (VECM)

The direction of causality among the cointegrated variables could be specified by using the vector error correction models (VECM). The VECM augments a vector autoregressive process in first differences of the variables with their cointegrating relationship. We used only the Trace test to take decision in this paper as it has more local power than other alternatives.

3.3 Econometric model of the consumer sentiment and consumer confidence

This section clearly describes the econometric models developed for the work. The quarterly consumer sentiment and consumer confidence regressions in a structured time series framework formulated are presented below. To develop a practical model of the determinants of consumer attitudes, we expand on the traditionally used explanatory variables—such as inflation, petrol price, unemployment, stock market performance (All Share Index), unemployment rate, exchange rate, inflation rate, interest rate, gross external reserve, GDP growth rate (%), and private sector credit.

The econometric representation of the consumer confidence regression equation is specified as follows:

$$CMI_t = \beta_0 + \beta_1 PCI_t + \beta_2 VAR_t + \beta_3 ASI_t + \beta_4 BII_t + \beta_5 INR_t + \beta_6 PEP_t + \beta_7 PSC_t + \beta_8 GDP_t + \beta_9 GSP_t + \beta_{10} CEX_t + \varepsilon_{1t}. \quad (4)$$

and $\varepsilon_{1t} \sim N(0, \sigma^2)$

$$CBM(t) = \alpha_0 + \alpha_1 PCI_t + \alpha_2 VAR_t + \alpha_3 ASI_t + \alpha_4 BII_t + \alpha_5 INR_t + \alpha_6 PEP_t + \alpha_7 PSC_t + \alpha_8 GDP_t + \alpha_9 GSP_t + \alpha_{10} CEX_t + \varepsilon_{2t} \quad (5)$$

Where $\varepsilon_{2t} \sim N(0, \sigma^2)$

β_j, j=0,…, 10 and α_j, j=0,…, 10 are the parameters to be estimated. The dependent variables: "CMI (t)" denotes the monthly Reuters/University of Michigan's consumer sentiment index at time period "t," and "CBM (t)" denotes the Conference Board's consumer confidence index. The explanatory variables are clearly described in Table 1. The explanatory variables are described in Table 1. For the sake of brevity, we drop the monthly time index for the remainder of this article.

4. Empirical Results

Correlation analysis

Before we report the empirical results of our two models developed couple with the other results, it would be useful to first examine the statistical relationship between consumer confidence index and some of the variables considered in the work. The first column in Table 2 reports the correlation between the percentage growth rate, the Michigan confidence sentiment and the buying intension index of the consumers. As can be seen from this Table 2, these series reveal a close association for the period under consideration.

Table 2

Correlations between CC Indicators and Key Macroeconomic Variables

CCI	GDP growth, CBM, BII	0.780, 0.922, 0.749
BII	CBM, EXR, GDP	0.724, 0.630, 0.602
GSP	CCI, EXR, INR	0.297, 0.467, 0.385
PEP	CCI, INF, GSP	0.232, 0.015, 0.303
GDP	CCI, UER, GSD	0.780, 0.389, 0.400
INR	CCI, UER, GSP	0.556, 0.183, 0.386

Source: Authors' Calculation

Table 2 shows the correlations between each overall index and the economic variables. All of the correlations are in the expected direction: except for unemployment and CPI that gave positive value of 0.1831. The confidence indices correlate well with GDP, unemployment, and inflation. In addition, there are moderate and statistically significant correlations in the expected directions between the indices and the other economic variables: the INR, petrol price and government spending.

Table 3

The Degree of relationship between the ABC/Money, Conference, Michigan approaches

	ABC/Money	*Conference*	*Michigan*
ABC/Money	1		
Conference	0.536631	1	
Michigan	0.809333	0.825638	1

Source: Authors' Calculation

Table 4

Correlation matrix of CCI, short-term interest rate and other macroeconomic variables

	ASI	BII	CBM	CCI	CEX	CMI	EXR	GDP	GSP	INR	PCI	PEP	PSC	UER	VAR	XRS
ASI	1	0.447282	0.779173	0.859499	0.432418	-0.68328	-0.05474	0.708168	0.156249	0.669915	0.859499	0.045579	0.233187	0.47514	0.511271	-0.54752
BII	0.447282	1	0.723517	0.749428	0.670502	-0.27849	0.629705	0.602293	0.390337	0.032082	0.749428	0.467766	-0.39762	0.817847	0.53739	-0.80225
CBM	0.779173	0.723517	1	0.92245	0.367539	-0.44318	0.246029	0.72254	0.261451	0.40943	0.92245	0.360392	0.089486	0.575839	0.483877	-0.61084
CCI	0.859499	0.749428	0.92245	1	0.579459	-0.58571	0.196857	0.779868	0.297279	0.55553	0.9999	0.232153	-0.08144	0.696191	0.594518	-0.78047
CEX	0.432418	0.670502	0.367539	0.579459	1	-0.22602	0.329262	0.386729	0.182357	0.116626	0.579459	0.102292	-0.50089	0.790784	0.668199	-0.82475
CMI	-0.68328	-0.27849	-0.44318	-0.58571	-0.22602	1	-0.1089	-0.62839	-0.44223	-0.83709	-0.58571	-0.18184	-0.22327	-0.25086	-0.05612	0.32864
EXR	-0.05474	0.629705	0.246029	0.196857	0.329262	-0.1089	1	0.048371	0.46755	-0.12068	0.196857	0.7052	-0.1621	0.655559	-0.08545	-0.50218
GDP	0.708168	0.602293	0.72254	0.779868	0.386729	-0.62839	0.048371	1	0.40027	0.584458	0.779868	0.17312	-0.03855	0.389035	0.358412	-0.52944
GSP	0.156249	0.390337	0.261451	0.297279	0.182357	-0.44223	0.46755	0.40027	1	0.385781	0.297279	0.303173	-0.02733	0.344805	-0.11472	-0.37429
INR	0.669915	0.032082	0.40943	0.55553	0.116626	-0.83709	-0.12068	0.584458	0.385781	1	0.55553	0.014743	0.348557	0.183142	-0.02586	-0.30371
PCI	0.859499	0.749428	0.92245	0.9999	0.579459	-0.58571	0.196857	0.779868	0.297279	0.55553	1	0.232153	-0.08144	0.696191	0.594518	-0.78047
PEP	0.045579	0.467766	0.360392	0.232153	0.102292	-0.18184	0.7052	0.17312	0.303173	0.014743	0.232153	1	-0.02422	0.368565	-0.16801	-0.27566
PSC	0.233187	-0.39762	0.089486	-0.08144	-0.50089	-0.22327	-0.1621	-0.03855	-0.02733	0.348557	-0.08144	-0.02422	1	-0.29371	-0.36794	0.378471
UER	0.47514	0.817847	0.575839	0.696191	0.790784	-0.25086	0.655559	0.389035	0.344805	0.183142	0.696191	0.368565	-0.29371	1	0.512282	-0.94921
VAR	0.511271	0.53739	0.483877	0.594518	0.668199	-0.05612	-0.08545	0.358412	-0.11472	-0.02586	0.594518	-0.16801	-0.36794	0.512282	1	-0.56052
XRS	-0.54752	-0.80225	-0.61084	-0.78047	-0.82475	0.32864	-0.50218	-0.52944	-0.37429	-0.30371	-0.78047	-0.27566	0.378471	-0.94921	-0.56052	1

Source: Authors' Calculation

This paper examined the degree of association between the three most prominent approaches. A main reason the three confidence measures correlate so strongly over time, even though they use quite different methods, is that they each use a consistent methodology which produces reliable trend measurements over time. Even though the indices are highly correlated over time, particularly between Michigan and Conference Board, and between Michigan and ABC/Money with degree of relationship 82.56 percent and 80.93 percent, respectively, the results can diverge in the short term. One reason is the different fieldwork and release schedules; releases of the different indices within the same week or even on the same day can be based on very different field periods. The relationship between the Michigan Consumer Sentiment Index and GDP growth over the next quarter is negative correlated, implying that GDP growth declines following periods of high confidence. The correlation obtained here is potentially consistent with a precautionary savings argument that is higher confidence is associated with lower uncertainty about the future and therefore a reduction in saving, then high confidence will be associated with a higher level of current consumption relative to future consumption and lower consumption growth going forward.

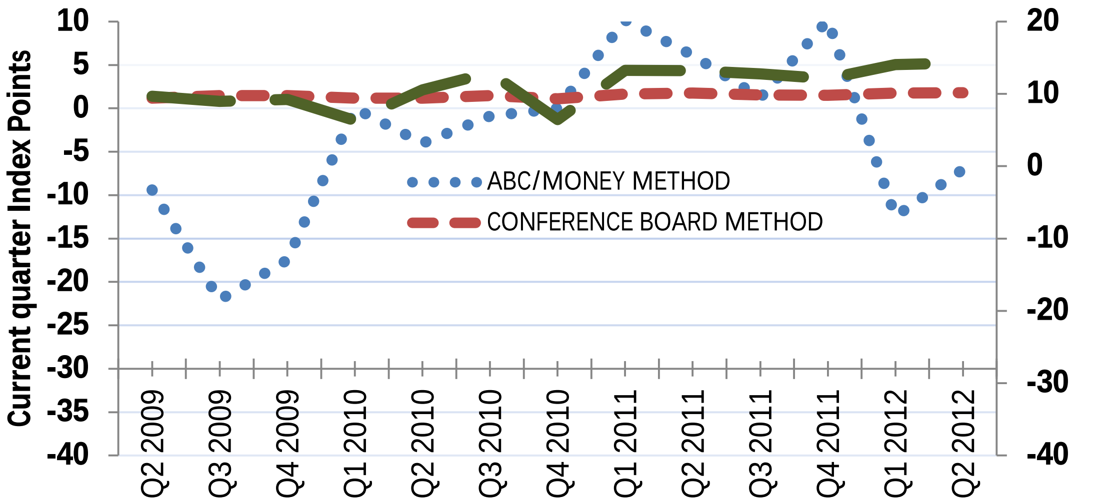


Fig 1: Consumer Outlook Index

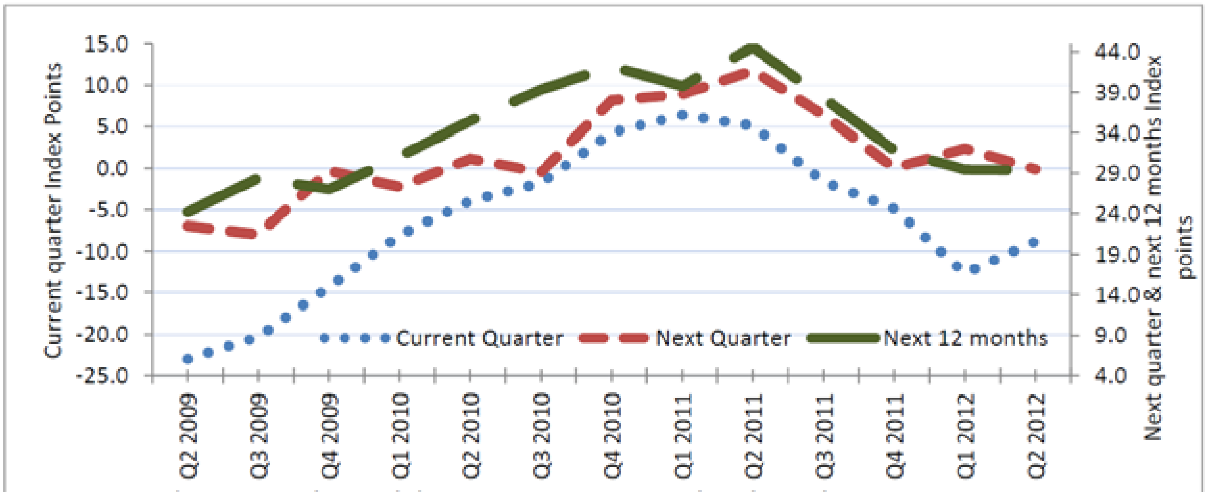


Fig 2: Nationwide Consumer Outlook Index

Fig.2 shows the trend of the national Outlook Index from Q2 2009 to Q2 2012. The next quarter and the next 12 months outlook are more optimistic than the current quarter in all the periods considered. Precisely, the Consumer's overall outlook in Q2 2012, which stood at –8.8 points rose by 3.9 points above its level in the previous quarter but fell by 13.9 points below its levels in the corresponding period of 2011. The bleak outlook of consumers in the quarter under review could be attributable to the pessimistic outlook of consumers in their family financial situation, which dropped to –16.7 from –15.9 points in the previous quarter. Consumer outlook for the next quarter was positive, at 29.5 points the index rose significantly by 38.3 points from the –8.8 points attained in the current quarter. The positive outlook of consumers in the next quarter could be attributable largely to the optimistic outlook of consumers in their family income.

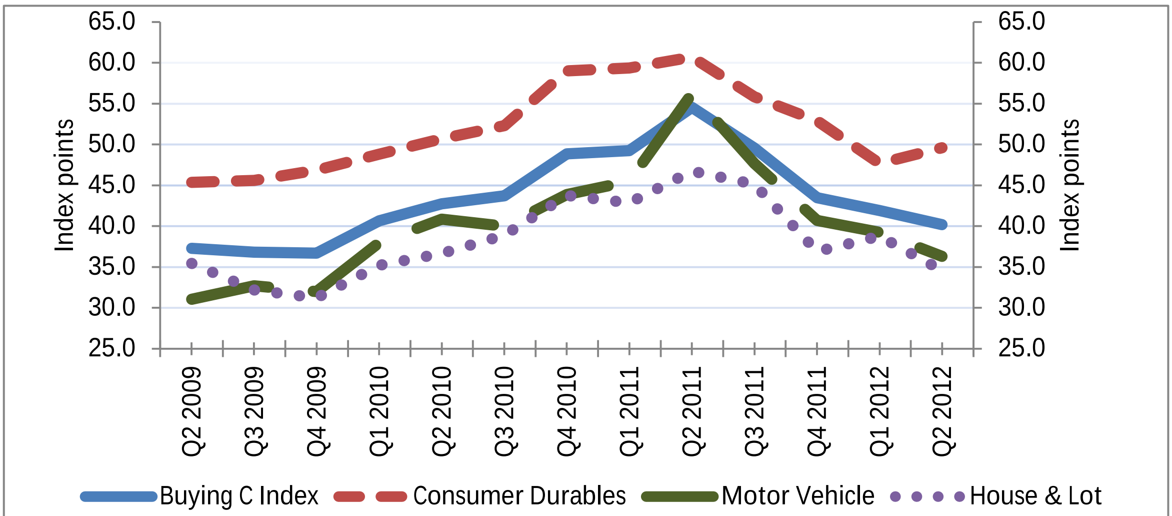


Fig. 3: Buying Conditions Index: National

Fig. 3 depicts the buying conditions index of the consumers from Q2 2009 to Q2 2012. Majority of consumers nationwide believed that the current quarter is not the ideal time to purchase big-ticket items like consumer durables, motor vehicles and house and lot. In quarter two 2012 the overall buying conditions index for consumer for big-ticket items stood at 40.2 per cent, representing a decline of 1.7 and 14.4 points when compared with the level attained in previous quarter and the corresponding period of 2011. The decline in buying conditions index in Q2 2012 was driven largely by the decline in sentiments on motor vehicle and house and lot, with the house and lot posting the lowest sentiment in the last 9 quarters.

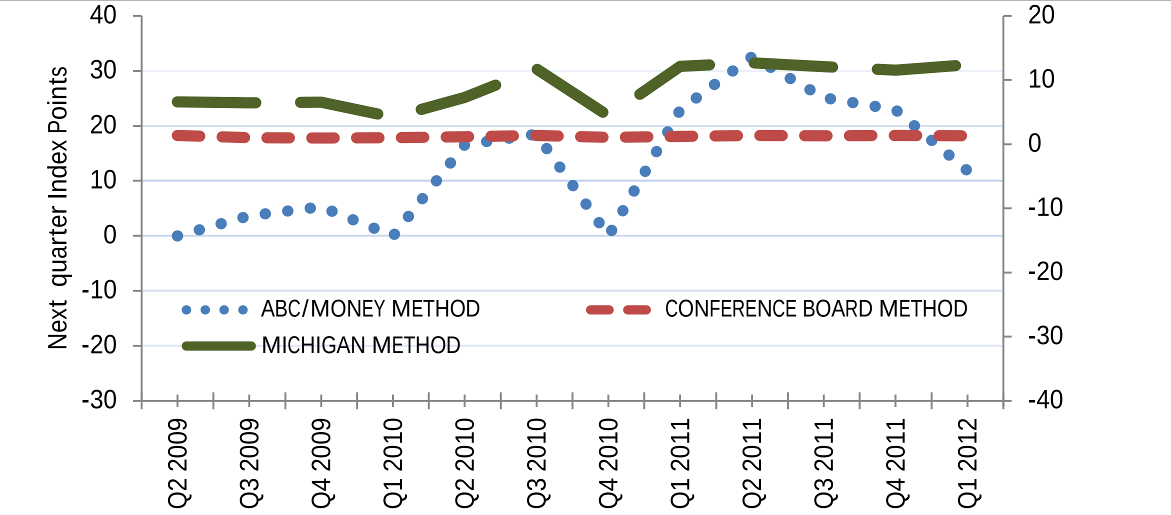


Fig 4: Consumer Outlook Index: Next Quarter

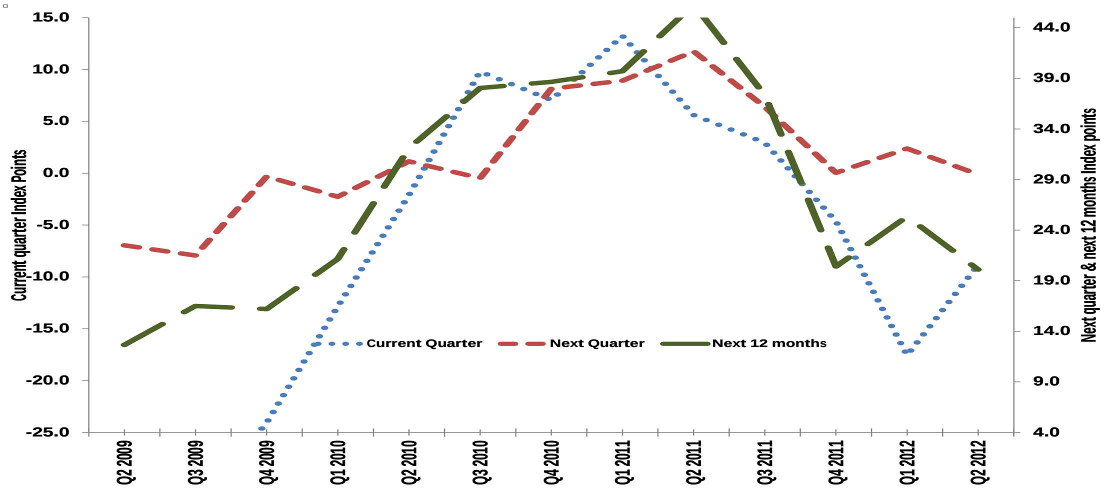


Fig 5: Consumer outlook indices on the economic condition

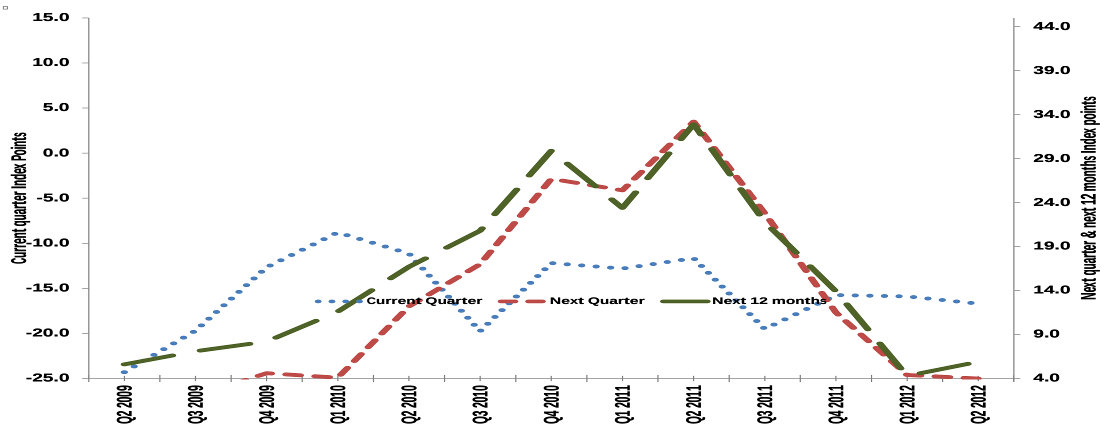


Fig 6: Consumer outlook indices on the family financial situation

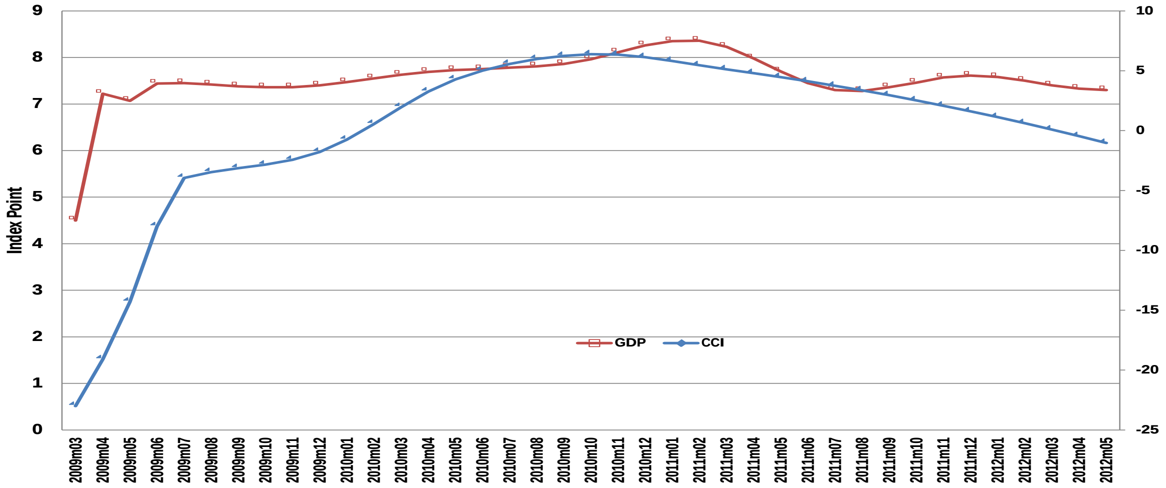


Fig.7: Evolution of CCI and GDP Indices

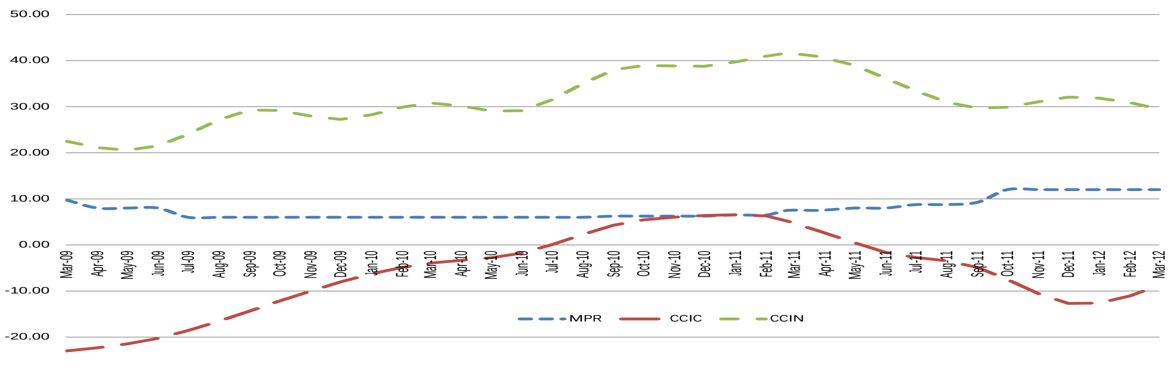


Fig.8 : Gap between the observed and the perceived consumer expectations and monetary policy rates.

Fig. 7 shows the evolution of the Consumer Confidence Index and the GDP growth rate from March 2009 to May, 2012. From the graph, there is clear indication that the GDP and CCI are mirroring each other. Consumers have more confidence in the economy when there is increase in the output of goods and services. Fig. 8 shows the level is consistency in the monetary policy rate and the confidence indices for both the current and the next quarter. Obviously, the stance of consumer confidence during the period under consideration and the opportunity of credit to the real sector on households and enterprises would reduce risks of the growth outlook.

The other function examined in this work is Consumer Confidence Index as dependent variable and the GDP growth rate as the independent variable

$$CCI = f(GDP) \qquad (6)$$

From the analysis carried out, the consumer confidence improved from -12.7 in Q1 2012 to 8.8 in June of 2012. Historically, the overall conference outlook index is a barometer of the health of the economy from the perspective of the consumer. The CCI and its related series are among the earliest sets of economic indicators available each quarter and are closely watched as indicators by the monetary policy committee members and other stakeholders for the Nigeria economy.

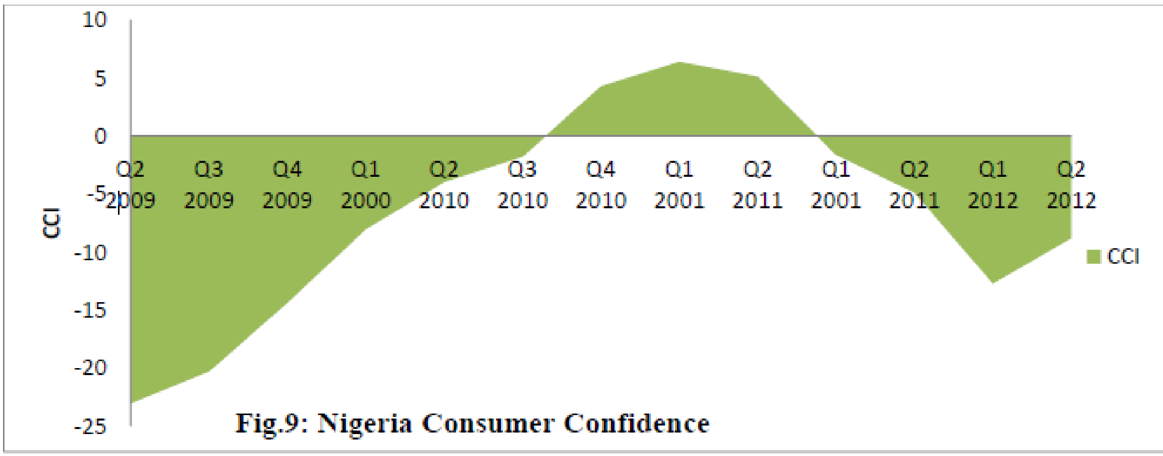


Fig.9: Nigeria Consumer Confidence

The results obtained by using the Michigan's Consumer Sentiment model and Conference board's confidence model specified in equation (4) and (5) with E-views software and based on the minimum selection criterion are given in the Table 6 below.

All the coefficients are statistically significant at 5 per cent level with the exception of unemployment rate and private sector credit. However, all the variables are significant at 10 percent significance level. The R- squared for the Michigan method produces 89.2 percent; this represents the variation in the response variable that can be explained by explanatory variables. They key variables in the model have appropriate signs and magnitudes with the exception of GDP in this case. The model developed for Michigan consumer sentiment shows that the consumer demand for petrol is highly inelastic in Nigeria. In Nigeria, most of the consumers always buy petrol for their vehicles, domestic usage (both for powering home generators) and other industrial usage. When Government remove petrol subsidy and increase the price of petrol in Nigeria, households have to pay additional charges. Several previous governments have tried to remove the subsidy but have backed down in the face of widespread public protest and reduce it instead. Analysts say many Nigerians regard cheap fuel as the only benefit they get from the national oil wealth. During the period considered in this paper, price of petrol have increased from N65.00 (US$ 0.40; £0.26) per litre to at least N140.00 in filling stations and from N100 to at least N200 on the black market, where many Nigerians buy fuel. To be able to pay for additional charges, consumer have to dip into their saving to be able to meet up with these additional charges. Consumers have to adjust their budgets equations to be able to cope with instantaneous price increase in all goods and services. The results shows that 10 per cent increase in the price of petrol will lead to 5.7 percent reduction in consumer sentiment as shown by Michigan consumer sentiment model estimated. In addition, a unit increase in government spending reduces consumer sentiment by 1.4 percent. One possible reason for this is that consumers might not have confidence in the judicious spending pattern of government because of the level of transparency and proper accountability over the years. The test for the series CCI, INR, PEP GSP shows that there is co-movement in the series. The results of the Johansen cointegration test are presented in the appendix.

Table 5

Unit Root test of the Consumer Confidence indicators and the other economic variables

VARIABLE	LEVEL OF INTEGRATION	ADF Value	TEST STATISTIC	Prob.
ASI	I(1)	ADF -4.523187	1% -3.621023 5% -2.943427 10% -2.610263	0.0009
BII	I(1)	ADF -6.69977	1% -3.632900 5% -2.948404 10% -2.612874	0.0000
CBA	I(1)	ADF -4.289087	1% -3.626784 5% -2.945842 10% -2.611531	0.0017
CMI	I(0)	ADF -4.246862	1% -3.639407 5% -2.951125 10% -2.614300	0.0021
CCI	I(1)	ADF -3.205680	1% -3.679322 5% -2.967767 10% -2.622989	0.0299
CEX	I(1)	ADF -7.837279	1% -3.626784 5% -2.945842 10% -2.611531	0.0000
EXR	I(1)	ADF -7.837279	1% -3.621023 5% -2.943427 10% -2.610263	0.0000
XRS	I(1)	ADF -4.651290	1% -3.621023 5% -2.943427 10% -2.610263	0.0006
GSP	I(0)	ADF -5.238255	1% -3.679322 5% -2.967767 10% -2.622989	0.0002
INR	I(1)	ADF -5.414476	1% -3.699871 5% -2.976263 10% -2.627420	0.0001
PEP	I(0)	ADF -6.400217	1% -3.626784 5% -2.945842 10% -2.611531	0.0000
PCI	I(1)	ADF -3.205680	1% -3.679322 5% -2.967767 10% -2.622989	0.0299
PSC	I(1)	ADF -8.028541	1% -3.621023 5% -2.943427 10% -2.610263	0.0000
GDP	I(1)	ADF -4.296524	1% -3.646342 5% -2.954021 10% -2.615817	0.0019
UER	I(1)	ADF -4.090807	1% -3.621023 5% -2.943427 10% -2.610263	0.0029
VAR	I(1)	ADF -10.87470	1% -3.621023 5% -2.943427 10% -2.610263	0.0000

Source: Authors' Calculation

Table 6

Comparison of Michigan's consumer sentiment model and Conference board's confidence model

	Michigan's consumer sentiment model		Conference board's confidence model	
	Estimated Parameter	Prob.	Estimated Parameter	Prob.
C	13.289 (1.012)	0.0000	0.238 (0.0574)	0.0003
Δ^2GDP			0.073 (0.00024)	0.0900
GDP(-1)	-0.186 (0.0959)	0.0655		
GSP	-0.014 (-0.003)	0.0000	-0.00049 (0.00024)	0.0475
ΔINR			0.132360 (0.0647)	0.0505
Δ^2(INR)	-11.071 (1.467)	0.0000		
ΔUER(-1)	-0.476 0.234	0.0543	-0.05026 (0.0161)	0.0041
ΔBII	-1.187 (0.306)	0.0009	-0.03282 (0.0106)	0.0045
ΔPSC	-1.954 (1.074)	0.0833	0.002152 (0.0011)	0.0618
PEP	-0.057 (0.014)	0.0004	-0.00289 (0.00078)	0.0009
ΔPCI	-0.760 (0.288)	0.0154	0.084769 (0.0105)	0.0000
ΔEXR(-1)	0.190 (0.071)	0.0139		
CEX(-1)	-0.054 (0.023)	0.0249		
ΔVAR	-6.42E-05 (3.03E-05)	0.0460		
R-squared	0.892		0.871	
Adjusted R-squared	0.835		0.834	
Akaike info criterion	2.544		0.395	
Schwarz criterion	3.088		0.978	
Hannan-Quinn criter.	2.727		0.594	
Durbin-Watson stat	1.779		1.796	

Source: Authors' Calculation

Table 7

Result of the regression of CCI model with GDP as independent variable

Dependent Variable: D(CCI)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.045086	0.178358	0.252782	0.8021
D(GDP(-1))	3.935088	0.560884	7.015869	0.0000
AR(1)	0.479678	0.067779	7.077064	0.0000
MA(1)	0.999986	5.97E-08	16737735	0.0000

R-squared	0.963837	Mean dependent var	0.368611
Adjusted R-squared	0.960446	S.D. dependent var	1.352135
S.E. of regression	0.268914	Akaike info criterion	0.315590
Sum squared resid	2.314074	Schwarz criterion	0.491536
Log likelihood	-1.680617	Hannan-Quinn criter.	0.377000
F-statistic	284.2911	Durbin-Watson stat	1.506953
Prob(F-statistic)	0.000000		

Inverted AR Roots	.48
Inverted MA Roots	-1.00

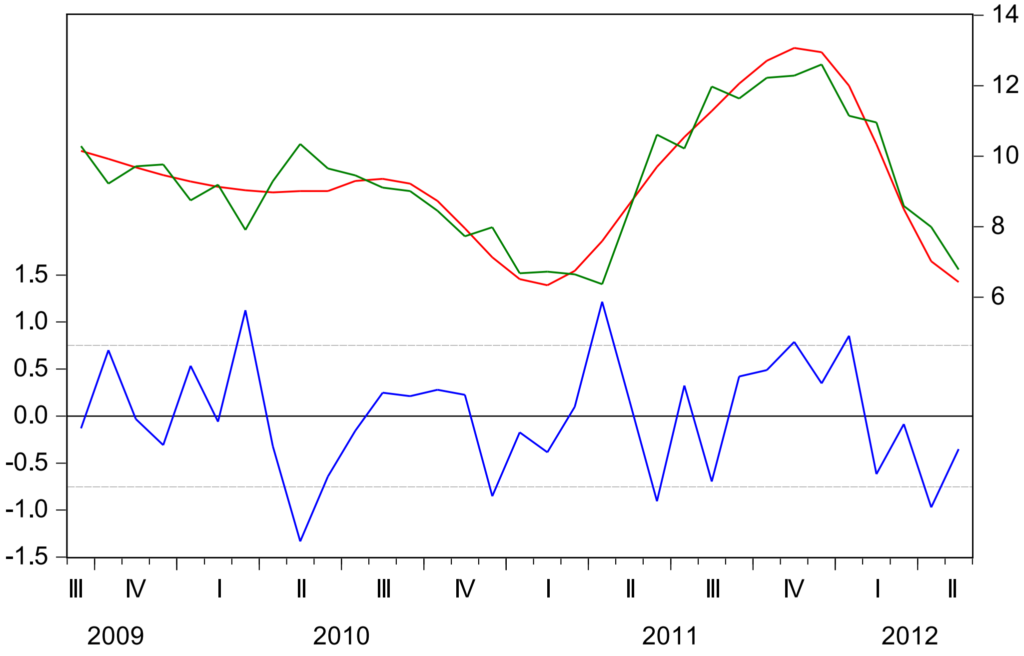
Source: Author's calculation

The estimated consumer confidence index model when regressed with the GDP shows that a unit increases in the GDP growth rate will have a positive effect on CCI with. This satisfied the *a priori* expectation in term of output and consumer confidence index.

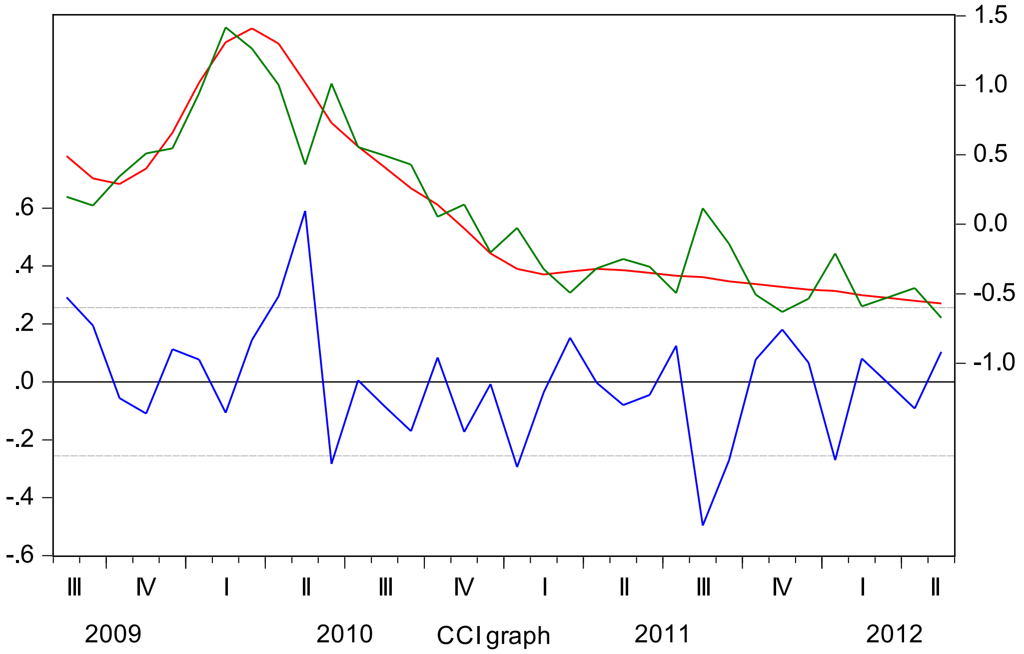
5. Concluding remarks

This study assesses the consumer confidence indices, the outlooks variables and the inter-linkages between consumer confidence and selected macroeconomic variables in Nigeria. Furthermore, we developed and estimated the consumer sentiment model and conference board confidence model for Nigeria with time series methods and these are novel in the literature. We noticed that a change in economic growth have a strong impact on consumer confidence. The study has also shown that several factors are likely to affect the consumer confidence in an economy like Nigeria. Among these are unemployment, petrol prices, financial market indicators like the movements in stock exchange markets (ASI), exchange rates, interest rates, government spending, terrorist attacks etc. Our findings equally suggest that movements in exchange rate and interest rates are negatively affecting consumer confidence in all the six geo-political zones of the country. For instance, rising interest rates and exchange rates usually reflects negative economic and political news. These are quickly priced in money particularly in domestic market and foreign exchange markets. Empirical findings have shown that the movements of some economic variables in these markets are closely watched by consumers and negatively reflected in their behaviors and budget equations. When sufficient monthly data are available, it is expected that the results may be more robust than the one obtained by the cubic spline decomposition method used for the conversion of quarterly data to monthly series. Further study to examine consumer confidence and other key macroeconomic variables across the West Africa zone will be examined in phase two of this work.

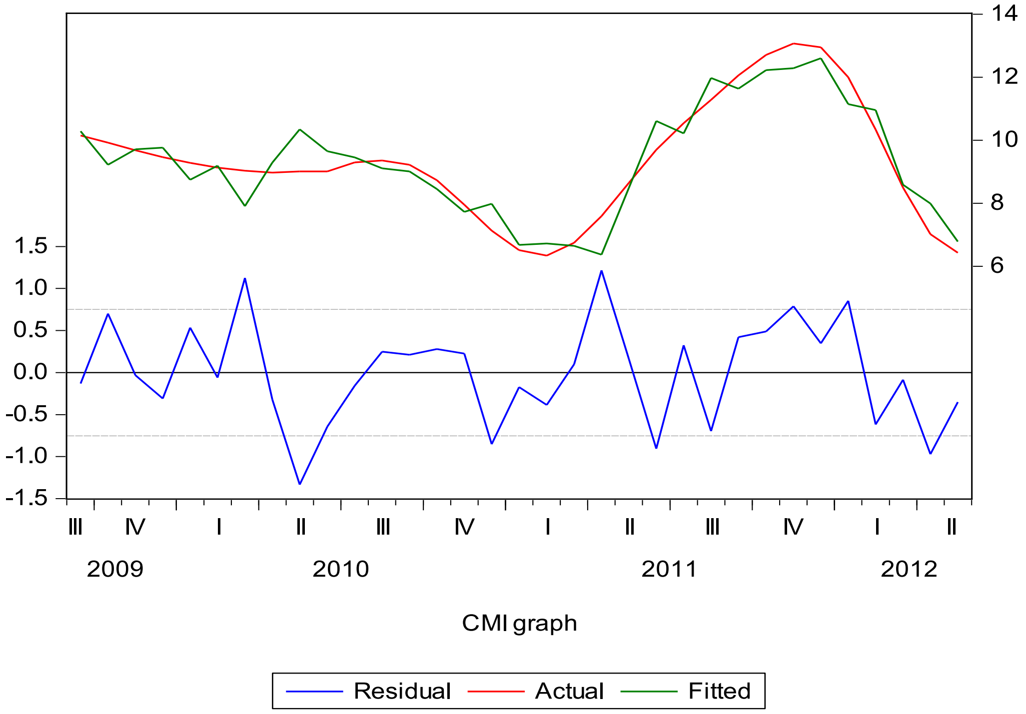
Appendix



CMI graph



CCI graph



CMI graph

Date: 07/24/12 Time: 16:58
Sample (adjusted): 2009M05 2012M05
Included observations: 37 after adjustments
Trend assumption: Linear deterministic trend
Series: CCI INR PEP GSP
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.729917	107.0656	47.85613	0.0000
At most 1 *	0.662018	58.63169	29.79707	0.0000
At most 2 *	0.296108	18.49549	15.49471	0.0171
At most 3 *	0.138214	5.503672	3.841466	0.0190

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.729917	48.43393	27.58434	0.0000
At most 1 *	0.662018	40.13620	21.13162	0.0000
At most 2	0.296108	12.99182	14.26460	0.0786
At most 3 *	0.138214	5.503672	3.841466	0.0190

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

CCI	INR	PEP	GSP
-0.122873	0.728822	0.035437	3.88E-06
-0.197440	0.263122	-0.086476	6.08E-07
0.078473	-0.569417	-0.044195	9.84E-06
-0.305364	0.106853	0.049242	4.92E-06

Unrestricted Adjustment Coefficients (alpha):

D(CCI)	-0.088613	0.414464	-0.154828	0.126760
D(INR)	-0.107026	-0.005288	0.008737	0.004420
D(PEP)	-3.127795	4.951404	5.831097	1.122200
D(GSP)	-5227.323	-22768.85	-21301.40	24299.43

1 Cointegrating Equation(s): Log likelihood -598.0197

Normalized cointegrating coefficients (standard error in parentheses)

CCI	INR	PEP	GSP
1.000000	-5.931490	-0.288403	-3.15E-05
	(0.70243)	(0.10096)	(9.9E-06)

Adjustment coefficients (standard error in parentheses)

D(CCI)	0.010888
	(0.01496)
D(INR)	0.013151
	(0.00151)
D(PEP)	0.384323
	(0.28313)
D(GSP)	642.2988
	(1792.56)

2 Cointegrating Equation(s): Log likelihood -577.9516

Normalized cointegrating coefficients (standard error in parentheses)

CCI	INR	PEP	GSP
1.000000	0.000000	0.648479	5.17E-06
		(0.09556)	(8.7E-06)
0.000000	1.000000	0.157951	6.19E-06
		(0.02609)	(2.4E-06)

Adjustment coefficients (standard error in parentheses)

D(CCI)	-0.070944	0.044472
	(0.02241)	(0.07466)
D(INR)	0.014195	-0.079394
	(0.00285)	(0.00949)
D(PEP)	-0.593283	-0.976785
	(0.49434)	(1.64713)
D(GSP)	5137.781	-9800.765
	(3256.60)	(10851.0)

3 Cointegrating Equation(s): Log likelihood -571.4557

Normalized cointegrating coefficients (standard error in parentheses)

CCI	INR	PEP	GSP
1.000000	0.000000	0.000000	0.001638
			(0.00037)
0.000000	1.000000	0.000000	0.000404
			(9.0E-05)
0.000000	0.000000	1.000000	-0.002519
			(0.00057)

Adjustment coefficients (standard error in parentheses)

D(CCI)	-0.083093	0.132633	-0.032138
	(0.02264)	(0.08871)	(0.00954)
D(INR)	0.014880	-0.084369	-0.003721
	(0.00298)	(0.01168)	(0.00126)
D(PEP)	-0.135701	-4.297113	-0.796723
	(0.45401)	(1.77875)	(0.19123)
D(GSP)	3466.202	2328.622	2725.133
	(3306.26)	(12953.6)	(1392.61)

Date: 07/24/12 Time: 16:19
Sample (adjusted): 2009M05 2012M05
Included observations: 37 after adjustments
Trend assumption: Linear deterministic trend
Series: CMI EXR GSP INR PEP
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.811231	152.2484	69.81889	0.0000
At most 1 *	0.708766	90.56080	47.85613	0.0000
At most 2 *	0.615711	44.91658	29.79707	0.0005
At most 3	0.152995	9.531211	15.49471	0.3185
At most 4	0.087486	3.387403	3.841466	0.0657

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.811231	61.68765	33.87687	0.0000
At most 1 *	0.708766	45.64422	27.58434	0.0001
At most 2 *	0.615711	35.38537	21.13162	0.0003
At most 3	0.152995	6.143808	14.26460	0.5948
At most 4	0.087486	3.387403	3.841466	0.0657

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

CMI	EXR	GSP	INR	PEP
1.191552	0.058864	-5.23E-06	1.482369	0.045898
0.202702	-0.698679	4.91E-06	0.053659	0.203227
-0.105869	0.005872	-4.84E-06	-0.392339	0.051185
0.494145	-0.479053	8.19E-06	-0.383292	0.083112
0.395509	-0.134667	9.85E-06	0.046650	0.094392

Unrestricted Adjustment Coefficients (alpha):

D(CMI)	-0.223031	0.117107	-0.070770	-0.022431	0.003718
D(EXR)	0.018643	-0.089724	0.153226	0.030245	0.288375
D(GSP)	-456.6313	-7524.788	31087.71	-24722.35	1343.554
D(INR)	0.022022	-0.049361	0.080042	0.012564	-0.000845
D(PEP)	0.070452	-9.892160	-2.318250	2.013590	-0.079723

1 Cointegrating Equation(s): Log likelihood -599.4704

Normalized cointegrating coefficients (standard error in parentheses)

CMI	EXR	GSP	INR	PEP
1.000000	0.049402	-4.39E-06	1.244066	0.038519
	(0.06047)	(1.1E-06)	(0.07586)	(0.01596)

Adjustment coefficients (standard error in parentheses)

D(CMI)	-0.265753
	(0.04485)
D(EXR)	0.022214
	(0.21821)
D(GSP)	-544.0998
	(16374.0)
D(INR)	0.026241
	(0.02664)
D(PEP)	0.083947
	(2.86441)

2 Cointegrating Equation(s): Log likelihood -576.6483

Normalized cointegrating coefficients (standard error in parentheses)

CMI	EXR	GSP	INR	PEP
1.000000	0.000000	-3.98E-06	1.230228	0.052142
		(8.3E-07)	(0.05737)	(0.00692)
0.000000	1.000000	-8.19E-06	0.280116	-0.275745
		(1.9E-06)	(0.13027)	(0.01571)

Adjustment coefficients (standard error in parentheses)

D(CMI)	-0.242015	-0.094949
	(0.03744)	(0.02172)
D(EXR)	0.004027	0.063786
	(0.22046)	(0.12789)
D(GSP)	-2069.392	5230.533
	(16526.0)	(9586.82)
D(INR)	0.016235	0.035784
	(0.02473)	(0.01435)
D(PEP)	-1.921217	6.915593
	(1.91759)	(1.11240)

3 Cointegrating Equation(s): Log likelihood -558.9556

Normalized cointegrating coefficients (standard error in parentheses)

CMI	EXR	GSP	INR	PEP
1.000000	0.000000	0.000000	1.431775	0.007571
			(0.08847)	(0.01205)
0.000000	1.000000	0.000000	0.694460	-0.367374
			(0.19327)	(0.02633)
0.000000	0.000000	1.000000	50594.83	-11188.67
			(18975.0)	(2585.12)

Adjustment coefficients (standard error in parentheses)

D(CMI)	-0.234522	-0.095364	2.08E-06
	(0.03416)	(0.01974)	(2.4E-07)
D(EXR)	-0.012195	0.064686	-1.28E-06
	(0.21868)	(0.12638)	(1.6E-06)
D(GSP)	-5360.619	5413.095	-0.185030
	(15092.4)	(8722.10)	(0.10766)
D(INR)	0.007761	0.036254	-7.45E-07
	(0.01738)	(0.01004)	(1.2E-07)
D(PEP)	-1.675786	6.901979	-3.78E-05
	(1.85517)	(1.07212)	(1.3E-05)

4 Cointegrating Equation(s): Log likelihood -555.8837

Normalized cointegrating coefficients (standard error in parentheses)

CMI	EXR	GSP	INR	PEP
1.000000	0.000000	0.000000	0.000000	0.001504
				(0.05049)
0.000000	1.000000	0.000000	0.000000	-0.370317
				(0.03306)
0.000000	0.000000	1.000000	0.000000	-11403.08
				(2579.28)
0.000000	0.000000	0.000000	1.000000	0.004238
				(0.03723)

Adjustment coefficients (standard error in parentheses)

D(CMI)	-0.245607	-0.084618	1.90E-06	-0.287967
	(0.03649)	(0.02366)	(3.3E-07)	(0.04405)
D(EXR)	0.002751	0.050197	-1.03E-06	-0.048887
	(0.23601)	(0.15299)	(2.1E-06)	(0.28491)
D(GSP)	-17577.05	17256.41	-0.387544	-3801.725
	(15185.5)	(9843.43)	(0.13813)	(18331.8)
D(INR)	0.013969	0.030235	-6.42E-07	-0.006223
	(0.01852)	(0.01200)	(1.7E-07)	(0.02236)
D(PEP)	-0.680780	5.937363	-2.13E-05	-0.288617
	(1.94437)	(1.26037)	(1.8E-05)	(2.34723)

Date: 07/24/12 Time: 16:21
Sample (adjusted): 2009M05 2012M05
Included observations: 37 after adjustments
Trend assumption: Linear deterministic trend
Series: CBM EXR GSP INR PEP
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.920893	192.3017	69.81889	0.0000
At most 1 *	0.797642	98.43452	47.85613	0.0000
At most 2 *	0.506503	39.31905	29.79707	0.0030
At most 3	0.252962	13.18821	15.49471	0.1081
At most 4	0.062744	2.397575	3.841466	0.1215

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.920893	93.86717	33.87687	0.0000
At most 1 *	0.797642	59.11546	27.58434	0.0000
At most 2 *	0.506503	26.13085	21.13162	0.0091
At most 3	0.252962	10.79063	14.26460	0.1650
At most 4	0.062744	2.397575	3.841466	0.1215

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

CBM	EXR	GSP	INR	PEP
-2.437223	0.206110	-2.09E-06	-0.617902	-0.163958
2.783838	-0.094667	-1.70E-06	-0.462563	0.062713
-0.990185	-0.761354	5.95E-06	-0.812183	0.103679
-2.956647	0.128487	-8.65E-06	0.343601	0.013086
2.166413	0.297434	-1.11E-05	0.719295	-0.085985

Unrestricted Adjustment Coefficients (alpha):

D(CBM)	0.032651	-0.016116	0.005403	0.017234	-0.000265
D(EXR)	0.122918	0.171210	-0.065449	-0.037715	-0.239547
D(GSP)	-10468.74	14889.49	-24064.98	32725.96	-2133.631
D(INR)	0.084259	0.086622	-0.009228	0.005328	0.002610
D(PEP)	7.914454	-1.210047	-4.999944	-3.465589	0.196296

1 Cointegrating Equation(s):	Log likelihood	-531.2648		
Normalized cointegrating coefficients (standard error in parentheses)				
CBM	EXR	GSP	INR	PEP
1.000000	-0.084568	8.59E-07	0.253527	0.067272
	(0.01881)	(3.4E-07)	(0.02949)	(0.00476)
Adjustment coefficients (standard error in parentheses)				
D(CBM)	-0.079579			
	(0.01808)			
D(EXR)	-0.299578			
	(0.43750)			
D(GSP)	25514.66			
	(33703.9)			
D(INR)	-0.205359			
	(0.04539)			
D(PEP)	-19.28929			
	(4.55238)			

2 Cointegrating Equation(s):	Log likelihood	-501.7070		
Normalized cointegrating coefficients (standard error in parentheses)				
CBM	EXR	GSP	INR	PEP
1.000000	0.000000	-1.60E-06	-0.448426	-0.007566
		(6.4E-07)	(0.05653)	(0.00776)
0.000000	1.000000	-2.91E-05	-8.300490	-0.884957
		(8.8E-06)	(0.77545)	(0.10642)
Adjustment coefficients (standard error in parentheses)				
D(CBM)	-0.124443	0.008255		
	(0.02519)	(0.00154)		
D(EXR)	0.177043	0.009127		
	(0.65402)	(0.04009)		
D(GSP)	66964.60	-3567.255		
	(50167.9)	(3075.33)		
D(INR)	0.035783	0.009166		
	(0.03639)	(0.00223)		
D(PEP)	-22.65786	1.745800		
	(6.86250)	(0.42068)		

3 Cointegrating Equation(s):	Log likelihood	-488.6416		
Normalized cointegrating coefficients (standard error in parentheses)				
CBM	EXR	GSP	INR	PEP
1.000000	0.000000	0.000000	0.233405	0.044416
			(0.02201)	(0.00321)
0.000000	1.000000	0.000000	4.091741	0.059824
			(0.37933)	(0.05525)
0.000000	0.000000	1.000000	426063.1	32482.95
			(35342.1)	(5147.97)
Adjustment coefficients (standard error in parentheses)				
D(CBM)	-0.129793	0.004142	-8.83E-09	
	(0.02580)	(0.00535)	(4.4E-08)	
D(EXR)	0.241849	0.058956	-9.38E-07	
	(0.67549)	(0.14010)	(1.2E-06)	
D(GSP)	90793.38	14754.71	-0.146545	
	(49131.2)	(10190.3)	(0.08378)	
D(INR)	0.044920	0.016192	-3.79E-07	
	(0.03712)	(0.00770)	(6.3E-08)	
D(PEP)	-17.70699	5.552527	-4.43E-05	
	(6.18400)	(1.28263)	(1.1E-05)	

4 Cointegrating Equation(s): Log likelihood -483.2463

Normalized cointegrating coefficients (standard error in parentheses)

CBM	EXR	GSP	INR	PEP
1.000000	0.000000	0.000000	0.000000	0.021166
				(0.00315)
0.000000	1.000000	0.000000	0.000000	-0.347766
				(0.04242)
0.000000	0.000000	1.000000	0.000000	-9958.365
				(3762.97)
0.000000	0.000000	0.000000	1.000000	0.099613
				(0.01202)

Adjustment coefficients (standard error in parentheses)

D(CBM)	-0.180747	0.006356	-1.58E-07	-0.011187
	(0.02882)	(0.00479)	(6.5E-08)	(0.00698)
D(EXR)	0.353358	0.054111	-6.12E-07	-0.114949
	(0.85268)	(0.14182)	(1.9E-06)	(0.20653)
D(GSP)	-5965.722	18959.56	-0.429571	30371.19
	(54922.3)	(9134.54)	(0.12302)	(13302.7)
D(INR)	0.029167	0.016876	-4.25E-07	-0.082807
	(0.04665)	(0.00776)	(1.0E-07)	(0.01130)
D(PEP)	-7.460472	5.107244	-1.43E-05	-1.460541
	(7.18725)	(1.19537)	(1.6E-05)	(1.74082)

Here is Matlab code to plot a cubic spline:

```
function plot_cubic_spline(x,s0,s1,s2,s3)
n = length(x);
inner_points = 20;
for i=1:n-1
xx = linspace(x(i),x(i+1),inner_points);
xi = repmat(x(i),1,inner_points);
yy = s0(i) + s1(i)*(xx-xi) + ...
s2(i)*(xx-xi).^2 + s3(i)*(xx - xi).^3;
CCIgraph= plot(xx,yy,'b')
plot(x(i),0,'r');
end
```

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Brazil's Commodity Price Index

Alisson Curátola de Melo[1]

1. Introduction

The pass-through of commodity prices to consumer inflation is a topic of large interest in monetary policy studies, as a result of frequent inflationary pressures caused by these products price shocks. Understanding the pass-through mechanism enables the monetary authority to respond in a timely manner and in an appropriate intensity to commodity price shocks, smoothing the inflationary impact of such shocks and the economic cost of central bank actions.

Since 2007, in particular, the occurrence of two strong commodity price shocks has increased the uncertainty about the development of commodity prices and, therefore, the importance of monitoring these prices. Considering this outlook, this paper introduces the methodology used by the Banco Central do Brasil (BCB) to build the Brazil's Commodity Price Index (IC-Br) that aims to identify the share of international commodity price changes which is significant to the Brazilian Consumer Price Index (CPI). This indicator has been published monthly since January 2011 and its series begins on January 1998.

The reason behind the creation of a new commodity price index was the absence of an indicator with an appropriate weighting structure to measure the impact of those price changes on Brazilian consumer inflation, as the weights adopted by the available indexes did not reflect the relative share of each commodity in the domestic consumption basket. Thus, the IC-Br was built employing the Vector Autoregressive (VAR) methodology to estimate the pass-through coefficients of each commodity to CPI inflation, setting the weighting structure based on these estimations. The study provides evidence that IC-Br has a better adherence to the Brazilian CPI compared to other commodity price indexes.

Besides this introduction, the paper also includes four other sections. Section 2 provides a brief summary of the main aspects related to recent commodity price shocks and their implications on global inflation; Section 3 presents the theoretical background about the pass-through of changes in international commodity prices to inflation; Section 4 presents the methodology used to build the IC-Br, as well as some exercises designed to evaluate the index efficiency; and Section 5 concludes this study.

2. Commodity prices and global inflation

Since mid-2007, inflation rates around the world have been increasingly synchronized, showing strong increases up to the third quarter of 2008, intense declines amid the international financial crisis, a resumption between late 2009 and early 2011 and another drop as of the second half of 2011 (Graph 1).

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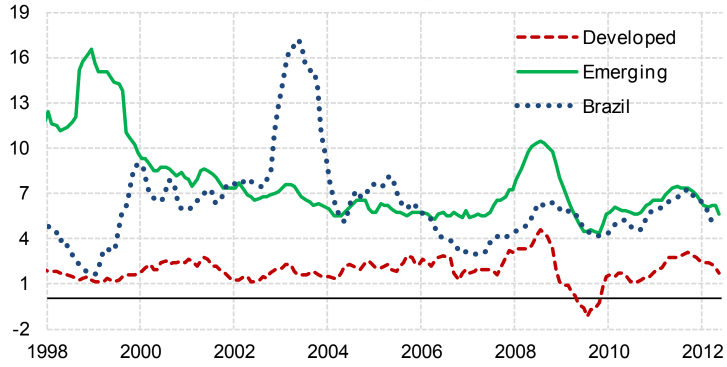
Graph 1 - Consumer inflation

Annual change

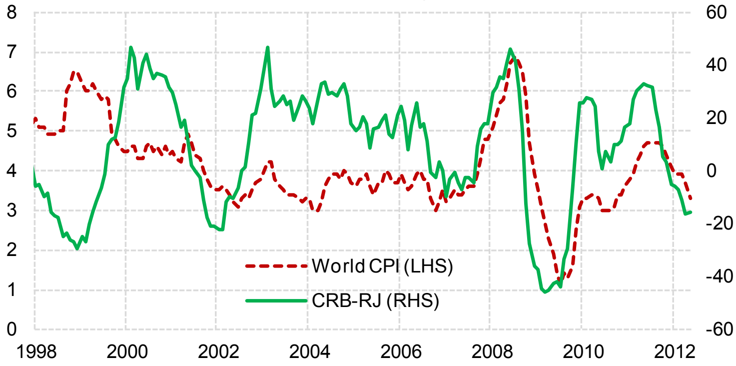


Source: IMF and IBGE

Regardless of country-specific factors, the more synchronized behavior of global inflation in recent years suggests the predominant influence of a common factor. Indeed, the economic cycle observed during this period and particularly its effects on commodity prices had an enormous influence on global inflation developments. The underlying hypothesis is supported by the analysis of Graph 2, which shows the symmetry between global inflation and international commodity prices since 2007.[2]

Graph 2 - Inflation and commodities

Annual change



Source: IMF and Reuters Jefferies

Notably, the two most recent periods of world inflation hikes, 2007/2008 and 2010/2011, occurred in an environment of apparent change in long-term trend of real commodity prices. Until late 1990s, international commodity prices had a clear downward trend in real terms[3] (Graph 3), as a result of productivity gains that enabled the expansion of supply at a faster pace than demand. However, since the end of 2002, international commodity prices have reversed this trend, beginning a period of strong rise, as a result of several factors.

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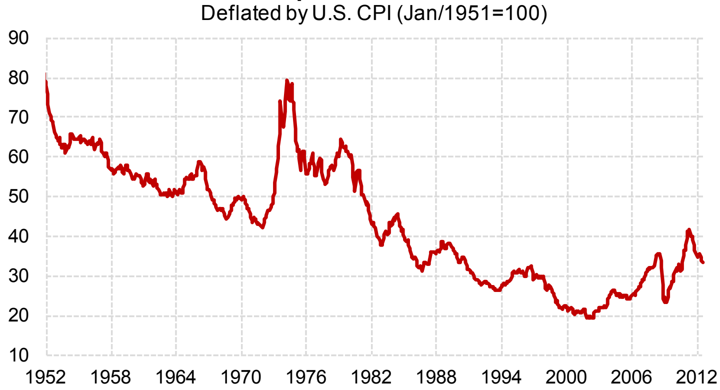
[2] For inflation, we used the annual change of World CPI, calculated by the International Monetary Fund (IMF), on which each country weight is proportional to its share of world Gross Domestic Product (GDP), considering the Purchasing Power Parity (PPP). The international commodity prices were represented by the annual change of CRB index, calculated by Reuters Jefferies, which aggregates the prices of agricultural, metal and energy commodities, totalling nineteen products.

[3] According to Cashin and McDermott (2002), commodities presented an average 1.3% real depreciation per year during the period of 1862 to 1999.

In this context, it should be highlighted the role of emerging economies, with emphasis on China, where the strong economic growth and current level of development – more intensive in natural resources – have led to a significant increase in demand for commodities, thus becoming an important component of the apparent changing trend of commodity prices. Regarding food consumption, the higher purchasing power has enabled these economies to adopt a richer protein diet, which has been sustaining strong growth in global demand for agricultural commodities, especially meat and grains.[4] Similarly, the massive investments in infrastructure and construction sectors in these economies, together with fast expansion of consumer durables production, boosted the demand for industrial inputs and contributed to higher prices in this segment. Additionally, it should be noted that the increased allocation of agricultural commodities for biofuel production, in this case concentrated in developed countries, also contributed to the change in the long-term price trend.

Graph 3 - CRB Index

Deflated by U.S. CPI (Jan/1951=100)



Source: Commodity Research Bureau and Bureau of Labor Statistics. BCB elaboration

Although the change in commodity long-term price trend has been an important component of recent periods of inflation hikes, trends usually do not cause price movements as intense as those seen in 2007/2008 and 2010/2011. Indeed, these two periods of significant commodity price increases were more related to short-run supply shocks rather than the change in long-term trend of prices. The world's supply of many agricultural commodities suffered significant impacts of adverse weather events, while the supply of oil was affected by disruptions, with emphasis to the production shutdown in Libya in the context of geopolitical tensions in North Africa and the Middle East in early 2011. In both cases the boom was intensified by agents in financial and physical markets, who increased the resources allocation in future contracts of these products – anticipating further price hikes – or increased precautionary inventories attempting to hedge from a possible continued price rise.

In Brazil, the most recent periods of international commodity price hikes were also followed by domestic inflation increase, which required a cautious monitoring of such prices by policymakers. However, as Brazil is a major exporter of commodities, those events have also been associated with increased capital inflows, exchange rate appreciation and aggregate demand strengthening. Therefore, for the Brazilian economy, those commodity price shocks have not represented a traditional supply shock.

[4] Increased demand for grain has been related not only to direct human consumption, but mainly to the higher allocation of these products for feed production, reflecting the rise of meat consumption.

3. The theory reference on commodity pass-through

The pass-through of commodity price changes to inflation is not a stable relationship, which, according to Malliaris (2006), reflects constant changes in the economic environment and the materialization of new inflation causes. In addition to the direct impact related to the pass-through of rising costs, Furlong e Ingenito (1996) point out that the statistical interaction between commodity prices and inflation is influenced by similar impacts, although with different lags, that a demand shock has on these variables.

Similarly, Bower, Geis and Winkler (2007) explain three channels through which commodity prices affect inflation in oil-exporting African countries. In addition to the direct pass-through to retail prices as a result of rising production costs, the authors argue that the rise in commodity prices may influence the level of domestic prices through increased private and public sectors spending, reflecting the positive income effect, or by the increase in banking sector liquidity as a result of the expansion of foreign exchange inflows.

It is important to note that commodity markets cover a wide range of products that can be segmented into agricultural, metal and energy, with different impacts on retail price level. JP Morgan Chase Bank (2009) notes that although metal prices are the most affected by economic growth, this segment has the less significant impact on inflation. According to the report, price changes of agricultural and energy commodities quickly affect the retail costs of food and transportation, while price fluctuations of base metals are smoothed along the usually large production chains. But Hobijn (2008) asserted that while a rise in oil prices affects gasoline price in about a month in the United States, rising prices of agricultural commodities can last up to a year to have an effect on consumer prices, due to slow pass-through of this supply chain.

The pass-through of the commodity price changes may also be different for increases or decreases, as shown by Brown and Yücel (2000) for the impact of oil prices on gasoline in the United States. While rising oil prices affects the U.S. fuel cost in four weeks, the fall requires several months to be reflected in prices paid by consumers.

Economic growth and the size of changes in commodity prices are also factors that can affect the degree of pass-through. According to JP Morgan Chase Bank (2008), although core inflation measures tend not to suffer a strong influence from changes in commodity prices, 39% of the rise in core inflation rates in developed countries from 2006 to 2008 could be explained by oil prices increases. The high level of capacity utilization in the period and the strength of commodity price hikes are the explanations provided by the report to the change in the pattern.

The commodity pass-through to inflation also tends to diverge from country to country according to the consumption basket, the productive efficiency and the energy matrix. Emerging countries, for instance, tend to suffer from greater inflationary impact of commodity prices, since food has a higher share in the average consumption basket and production is usually less energy efficient. According to Hobijn (2008), the influence of commodity prices on U.S. consumer spending is restricted to a few types of products and therefore the average annual increase of 40% in prices of agricultural and energy commodities from 2006 to 2008 was responsible for only 1.5 percentage point of the average consumer inflation of 3.2% in the period.

In countries where revenues from commodity exports accounts for a significant share of the exchange flow, the inflationary impact of a commodity price shock tends to be offset by the resulting currency appreciation. Bloch, Dockery and Sapsford (2006) found evidence of positive impact of international commodity prices on price level in Australia and Canada between 1970 and 2001, but also found that inflation in these countries has some resilience to shocks in these products value, as the resulting exchange rate appreciation offsets the direct effect of commodity prices on production costs.

Chen (2008) estimated that the pass-through of oil prices to inflation in nineteen industrialized countries was on average 17% between 1970 and 2006. The study also found evidence that the pass-through had been declining during the period, which, according to the author, can be attributed to the appreciation of these countries' currencies, more active monetary policy and increased trade liberalization.

In summary, the degree of pass-through of commodity prices to inflation of a given country is positively influenced by the pace of economic growth, the intensity of changes in commodity prices, the share of these products in the average basket consumption and the relative importance of fossil fuels and biofuels in the energy matrix. On the other hand, both the size of production chain and the productive efficiency lead to a smaller pass-through.

4. Brazil's Commodity Price Index

Seeking a better understanding of commodity price pass-through to consumer inflation in the Brazilian economy, the BCB developed the Brazil's Commodity Price Index (IC-Br). The main motivation for creating a new commodity price index was the absence of an indicator with an appropriate weighting structure to measure the impact of those price changes on Brazilian consumer inflation, since the weights adopted by the available indexes do not reflect the relative share of each commodity in domestic consumption basket. However, the definition of a more appropriate weighting is not easy, since the weights of these products in the Brazilian CPI are not directly observable, as commodities are mostly inputs to production of goods effectively weighted in the reference basket. Wheat is a classic example of this difficulty, since it has no direct participation in the reference basket, but is an important input for the production of flour, pasta and bread.

Given this difficulty, the IC-Br was built employing the Vector Autoregressive (VAR) methodology to estimate the pass-through coefficients of each commodity to CPI, and by using these coefficients, define each product weight as proportional to its estimated pass-through.

An initial step of developing a price index is the definition of price aggregation method. In the first version of the IC-Br,[5] the structure of weights determined by the VAR model was maintained constant throughout the series, not considering, therefore, the effect of a particular commodity price change on the income share destined to its consumption. Underlying this methodology is the hypothesis of adjusting the amount consumed of those products that register different variations of the basket average price. In contrast, the methodology used by the Brazilian Institute of Geography and Statistics (IBGE) to calculate the monthly CPI updates the weighting according to the price changes occurred in the previous month. In this methodology, the quantities consumed of each product remain constant in relative terms, implying change in the share of income destined for consumption of each good proportionately to price changes.

Disregarding any judgment about the most appropriate method for a price index, the methodology used by the IBGE to calculate the consumer inflation in Brazil is more appropriate for IC-Br, since the goal of this indicator is to identify the influence of international commodity prices on CPI. Indeed, the implementation of CPI methodology in IC-Br computation resulted in significant increase in the correlation between IC-Br and CPI.

[5] IC-Br aggregation methodology and weighting structure were revised in December 2011, resulting in the index series update.

Thus, the IC-Br current calculation methodology, based on Laspeyres index formula used by the IBGE, updates the weights monthly. Considering the weights estimated by the VAR model as for the month m, the weight of commodity i in month m+1 is:

$$w_{m+1}^{i} = \frac{w_m^i \times \frac{p_m^i}{p_{m-1}^i}}{\sum_{i=1}^{n} w_m^i \times \frac{p_m^i}{p_{m-1}^i}} \qquad \text{(eq. 1)}$$

Where:

w_m^i is the weight of the commodity i, in month m ($\sum_{i=1}^{n} w_m^i = 1$);

p_m^i is the average price of commodity i, in month m.

Once the weights are determined, the calculation of IC-Br on day d, of month m is:

$$I_d^{ICBr} = I_{d-1}^{ICBr} \times \left(\sum_{i=1}^{n} w_m^i \times \frac{p_d^i}{p_{d-1}^i}\right),\ I_0^{ICBr} = 100 \qquad \text{(eq. 2)}$$

Thus, the index published in a given month m is defined:

$$I_m^{ICBr} = \frac{\sum_{d_m=1}^{u_m} I_{d_m}^{ICBr}}{u_m} \qquad \text{(eq. 3)}$$

Where:

u_m is the number of working days in the month m.

In order to estimate the weights, we used monthly data covering the period between January 2004 and November 2011. The beginning of the sample was chosen to avoid the period before 2004, because of significant structural breaks in the Brazilian economy from 1994 to 1999 and the turmoil in the exchange market in 1999 and 2003. The variables used in VAR models estimations were: the monthly changes of commodity prices measured in reais, a measure of economic activity (IBC-Br), a monetary policy variable (Selic interest rate), the monthly change of exchange rate and CPI inflation. The adoption of reais to measure commodity prices in IC-Br is justified by the fact that these products are actually traded by using the domestic currency within an economy.

The first step in setting the weights consisted in building a price index for each sector: agriculture, metals and energy. In order to do so, we estimated a VAR model for each product and, using impulse responses, it was possible to obtain individual pass-through coefficients of each commodity to CPI, accumulated in twelve months.[6] After that, the weights were calculated dividing each individual pass-through coefficient by the sum of all coefficients of the segment, in a way that the weight of each commodity should be proportional to its pass-through (Equation 4).

$$w_0^{i,j} = \frac{\emptyset^{i,j}}{\sum_{i=1}^{n_j} \emptyset^{i,j}} \qquad \text{(eq. 4)}$$

[6] The choice of estimating a model for each product is justified by the enormous loss of degrees of freedom resulting from the inclusion of all products in the same model.

Where:

$w_0^{i,j}$ is the reference weight of the commodity i, component of segment j ($\sum_{i=1}^{n_j} w_0^{i,j} = 1$);

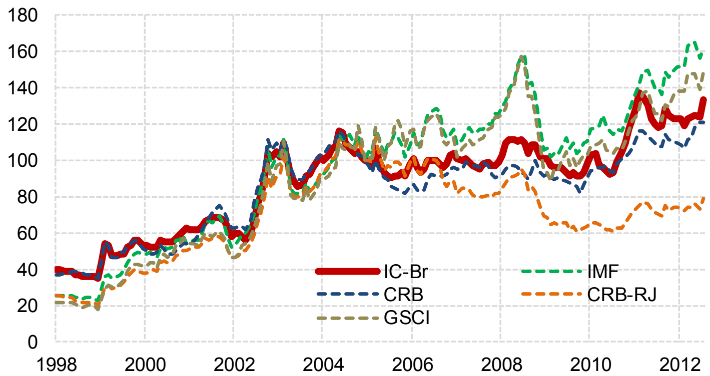
$\emptyset^{i,j}$ is the impulse response accumulated after twelve months of a 1% shock in the price of commodity i, component of segment j, on CPI;

n_j is the number of the commodities in segment j.

Once the three indexes were built, the second step consisted in repeating the procedure of estimating the VAR model and the impulse responses, but this time using the price series of the three segments, in order to establish the weight of each segment and thus achieve the composite index. Differently from the initial step, when a VAR model was estimated for each commodity, the second step included the three segments in the same model, since the loss of degrees of freedom would not be so significant.

Graph 4 compares the resulting index, the IC-Br, with other commodity indexes often used in macroeconomic analysis. As up to 2004 the volatility of Brazilian exchange rate was higher than international commodity prices, the fluctuations of all commodity indexes measured in reais were very similar until this year, reflecting the exchange rate movements rather than commodity prices. Since 2005, however, the indexes developments have been different, as the increased volatility in commodity prices exposed the differences of composition and methodology between the indexes. It should be noted that the indexes presented in Graph 4 are measured in reais in order to be comparable to IC-Br, which is conceptually measured in Brazilian currency.

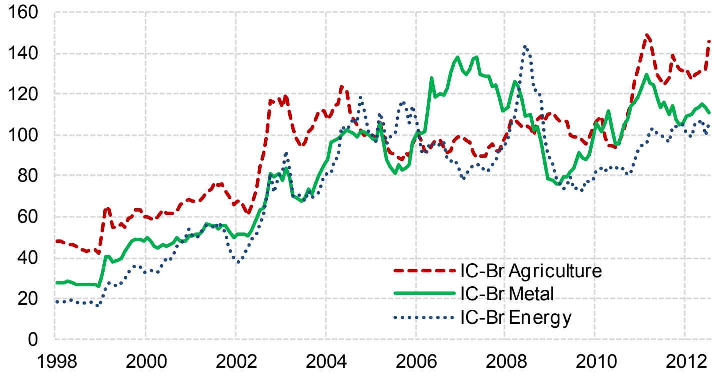
Graph 4 - IC-Br and other indexes
measured in R$ - Dec/04=100



Source: Commodity Research Bureau, Reuters Jefferies, S&P GSCI, IMF and BCB.

The segmentation of the IC-Br is presented in Graph 5. For the Agricultural index, prices of live cattle, cotton, soybean, wheat, rice, sugar, corn, coffee and lean hogs were considered. The Metal segment gathers aluminum, iron ore, copper, tin, zinc, lead and nickel, while the Energy index includes Brent oil, natural gas and coal.

Graph 5 - IC-Br segments
measured in R$ - Dec/04=100

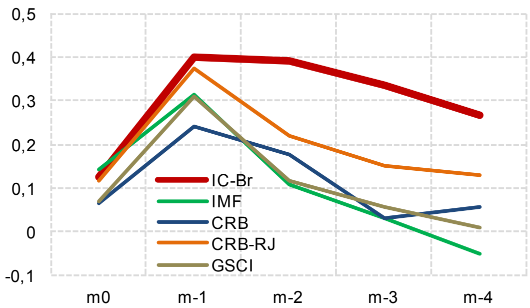


Source: BCB.

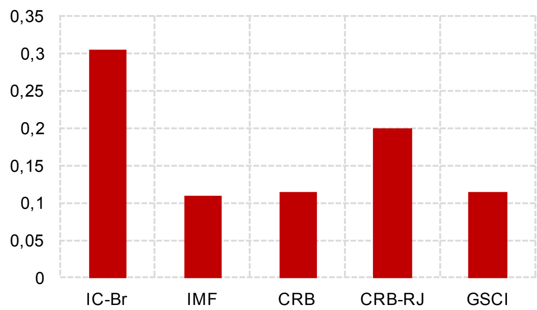
4.1 Index efficiency

In order to evaluate the IC-Br efficiency in identifying the share of changes in commodity prices significant to domestic inflation, we calculated the correlations of some commodities indexes[7] with the monthly CPI, covering the contemporary relationship and four months of lag for commodities.

Graph 6a - Correlation with IPCA
By month of lag



Graph 6b - Average correlations

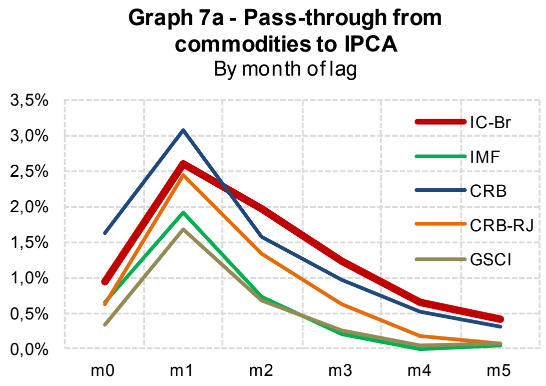


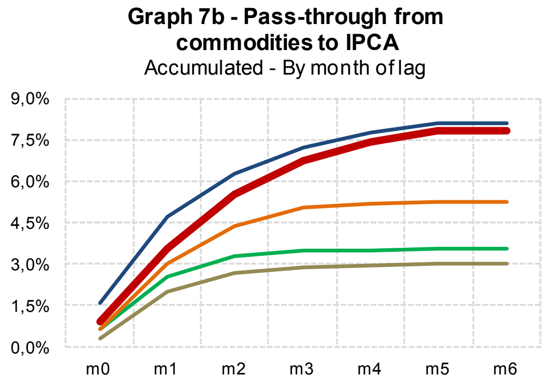
Source: BCB, IBGE, Reuters Jefferies, Commodity Research Bureau, Standard & Poor's/Goldman Sachs and IMF. BCB elaboration.

As demonstrated in Graph 6a, the IC-Br contemporary coefficient is situated at a similar level to those of other indexes, but its correlations with lags are always at a higher level, resulting in higher average correlation (Graph 6b). These results are a good indication that the IC-Br is more efficient in identifying the relevant changes in commodity prices, regarding their impact on CPI.

Alternatively, the index efficiency can be evaluated from its capacity of measuring the monthly impact, in percentage points, that changes in commodity prices have on CPI. Considering this goal, we have estimated a monthly pass-through structure for each index using the same VAR methodology used in determining the weights. The results are compared in the graphs below:

[7] CRB: Index computed by Commodity Research Bureau; CRB-RJ: Index computed by Reuters Jefferies; GSCI: index computed by Standard & Poor's together with Goldman Sachs; IMF: index computed by International Monetary Fund.

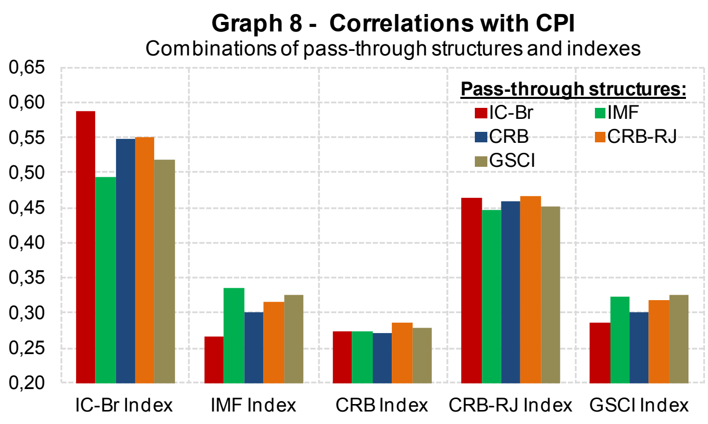




Source: BCB, IBGE, Reuters Jefferies, Commodity Research Bureau, Standard & Poor's/Goldman Sachs and IMF. BCB elaboration.

The five structures shown in Graph 7 indicates that, for the period under consideration, a commodity price shock affects CPI in the first month in which the average price of these products increase (m0), reaching the highest impact in the following month (m1) and losing strength from then, almost exhausting the pass-through in the sixth month (m5). Although the accumulated pass-through estimated with IC-Br is slightly smaller than the one estimated with CRB, it seems that the IC-Br pass-through is better distributed in time. The IC-Br structure provides a larger weight to more persistent shocks, which tends to avoid an overestimation of the impact of a transitory shock on inflation. It should be noted that the estimated structures reflect the average economic context of the sample used on estimation. Thus the effective pass-through in a given month depends on several factors.

After that, the five pass-through structures were used to estimate twenty-five monthly series of commodity prices impact on CPI, combining those structures with the five indexes. The resulting series were used to calculate the correlation coefficients with monthly CPI (Graph 8), which revealed that regardless of the structure used, IC-Br provides a better estimate of commodity price impact on inflation. Additionally, the monthly impact series calculated with IC-Br and its associated pass-through structure has the highest correlation with Brazilian consumer inflation among all the twenty-five coefficients calculated, which confirms the superior performance of the IC-Br compared to other indexes.

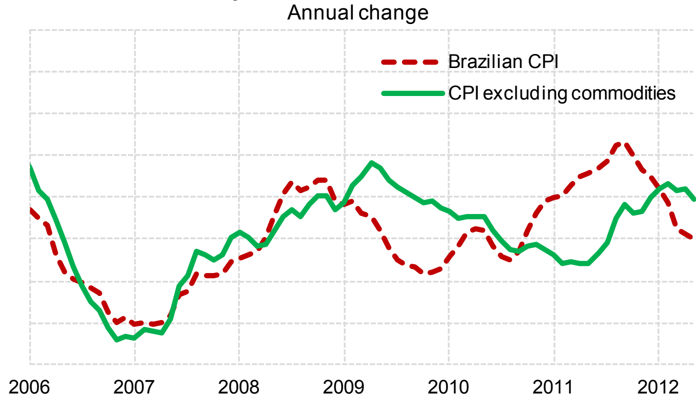


Source: BCB, IBGE, Reuters Jefferies, Commodity Research Bureau, Standard & Poor's/Goldman Sachs and IMF. BCB elaboration.

4.2 CPI excluding commodities

Finally, once the IC-Br efficiency was confirmed, the index and its pass-through structure were used to gauge the CPI with exclusion of commodity price influence. It should be noted that the exclusion of commodity prices using the estimations provided by the VAR model removes not only the direct impact of higher production costs. Such procedure also removes possible second-round effects and the impact of demand pressures related to the income effect of a commodity shock, opposing, therefore, to a simple removal of a component as in traditional core measures.

Graph 9 - Consumer inflation
Annual change



Source: IBGE and BCB.

The developments of headline inflation and the CPI excluding commodity effects are compared in Graph 9. After showing variations similar to the CPI from 2006 to 2008, the exclusion measure has disclosed a different behavior since 2009, reflecting the influence of higher commodity prices volatility on consumer inflation in Brazil. Although during the 2007/2008 shock the exchange rate appreciation helped to keep the exclusion measure near the headline inflation, the commodity prices collapse that followed the intensification of the global financial crisis in late 2008 and early 2009 enabled the decline of consumer inflation in Brazil, which is confirmed by the exclusion measure at a higher level than the CPI in 2009. A new period of detachment began in the second half of 2010, when CPI registered a sharp increase, moving away from the exclusion measure, a behavior consistent with the strong rise in international prices of major agricultural, metal and energy commodities. Recently, the worsening of the fiscal crisis in Europe in the second half of 2011 resulted in new decreases in commodity prices, which has contributed to the downward trend of the headline inflation that is below the exclusion measure.

5. Conclusion

Commodity price fluctuations demand constant monitoring by central banks around the world given frequent inflationary pressures arising from increases in these prices. In particular, given the higher volatility of commodity prices in recent years, understanding the pass-through mechanism has become even more important, as it helps the monetary authority to react in a timely manner and in an appropriate intensity to shocks in commodity prices, smoothing the inflationary impact of those shocks and the economic cost of central bank actions.

In this context, seeking a better understanding of this matter, this paper introduced the methodology used by the BCB to develop the IC-Br, which is more appropriate to identify the impact of changes in international commodity prices on consumer inflation in Brazil. The IC-Br was built employing the VAR methodology to estimate the pass-through coefficients of each commodity to CPI, setting the weighting structure based on these estimates.

This paper showed some evidence that the IC-Br efficiency is notably superior to other indexes in identifying the impacts which changes in commodity prices have on the CPI dynamics.

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Statistical issues and activities in a changing environment: improvements in the commodity price input used for the ECB's analysis of HICP food prices

Andrew Kanutin[1, 2, 3]

1. Introduction

The ECB regularly assesses commodity prices[4] as part of its inflation analysis and forecasting framework. Given the ECBs primary mandate of price stability[5] not only are the outturns examined but also the causes for deviations from the forecasts. In 2007 the ECB started to see sustained errors relating to the forecasting of the HICP food price sub-index. In the calculation of consumer price indices, Eurostat makes a distinction between processed and unprocessed food and provides separate HICP aggregates. The HICP unprocessed food index includes meat, fish, fruit and vegetables; while HICP processed food index covers the rest of the food sub-indices plus alcohol and tobacco. For the purpose of explaining domestic food prices, the commodities should be defined as close as possible to that of the HICP food sub index. Around one third of the forecast error could be attributed to the raw commodity price index used which was not reflecting the costs being borne by European Union (EU) food consumers as it reflected world market prices rather than EU prices which may be affected by the Common Agricultural Policy (CAP) and other regional affects. After examination of alternative sources and weighting schemes it became clear that rather than raw commodity prices it was necessary to examine prices one step further along the production chain i.e. farm gate or wholesale market prices in the EU.

2. Commodity price data used at the ECB

The ECB has used several different data sources and approaches to analyse the effect of commodity prices on inflation. The following two commodity price indices are compiled by the ECB and are still used for analytical purposes but did not prove to be optimal for projections of the HICP food sub-index.

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3 The author would like to thank Daniela Schackis and Cyril Papadacci for their comments. All remaining errors are his. The views expressed are those of the author and do not necessarily reflect the view of the European Central Bank or the Eurosystem.

4 The term "commodity" means different things to different users. There is not a strictly established definition worldwide and very generally speaking any tangible good can be categorised as a commodity. Usually the commodity should be a comparatively homogeneous product that can typically be bought in bulk. Well-established physical commodities are actively traded at spot and derivative markets. However, the term commodity may not be restricted to raw materials only (oil, cotton, cocoa, or silver) but can also describe a manufactured product used to make other things, for example, microchips used in personal computers.

5 "Price stability is defined as a year-on-year increase in the Harmonised Index of Consumer Prices (HICP) for the euro area of below 2%." The Governing Council has also clarified that, in the pursuit of price stability, it aims to maintain inflation rates below, but close to, 2% over the medium term.

2.1 Non-energy commodity price index weighted using euro area imports (NECPI)

The NECPI was used for forecasting HICP food-price inflation when the analytical issues first started to be examined. It is a Laspeyres-type price index which has been produced by the ECB since 2002 as a monthly index with a monthly price collection frequency and steady improvement of the data quality. The NECPI is tailor-made for ECB needs, including the selection of commodities and the frequency of updating the weights. The index includes 18 food commodities[6] weighted by import value.

In the first half of 2008, the NECPI commodity coverage was updated and new weights referring to 2004–2006 euro area imports were introduced. The old price series using the imports over the period 1999–2001 as weights were linked with the new price series using December 2002 as a linking month. Applying accumulated three-year weights aims at reducing one-off effects on the weights. The source for the weighting data is the European Commission external trade statistics, as available from Eurostat's COMEXT databank.

2.2 Non-energy commodity price index weighted using domestic demand (UWI)

The first approach to reduce the projection errors was to develop a food non-energy commodity price index using a more adapted weighting structure but with the same commodity coverage and commodity price data as the NECPI. The weights of the UWI are based on estimated euro area domestic demand, or "use", taking into account information on imports, exports and the domestic production of each commodity (ignoring for simplicity – as well as lack of appropriate and comprehensive source data – inventories, which are assumed to be relatively stable over the observed period). In terms of its theoretical properties this use-weighted commodity price index was believed to be more appropriate for the assessment of price pressures stemming from global commodity price changes on the HICP processed food index than the NECPI. Furthermore, its composition is closer to the product coverage of the food components of both the NECPI and the HICP.

While this approach improved the projection accuracy there were still significant errors recorded in the overall HICP projections from this source. The series are still used for several purposes within the ECB.

3. The current approach for food-price inflation projections: European Commission's DG-Agriculture data-set

The European Commission's Directorate General for Agriculture (DG-AGRI) has collected data on wholesale market or / farm-gate[7] prices for a range of agricultural products over several decades. The data are self-reported by Member States on a weekly basis and are presented as monthly averages. They are not subject to any significant verification by DG-AGRI who simply collate the data, calculate rudimentary EU averages and make them available via their web-site.[8]

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[6] Barley, maize, rice, wheat, soya beans, sunflower seeds, coconut oil, palm oil, sunflower seeds oil, beef, swine meat, cocoa, coffee, sugar, tea, tobacco, bananas, and oranges.

[7] These are two different concepts. Farm gate prices exclude any transport costs to the wholesale market and any wholesaler margin. Wholesale prices include these two aspects. National practices differ regarding when in the supply chain the data are collected.

[8] See http://ec.europa.eu/agriculture/markets/prices/monthly_en.xls

The advantage of the data set is that it reflects true input prices paid by EU food producers which then are passed through to consumers. The data-set contains almost 450 time series at a monthly frequency with a time horizon from 1997 onwards. There is significant heterogeneity in time ranges: some of the newer Member States' price series begin at later dates, but not always in line with their accession date to the European Union and other price series are not available after certain dates due to longer reporting lags. All of the data are split into four food categories (see Table 1).

Table 1

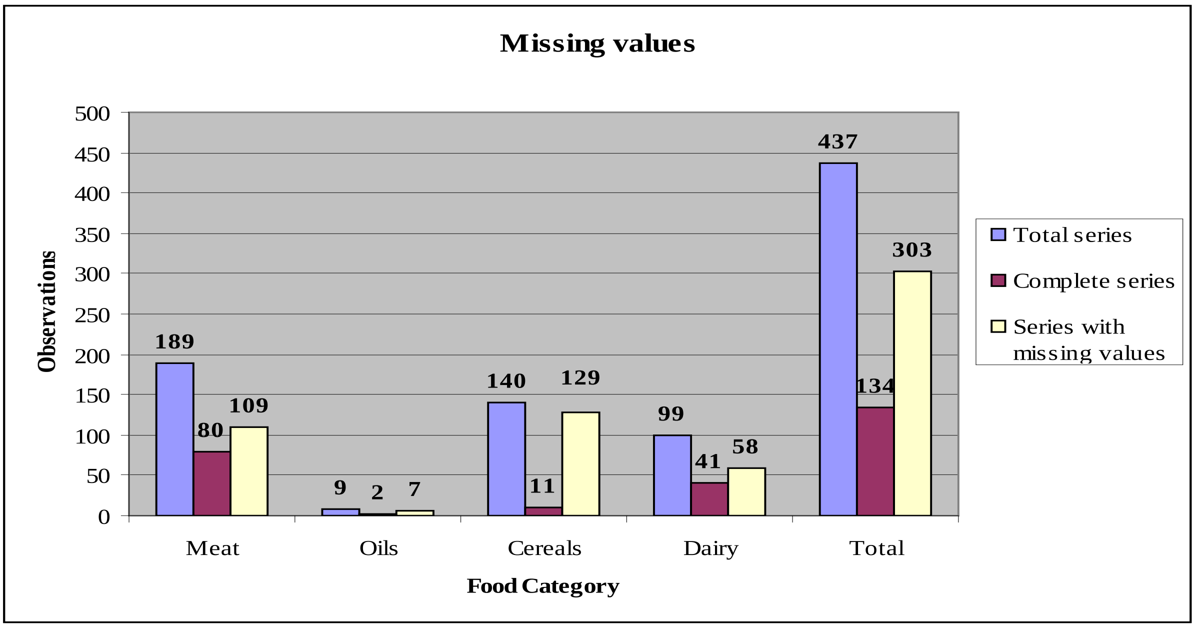
Food categories

Food categories			
Meat	**BOV**	**CALVE**	**Veal**
		BEEFF	Beef
		COWS1	Cows
		HEIFR	Beef Live
	POR	**PORK1**	**Pork 20kg**
		PORK2	Pork Regulated
	OVI	**LAMB1**	**Lamb**
		LAMB2	Lamb
	CHIC	**CHIC1**	**Chicken 83%**
		CHIC2	Chicken PAC
		CHIC0	Every type of chicken
Cereals	**CER**	**OAT01**	**Feed oats**
		OAT02	Milling oats
		WHEA1	Common wheat
		WHEA2	Breadmaking common wheat
		WHEA3	Durum wheat
		MAIZE	Feed maize
		BARL1	Malting barley
		BARL2	Feed barley
		RYE01	Rye
		RYE02	Rye
Dairy	**LAI**	**MILP1**	**Skimmed milk powder**
		MILP2	Skimmed milk powder
		BUTTR	Butter
		CHEDA	Cheddar
		EDAM1	Edam
	OEV	**EGGS1**	**Eggs L&M 63gr**
		EGGS0	All types of eggs
Oils and Fats	**OIL**	**OILS1**	**Oil extra-virgin 0.5%**
		OILS2	Oil extra-virgin 0.8%
		OILS3	Olive sauce

Some monthly series remain constant for several successive months, which may hide missing values in data sources. Others have true missing values i.e. holes in the time series (See Graph 1). In order to enhance the data-set the ECB examined how best to estimate some of the missing data to complete the data set.

Graph 1

Missing Values in DG-AGRI data set



Missing data are a common problem in large datasets and the problem is broadly discussed in the statistics and data analysis literature. However, no standardised method of estimating missing values in time series exists. The approach taken was to first classify the data gaps per series according to the following rules:

Case A	Time series has at least 30 observations before a missing value (gap) occurs and a gap is no longer than six consecutive missing values.
Case B	Time series does not have sufficient observations (<30) before the gap.
Case C	Time series has sufficient observations (>=30) before the gap but the gaps extends to seven or more consecutive missing values.

Only in case A did the ECB made an attempt made to fill the holes in the data. The other two cases have too much missing data and hence any attempt to fill gaps is hard to defend statistically.

The two most basic techniques used to fill gaps in data-sets are *mean substitution* (replacing all missing data in a variable by the mean of that variable) and the *repetition* of the previous value. While either method would be a simple and fast way to complete the dataset, they both have the significant disadvantage that the variability in the data set is artificially decreased in direct proportion to the number of missing data points, with an impact on dispersion and correlation measures.

For these reasons two further methods were investigated: a *correlation method* and the *Box-Jenkins' autoregressive and moving average models*.

3.1 Correlation method

In this method missing values are estimated through a correlation procedure that identifies which country series can be considered as an indicator of another price series with missing values. The basic idea is that for any missing data of a series and country, the most comparable series of another country is sought on which then the estimation of the missing data is based.

Using FAOSTAT 2008 production data, four geographic macro areas of EU countries were created. Classification criteria for each group were based on the characteristics they share such as similar agricultural outputs (e.g. grapes and wheat in the Southern area and cow milk, whole, fresh and potatoes in Western area) and similar weather conditions (e.g. Mediterranean climate in Southern countries and maritime sub-arctic climate in Northern countries). The resultant groups are shown in Table 2 below.

Table 2

Grouping of Member States for correlation

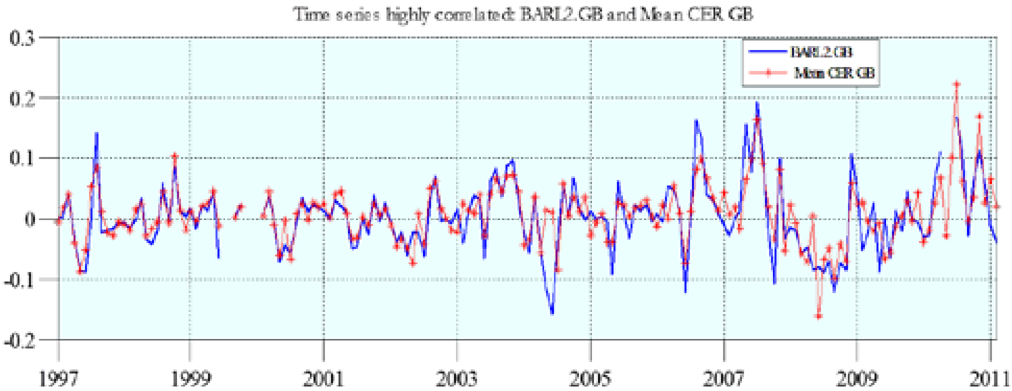
Country		Joined	Southern-Europe	Western-Europe	Northern-Europe	Eastern-Europe
Italy	**IT**	**Founder**	X			
Spain	ES	1986	X			
Austria	**AT**	**1995**		X		
Belgium	BE	Founder		X		
Bulgaria	**BG**	**2007**				X
Cyprus	CY	2004	X			
Czech Rep.	**CZ**	**2004**				X
Germany	DE	Founder		X		
Denmark	**DK**	**1973**			X	
Estonia	EE	2004			X	
Finland	**FI**	**1995**			X	
France	FR	Founder		X		
UK	**GB**	**1973**			X	
Greece	GR	1981	X			
Hungary	**HU**	**2004**				X
Ireland	IE	1973			X	
Lithuania	**LT**	**2004**			X	
Luxembourg	LU	Founder		X		
Latvia	**LV**	**2004**			X	
Malta	MT	2004	X			
Netherlands	**NL**	**Founder**		X		
Poland	PL	2004				X
Portugal	**PT**	**1986**	X			
Romania	RO	2007				X
Sweden	**SE**	**2004**			X	
Slovenia	SI	2004	X			
Slovakia	**SK**	**2004**				X
EU-27	V1					

For each national data series correlation coefficients were calculated using month-on-month percentage changes in the food price series. These are then compared to the countries in the same geographic area and the same food category. Furthermore, in order to reveal additional patterns and find connections, each series was compared to aggregate series of the average month-on-month percentage changes in prices. For example, the British barley price series was correlated not only with barley series of other Northern countries (cross-correlation) but also with the average of the total British cereals month-on-month percentage changes and with the average of barley month-on-month percentage changes for the Northern Area as a whole.

In the graph below it can be seen that while the barley price series is highly volatile, there is a strong correlation with the mean of all the remaining cereal time series for the UK (rho coefficient = 0.8039).

Graph 2

UK barley price correlations



Once this full set of correlations was undertaken, the most highly correlated price series was used to fill the gaps of those series with missing values by applying to the last available price the month-on-month percentage change of the highly correlated time series multiplied by the correspondent correlation coefficient.[9] However, in order to ensure robustness of the results, the correlation coefficient must be greater than a threshold of 0.65[10] for the method to be applied and the number of missing monthly observations that need to be filled should be six or fewer.

Applying this approach to the 169 "Case A" series[11] it is possible to complete 70 time series.

3.2 Modelling method

For the 99 "Case A" series that had a correlation coefficient lower than 0.65 a further attempt was made to fill the data gaps using modelling methods. Univariate ARIMA models were used to forecast missing values in the price series using the information contained in their own past values and in current and past values of an error term (see Annex A for more details). This model based approach yielded only a further seven series that would have missing data filled. Given the large overhead required to maintain the models and the low cost-benefit ratio it was decided to not pursue this approach further.

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9 In order to be consistent with the Counter-seasonal estimation procedure to estimate missing observations in the HICP (Commission Regulation (EC) No 330/2009), the first missing value is filled adjusting the last available price by the average month-on-month percentage changes over previous 13 months and from the second month on, missing values are filled with the correlation method procedure.

10 While it can be argued that this threshold is arbitrary a sensitivity analysis was undertaken to examine the impact that the change has on the number of series that could be filled and 0.65 was the best compromise regarding quality and increasing the number of series that are completed. For example, by changing the threshold from 0.65 to 0.75 the percentage of series filled falls from 41.4 % to 24.9%.

11 Case A price series are those series that have at least 30 observations before the missing value and that have no more than six consecutive gaps to be filled.

4. Weighting scheme

DG-AGRI publishes EU aggregates of the specific data collected. However, mixed methods are used to calculate these averages (for example sometimes simple averages while at other times weighted averages are used depending on the underlying data availability). Given that the intention of the ECB is to use a methodology that is closer to the HICP, a different approach is used to calculate aggregates. In order to compile the euro area aggregate the underlying countries are weighted according to their relative size of private consumption in the euro area, while for the non-euro area and EU aggregates the relative size of private consumption in the EU is utilised.

At the same time the ECB additionally calculates for each Member State, for the euro area (in both the current composition and moving composition forms) and the EU, special aggregates for four categories: Meat, Cereal, Dairy (cheese and eggs) and Oils & Fats.

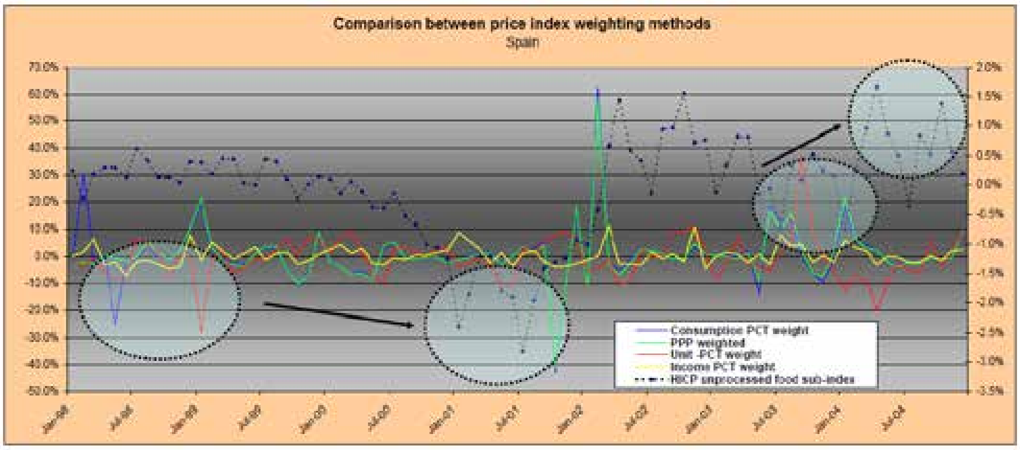
In order to calculate these four special aggregates, elementary series for each country and for a particular product group are calculated – these are un-weighted geometric averages of the price data for the cases where we have no weights (e.g. edam and cheddar cheese are combined). Confidential Purchasing Power Parities (PPP) consumption weights supplied to the ECB by Eurostat are then used to aggregate the series to get to country series for each of the four product groups. For simplicity, monthly rates of change with 2009 PPP weights are currently used to build up the aggregates. The euro area series are then created from these country aggregates and weighted using the HICP weights and index formula. The moving coverage series follow the same moving coverage country coverage as in the HICP, i.e. each reference month reflects the composition of the euro area at that moment, while the current composition series reflects the current euro area 17 members throughout the series. A similar approach is taken when computing the EU series.

As a quality check three alternative weighting methods were compared against the PPP weighted European series described above. These alternative weighting schemes are based on different items from the Economic Accounts for Agriculture (EAA):[12]

1. Units of production- these are obtained by dividing current values of producer prices by the corresponding physical quantities. Their value is given in 1000 tonnes (quantities), Euro per tonnes (unit value) or national currency per tonnes (unit values). Unit values are converted to euro using market exchange rates where appropriate.
2. Food consumption- i.e. gross human apparent consumption of main food items expressed in values (1000 tonnes).
3. Income – the price receivable by the producers from the purchaser for a unit of a goods or services produced as output plus any subsidy receivable on that unit as a consequence of its production or sale minus any tax payable on that unit as a consequence of its production or sale. The producer price is expressed in millions of euro (from 1.1.1999)/millions of ECU (up to 31.12.1998). Income values are converted to euro using market exchange rates where appropriate

[12] Eurostat provides data on national agricultural accounts.

Graph 3



Graph 3 compares the different food indexes with the HICP unprocessed food sub-index for Spain. It shows that for food the currently used PPP consumption index is most similar to the food index weighted using gross human apparent consumption.

In order to assess further the best weighting method, the predictive performance of changes in the food price index weighted with the current and the alternative methods was compared with the HICP unprocessed food sub-index. The indicator used to evaluate the accuracy of the food index against the benchmark is the Mean Absolute Percentage Error (MAPE). It computes the absolute percentage difference between the Food index and the HICP unprocessed food sub-index. Empirical analysis confirms that a time-lag exists between movements in the food commodity prices and the HICP index. For this reason, a series of lagged MAPEs are computed to properly evaluate the performance of food indexes which the PPP approach gives the lowest MAPE values and therefore it is confirmed as the most appropriate weighting for the use of forecasting changes in the HICP unprocessed food sub-index.

5. Enhancements related to quality control

The farm gate and wholesale price data-set as delivered by DG-AGRI is extremely volatile. Extreme values can be defined as observations numerically distant from the rest of the time series; they can be the result of either an error in recording or of the heavy-tailed distribution of the sample mainly due to extreme food prices. Raw material prices may be very volatile due to the fragility of both supply and demand factors. The challenge is to identify and remove only erroneous outlying observations that can bias estimates but to leave in the dataset all outliers that correctly show the extreme price movements. A very pragmatic approach was taken in the end for this data-set and outliers have not been removed with the sole exception of zero values, as it is assumed that no farm provides goods for free. Not removing further outliers in the absence of any additional information is believed to support best the main use of the data-set as input into the forecasting process.

6. Results

The farm gate and wholesale price dataset is only relatively recently being used in the ECB analysis and therefore it is difficult to give it a full and categorical endorsement. Nonetheless, early indications show that it is performing significantly better than the previous datasets. One possible reason is that the previous data used international prices while the DG-AGRI data reflect the prices actually paid by EU food producers. This is particularly important as the EU prices will directly include the effect of the CAP. In times of buoyant commodity prices the effect will be minimal but, if world prices are below CAP thresholds then the effect is likely to be significant.

7. Future

While, as discussed in the previous section, the change to using the farm gate and wholesale price data set has seen improvements in the analysis and projection of commodity price feed through within the ECB further improvements could be envisaged. These include:

- Addition of additional commodities – one area which is not published in the current DG-AGRI dataset is the prices of fresh fruit and vegetables. These data are collected by DG-AGRI but up to now are believed to be of such a low quality and as having extreme volatility so as not to be of publishable quality. This is an area where further investigation could be undertaken in order to either use the available, but poor quality, DG-AGRI data or, alternatively, to see if an alternative data source could be found.
- Inclusion of non-indigenous commodities – Commodities which are not grown in the EU in sizeable quantities such as coffee or cocoa are not included in the DG-AGRI data as there is no corresponding farm-gate price. However, these commodities have a relatively high share in the Food sub-index in the HICP. One potential approach for these commodities would be to investigate ways to include these items into the current dataset.
- Publication – up to now the dataset is available only to ESCB internal users. However, the data are likely to be of wider interest and it could be considered if the EU aggregates could be released as "ECB experimental" data.
- While significant data cleaning and quality control is already undertaken further improvements are likely to be desirable.

8. Conclusions

This paper has presented the commodity price data that is being used at the ECB for price pass through analysis and projections. Historically, international price primary commodity indices were used for the task but since 2007, when these data started to give rise to sustained projection errors, alternative approaches have been explored. These have culminated in the current dataset which is based on raw information made available by the European Commission's Directorate General for Agriculture. As a result the projection errors and analysis of pass through effects have been improved. However, there are more improvements that can be explored.

Annex A:
Model-based procedure: detailed methodology

1. ***Data preparation***: Time series were differenced just enough to become stationary and no patterns such as a trend or seasonality are left.
2. **Model identification**: Sample autocorrelations are compared with the theoretical ones for different orders of AR, MA and ARMA models (see box Chatfield, 2004).[13]

> Summary on Auto regression and Moving Average models (ARMA)
>
> To model time series dependence, we use univariate ARMA models assuming that the level of current observations depends on the level of lagged observations.
>
> An autoregressive model (AR) is simply a linear regression of the current value of the series against one or more prior values of the series. An AR model of order p, denoted as AR(p), can be expressed as:
>
> $y_t = \mu + \varphi_1 y_{t-1} + \varphi_2 y_{t-2} + \cdots + \varphi_p y_{t-p} + u_t$
>
> where u_t is a white noise disturbance term.
>
> Another common approach for modeling univariate time series models is the moving average (MA) model where it is assumed that the observations of a random variable at time t are not only affected by the shock at time t, but also by previous shocks. Under the assumptions that u_t (t = 1, 2, 3, . . .) behave as a white noise with $E(u_t) = 0$ and $Var(u_t) = \sigma_2$.
>
> Then $y_t = \mu + u_t + \theta_1 u_{t-1} + \theta_2 u_{t-2} + \cdots + \theta_q u_{t-q}$
>
> is a qth order moving average mode, denoted MA(q).
>
> The autoregressive model AR includes lagged terms on the time series itself, and that the moving average model MA includes lagged terms on the noise or residuals. If we combine both types of lagged terms, we obtain the autoregressive-moving-average, or ARMA models. The order of the ARMA model is included in parentheses as ARMA(p,q), where p is the autoregressive order and q the moving-average order.

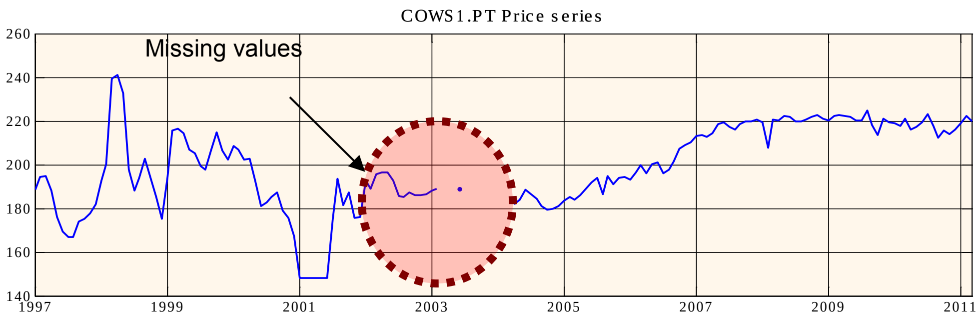
3. ***Parameter estimation***: Polynomial AR, MA and ARMA models are estimated for time-series data.
4. ***Model checking***: We determine if the model estimated in the previous step is adequate for the time series. If this is found to be inadequate, we need to go back to Step 2 and try to identify a better model. *Residual diagnostics* technique is used to check the model adequacy. This method implies checking residuals for

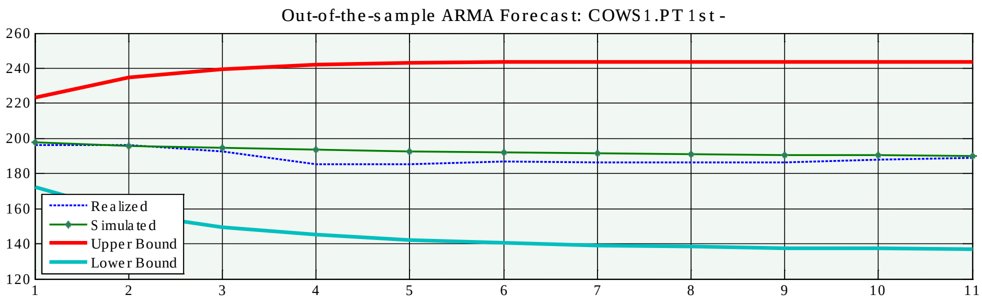
[13] "The analysis of time series: an introduction", Chatfield 2004

independency, homoscedasticity[14] and normal distribution and if these properties are present, it means that the model originally specified is adequate to capture the features of the data.

5. ***Forecasting***: After that we have selected, estimated and checked the model, the last step is to forecast missing values of a series given its previous values and/or previous values of an error term. Mean absolute percentage error (MAPE)[15] is used as a measure of accuracy in a fitted time series value. For differentiated time series, it could happen that we have zero values so in these cases instead of MAPE we measure the forecast accuracy with Symmetric Mean Absolute Percentage Error (SMAPE).[16] Firstly, we proceed with in-sample forecasts that are those generated for the same set of data that was used to estimate the model's parameters, then in the second part of the procedure, if the model shows good fitted values (i.e. R square greater than 0.70), we proceed with the out-of-sample forecast to fill the missing values in the series.

The graph below shows an example of forecast for Portuguese cow prices. We can notice that the proposed method ARMA(1,1) shows good forecasting accuracy, with MAPE of 0.021.





14 A vector of random variables is homoscedastic if all random variables in the sequence or vector have the same finite variance.

15 MAPE formula: $\mathrm{M} = \frac{1}{n}\sum_{t=1}^{n}\left|\frac{A_t - F_t}{A_t}\right|$

16 SMAPE formula: $\mathrm{SMAPE} = \frac{1}{n}\sum_{t=1}^{n}\frac{|A_t - F_t|}{A_t + F_t}$

International commodity prices – volatility and global liquidity

Asit B Chakraborty and Sanjib Bordoloi[1, 2]

1. Introduction

Recent years have witnessed large fluctuations in international commodity prices. A boom in commodity prices until 2008 was followed by a sharp decline during the peak of the financial crisis. Since early 2009, prices of major groups of commodities rose to levels close to or even above the peak reached in 2008. For some commodities, the speed and amplitude of the recent price swings have been large by historical standards. There has been a persisting concern about the high and volatile behaviour of commodity prices in view of its likely impact on macroeconomic situation. The most prolonged global financial crisis since the *Great Depression* is not yet over and the loose monetary policy with very low interest rates and monetary easing through injection of liquidity by major advanced economy central banks continue. In this scenario, the subject of analyzing the impact of global liquidity on the commodity, consumer and asset prices has been receiving considerable attention.

It is argued that monetary policy can affect commodity prices by changing the expectations of commodity market participants about future growth and inflation. This expectation channel works through both changes in monetary policy and central bank communication about the macroeconomic outlook and possible future policy actions. In this channel, commodity prices may change faster than the prices of manufactured goods or services do, due to their less sticky properties. Accommodative global monetary conditions can also affect commodity prices through changes in the behavior of commodity market participants independent of actual or expected changes in aggregate demand and inflation. Lower return on safe assets may encourage financial investors to shift their portfolios into riskier assets. Moreover, excessively low funding costs may create incentives to generate extra returns by borrowing short-term at low interest rates and investing in higher-yielding assets, which could include commodity markets as well.

The G20 Study Group on Commodities (April 2011) noted the existing debate on the drivers of the commodity price developments. While one view attributed the fundamental demand-supply factors behind the commodity price trends, the other view was that financialization of commodities has had significant price impact. The financialization argument points to the impact of loose monetary policy for prolonged periods by way of large global liquidity in search of yields finding its way into the commodity markets and thereby influencing the commodity prices.

In this background, this paper examines the impact of global liquidity, excess monetary liquidity to be more precise, on the trends and volatility in international commodity prices. Several issues have to be reckoned in this regard. First, adjustments in investors' portfolio allocation in response to monetary policy actions will often reflect a combination of changes in macroeconomic expectations and risk appetite. Second, lower policy interest rates may

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lead to higher commodity prices, but central banks in turn would be required to take into account changes in commodity prices in their monetary policy. Third, an appropriate formulation of the dynamic interactions of different variables is required so as to control for the more fundamental demand-supply factors in order to capture the impact of the monetary factors.

In recent years, a number of studies have sought to establish the existence of significant positive impact of excess global liquidity on commodity and asset prices. These studies, by and large, examined the relationship between various measures of global liquidity and excess global liquidity and international commodity / asset price indices in a VAR framework and usually depended upon constant coefficient models. It is, however, pertinent to ask whether the magnitude of such impact can vary over time and, probing further, whether the impact during the pre-crisis period could be different from that in the crisis or post-crisis period. In this paper, these issues are examined initially based on conventional SVAR models followed by the application of time-varying coefficient SVAR modelling approach proposed by Primiceri (2005). The latter framework allows one to investigate the variable impact of the shock in global liquidity imparted at different points of time on international commodity prices.

The rest of the paper is organised as follows. Section 2 presents a brief literature review. A brief description about the TVP-VAR methodology is described in Section 3. Section 4 provides a description of the variables and data used for modelling. Section 5 provides the basic statistical properties of the variables and Section 6 presents the empirical analyses. Finally, Section 7 concludes.

2. Select literature survey

The literature on the relationship between liquidity and prices can be broadly classified into two categories, viz., investigations at national level and at international level. In keeping with the objective, our attention is focused on the studies on liquidity and prices at international level. At the outset, such studies have to contend with the development of suitable indicators of global liquidity and also consider appropriate price indices. It is also necessary to incorporate in the model appropriate output and other price variables at the global level for arriving at desirable specifications. Once suitable indicators are constructed, the next step is to look for suitable modeling and estimation techniques. In this section, we first provide a snapshot of various approaches used in the literature for construction of these variables and then present the findings of a few select studies.

2.1 Variables used in literature

Price variables

Among the various relevant variables used in these studies, international commodity, consumer and asset prices are most common. Many international agencies such as the IMF, World Bank, Commodity Research Bureau compile data on the international commodity price indices. These are based on spot or future prices of commodities obtained from different international markets, which are then aggregated using suitable weights such as traded volume, size of the spot/future contracts, etc. The behavior of such price data series can vary depending on the choice of the basket, nature of the markets, types of prices and their weights. Similarly, a number of asset price indices, mainly equity prices at international level are also compiled by international agencies.

Global liquidity

Although the term global liquidity is not very precisely defined, IMF, WEO October 2007[3] provided two broad classifications of global liquidity, which are associated with (a) the global monetary policy stance (involving a range of monetary aggregates and policy interest rates) and (b) financial market liquidity. Along similar lines, Stark (2007)[4] noted that monetary liquidity defined is in quantitative terms on the basis of monetary and financial aggregates. In another approach, following Domanski *et. al.* (2011) global liquidity may be defined as the overall "ease of financing" in the international financial system. The BIS Committee on the Global Financial System (CGFS) in its Report on Global liquidity (2011) argued that, from a global perspective, the "ease of financing" depends on the both official liquidity (those created by the public sector) and private sector liquidity. Private sector liquidity is created by international banks, institutional investors, non-bank financial institutions etc. by lending in the inter-bank market, buying commercial papers issued by corporate by the money market mutual funds, etc. Official liquidity is defined as the funding that is unconditionally available to settle through monetary authorities. Another major issue pertaining to the assessment of global liquidity is measuring the global "excess liquidity". According to Stark *op. cit.* a qualitative definition of excess monetary liquidity is that poses a medium or long-term threat to price stability or starts to boost asset prices to levels not justified by economic fundamentals.

Agostino and Surico (2009) defined a baseline global liquidity as the simple average of the growth rates of broad money in the G7 economies. Sousa and Zaghini (2007) defined global liquidity as the sum of the monetary aggregates for the USA, the Euro area, Japan, the UK and Canada using exchange rates vis-à-vis the euro based on purchasing power parity. IMF (2010) defined two alternative measures of global liquidity based on monetary aggregates (M2) and reserve money for G-4 countries (the USA, the UK, Japan and the Euro area). Artus and Virard (2010) defined global liquidity as the "*money created by the central banks around the world",* i.e. the base money of all the countries around the world. Darius and Radde (2010) measured global liquidity as the total of international reserves and the USA base money.

The CGFS (*op. cit.)* questioned the absence of an agreed equilibrium concept against which the actual development can be assessed. Ruffer and Stracca (2006) defined the "Excess Money" indicator for 15 countries as a ratio between broad (narrow money) and nominal GDP. The global liquidity was defined as the aggregate of money supply for the USA, the Euro area, Japan, Canada and the UK, using fixed real GDP weights at PPP exchange rate. IMF (*op cit.)* defined excess liquidity as the difference between broad money growth and estimates for money demand in the G-4. De Nicolo and Wiegand (2007) defined global excess liquidity as the deviation of the short-term nominal interest rate from the interest rate based on the Taylor rule.

Global output

Generally, two different indicators of output are commonly used. In studies based on quarterly data, GDP of a group of countries, mainly advanced economies, are aggregated. One natural candidate is the aggregate GDP compiled by OECD for different groups of OECD economies.

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[3] IMF, World Economic Outlook, October 2007, Box 1.4 on Global liquidity.

[4] Speech by Jürgen Stark, ECB workshop on "The external dimension of monetary analysis", December 2007.

2.2 Modeling approaches and findings

Browne and Cronin (2007) used the Commodity Research Bureau Spot Index (CRBSI), the CRB Raw Industrials (CRBRI) and Conference Board's Sensitive Materials Index (SENSI) to represent the commodity price indices for their empirical analysis. They found that in the long run, the US money supply drives both commodity prices and in turn US consumer prices, under the cointegration framework.

Sousa and Zaghini (2007) examined the impact of global liquidity, estimated based on monetary aggregates of five industrial economies, on global output and prices through a Structural VAR model. Empirical analysis suggested that an increase in the global liquidity had a positive impact on real GDP in the short-run that disappeared in the medium to long term, while the impact on prices was found to be insignificant in the first two quarters, but become positive and permanent thereafter.

Belke *et. al.* (2009) investigated the relationship between money (global liquidity), consumer prices, commodity prices and output from 1970 to 2008. Global liquidity was proxied by broad monetary aggregate in major OECD countries. The Johansen cointegration technique suggested existence of long-run equilibrium relationship between the variables. According to their empirical findings, global liquidity could be considered as a useful indicator of commodity price inflation and of a more generally defined inflationary pressure at a global level. They used the CRB index and the CRB Raw Industrials index for the commodity price indices.

Darius and Radde (2010) examined the impact of global liquidity on various asset prices *viz.*, the extent to which the rise in asset prices was influenced by developments in global liquidity using a VAR model. The model included various measures of assets – the housing price, the equity price and the commodity price. It found that global liquidity had a significant impact on the buildup in house prices, while the impact on equity prices was limited.

Anzuini*et et. al.* (2010) investigated the relationship between the US money supply and commodity prices, using a Structural VAR framework, and found that a shock to the US money supply leads to an increase in the commodity prices.

3. Brief description of the methodology of Time Varying Vector Autoregression with Stochastic Volatility (TVP-VAR) Model

Let Y_t be a kx1 vector of variables with a lag length of "s". The VAR(s) model with time-invariant parameters and variance may be written as,

$$AY_t = F_1 y_{t-1} + \dots + F_s y_{t-s} + u_t$$

where A is the matrix of cotemporaneous coefficients, while F1, F2,,, Fs are the matrices of coefficients. Ut is assumed to have mean 0 and fixed variance-covariance matrix S. The structure of the matrix A is as follows:

$$A = \begin{bmatrix} 1 & 0 & \dots & 0 \\ a_{21} & 1 & .. & 0 \\ \dots & \dots & \dots & \dots \\ a_{k1} & a_{k2} & \dots & 1 \end{bmatrix}$$

The above referred equation can be rewritten in reduced form as

$$Y_t = X_t^{/} b + e_t$$

In case one allows the matrices A, F_1, F_2,,, F_s or the variance-covariance matrix Σ to vary over time, the model requires to incorporate some unobserved components as state variables. For estimation of the unobserved components, the state transition equation is required to be distinguished from a measurement equation under a state space model.

The structural changes in the macroeconomic indicators can be captured through a Time Varying Parameter VAR with stochastic volatility. Following Primiceri (2005), the time varying parameter VAR with stochastic volatility can be formulated as:

$$
\begin{aligned}
&Y_t = X_t^{\prime}\beta_t + \varepsilon_t,\ \varepsilon_t \sim N(0, A^{-1}H_t A^{-1\prime}) \\
&\beta_t = \beta_{t-1} + v_t, v_t \sim N(0, \Sigma_u) \\
&\log(H_{it}) = \log(H_{it-1}) + u_{it}, u_{it} \sim N(0, Q_i) \\
&with\ \Sigma_t = diag(\sqrt{H_{it}})
\end{aligned}
$$

The elements of the vector β_t are modelled as random walks. The standard deviations are assumed to evolve as geometric random walks, belonging to the class of models known as stochastic volatility. All the innovations in the model are assumed to be jointly normally distributed and uncorrelated.

The prior distribution for the variance-covariance matrix is assumed to follow Inverse-Wishart. The prior distribution for the initial states of the time varying coefficients is assumed to be normally distributed. This is estimated using Gibbs sampling in Markov Chain Monte Carlo (MCMC) algorithm.

4. Description of variables and data

Global commodity prices

In this paper, international commodity price movements have been measured using two alternative commodity price indices, viz., IMF Primary Commodity Price Index (representing spot prices) and Reuters-Jeffery CRB Commodity Price Index (representing future prices). The International Monetary Fund compiles indices of primary commodity prices on monthly basis. In the IMF index, individual commodity price indices are compiled in USD and SDR terms with base 2005. The group-indices are computed as weighted averages of individual commodity price indices, with the weights derived from their relative trade values compared to the total world trade. The IMF primary commodity index is mainly dominated by the Energy Group with a weight of 63.1%, of which Petroleum and Natural Gas has weights of 53.6% and 6.9% respectively. In the Non-Energy Group, Food and Industrial Inputs have weights of 16.7% and 18.4% respectively. In the IMF index, Petroleum price index is derived from the spot prices of UK Brent, Dubai Fateh and WTI.

The Reuters-Jefferies Commodity Research Bureau (CRB) index covers commodities that have significant contracts. The index has been designed to provide more liquid and economically relevant benchmark that represents commodities as an asset class more accurately. The data are collected from 19 future markets, with quotations for 5 commodities are collected from NYBOT and 4 are collected from NYMEX. Energy has the maximum weight (39%), of which WTI crude oil has a weight of 23% in the overall index. Data on CRB Commodity Index has been collected from Jeffries-Reuters web site. The monthly index has been estimated as the daily average.

Global liquidity

For measuring the impact of global liquidity on the commodity prices, this paper uses the variable "excess liquidity". Excess Liquidity has been estimated as the deviation of the money supply from its trend estimate. The OECD defines the M1 (Narrow money) consisting of currency i.e. banknotes and coins, plus overnight deposits. The OECD M3 consist of the total of M1, deposits with an agreed maturity of up to two years and deposits redeemable at notice of up to three months, repurchase agreements, money market fund shares/units and debt securities up to two years. The area totals for the monetary aggregate indices are based on annually chain-linked Laspeyres indices. The weights for each yearly link are derived as the previous year's gross domestic product adjusted for purchasing power parity. Based on these two alternative measures of money, two excess monetary liquidity measures viz. Excess_Liquidity1 (M1 based) and Excess_Liquidity3 (M3 based) have been estimated. HP filter has been used to estimate the Trend.[5]

Global output

Due to lack of monthly World GDP data, the monthly Index of Industrial Output of the OECD countries, compiled by the OECD has been used to represent World output. Data for OECD-IIP has been collected from the OECD database.

Global equity prices

As liquidity flows to the equity markets also, the equity price is captured through the Morgan Stanley Capital Investment- World Equity Index (MSCI). The monthly data has been collected from the Morgan Stanley website. The MSCI World Equity Index is a free float-adjusted market capitalization weighted index that is designed to measure the equity market performance of developed markets. It consists of 24 market country indices, *viz.* Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hongkong, Ireland, Israel, Italy, Japan, Netherlands, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, the UK and the USA.

The paper uses monthly data over the period from April 1994 to March 2012. All the above data have been obtained from public sources, viz., the websites of OECD, IMF, Reuters / CRB and Morgan Stanley.

5. Basic statistical properties of the data

During the sample period, the IMF Commodity price index showed an increasing trend from middle of 2001 till middle of 2008 and then declined sharply during the crisis period. The CRB commodity price index also showed an increasing trend towards the end of 2001 till the middle of 2008. The CRB commodity index is observed to be more volatile than the IMF commodity index prior to the financial crisis of 2008 (Chart 1). The behavior of OECD IIP and MSCI indicate considerable co-movements and the sharp downturn at different points of time indicate existence of structural breaks (Chart 2).

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[5] The behavior of these excess liquidity estimates have been validated with respect to an excess liquidity measure used by the IMF, viz., residuals of a money demand function based on quarterly data.

Chart 1

Movement of the Commodity Price Indices

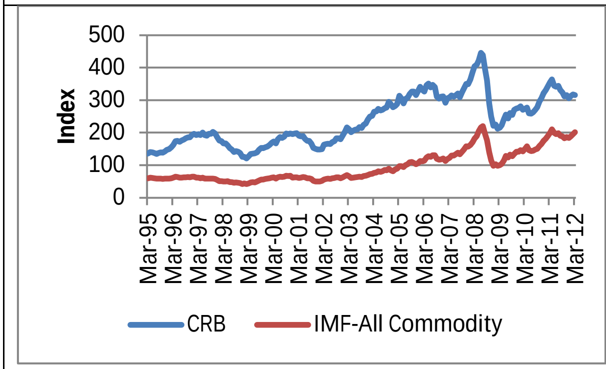
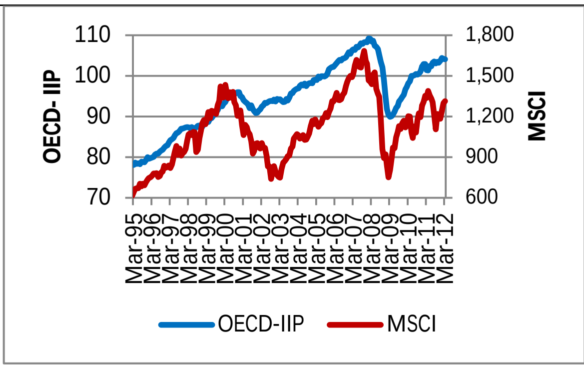


Chart 2

Movement of the IIP and MSCI



5.1 Pre-processing of the data

For empirical analysis, all the variables were transformed in logarithm and data are seasonally adjusted using the U.S. Census Bureau's X-12-ARIMA procedure. Further empirical analysis is carried out using seasonally adjusted data. The OECD publishes seasonally adjusted data on Industrial Production, M1 and M3and hence no seasonal adjustment has been made for these variables.

5.2 Unit root test

Initially test for the existence of unit roots was conducted using the widely applied ADF testand Phillips-Perron (PP) test, with the appropriate lag length is selected by the Schwarz Bayesian Criterion (SBC). Table-1 and Table-2 presents the results of the unit root test at level and first difference respectively. The ADF test indicates that the variables M1, M3, IIP, CRB and MSCI to be I(1). The PP test also suggest that these variables to be I(1), except for M3 under the specification "Constant".

Test for existence of unit root has also been conducted using the Zivot-Andrews (ZA) unit root test that considers existence of a single break in the series. All variables, except IIP are found to be I(1) under ZA test. The peculiar behavior of IIP could be due to the crisis period fluctuations, which may not be amenable to the unit root test used. All the three tests suggest both the measures of Excess Liquidity to be I(0).

Table-1

Results of the unit root test at level

Variables	**Without break**			**With break (Zivot-Andrews test)**		
	ADF	**PP (Trend)**	**PP (Constant)**	**Intercept (Model A)**	**Trend (Model B)**	**Both (Model C)**
Log(M1)	-1.36	-1.18	-0.37	-4.69 (Jun-06)	-3.38 (Jun-03)	-4.43 (Jun-06)
Log(M3)	-0.63	-0.19	-4.73***	-3.03 (Feb-09)	-2.33 (Mar-01)	-2.46 (Jan-01)
Log(IIP)	-2.63	-1.83	-2.13	-5.98*** (Aug-08)	-3.90 (May-06)	-6.10*** (Aug-08)
Log(CRB)	-2.70	-2.09	-1.63	-4.25 (Aug-08)	-3.41 (Mar-07)	-4.15 (Aug-08)
Log(IMF)	-2.16	-1.77	0.01	-4.12 (Dec-97)	-4.00 (Dec-98)	-4.30 (Oct-03)
Log(MSCI)	-2.56	-2.19	-2.15	-3.17 (Jun-08)	-2.87 (Jun-97)	-3.43 (Sept-00)
Excess_Liquidity1	-5.41***	-4.95***	-4.95***	-5.92*** (Nov-08)	-5.80*** (Jun-06)	-6.03*** (Nov-08)
Excess_Liquidity3	-6.06***	-4.83***	-4.83***	-6.85*** (Aug-09)	-6.68*** (Mar-09)	-7.17*** (Sept-08)

Note: (1) ***, ** and * indicates significance at 1%, 5% and 10% probability level respectively.

(2) The Critical values for ADF test with trend at 5% level is -3.43. The Critical values for Phillips-Perron test with Trend and Constant are at 5% level are -2.87 and -3.43 respectively, while the Critical values for the Zivot-Andrews test under Model A, Model B and Model C at 5% level are -4.80, -4.42 and -5.08 respectively.

Table-2 **Results of the unit root test at first difference**						
Variables	**Without break**			**With break (Zivot-Andrews test)**		
	ADF	**PP (Trend)**	**PP (Constant)**	**Intercept (Model A)**	**Trend (Model B)**	**Both (Model C)**
dLog(M1)	-11.27***	-11.33***	-11.33***	-6.72*** (Sept-08)	-6.42*** (Apr-97)	-6.82*** (Sept-08)
dLog(M3)	-7.34***	-8.09***	-7.38***	-7.05*** (Feb-09)	-6.40*** (Feb-08)	-7.47*** (Mar-09)
dLog(IIP)	-5.26***	-7.78***	-7.67***	-5.18*** (Mar-09)	-4.75*** (Dec-08)	-5.36*** (Feb-08)
dLog(CRB)	-7.13***	-10.08***	-10.06***	-4.99** (Mar-99)	-4.80** (Dec-03)	-5.30** (Jul-08)
dLog(IMF)	-10.77***	-10.87***	-10.82***	-5.81*** (July-08)	-5.49*** (Nov-04)	-6.24*** (Aug-08)
dLog(MSCI)	-12.67***	-12.76***	-12.73***	-6.01*** (Mar-09)	-5.64*** (Nov-08)	-6.09*** (Mar-09)

Note: (1) ***, ** and * indicates significance at 1%, 5% and 10% probability level respectively.

(2) The Critical values for ADF test with trend at 5% level is -2.88. The Critical values for Phillips-Perron test with Trend and Constant are at 5% level are -2.88 and -3.43 respectively, while the Critical values for the Zivot-Andrews test under Model A, Model B and Model C at 5% level are -4.80, -4.42 and -5.08 respectively.

6. Empirical estimates

6.1 Estimating volatility in commodity price

Initially, we tried to estimate the volatility of the two commodity price indices using a GARCH model. For this, the mean equation is estimated through an AR(1) process while the volatility is estimated through a GARCH(1,1) process. Chart-3 and Chart-4 presents the estimate of volatility in CRB and IMF commodity prices respectively. From the charts it can be observed that the volatility in both the commodity prices spiked during the crisis year of 2008. The commodity prices declined sharply during the period from August 2008 to December 2008. Further, the estimated volatility is found to be lower in CRB than IMF, on an average.

Chart 3

Estimate of Volatility – CRB Commodity Prices

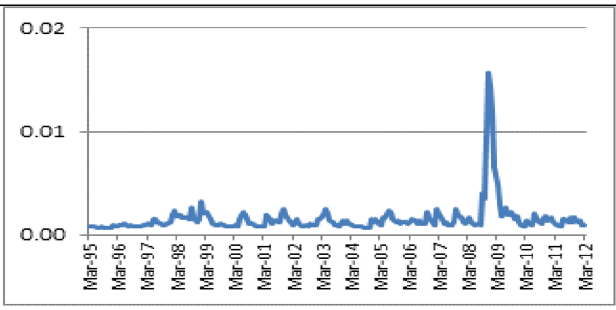
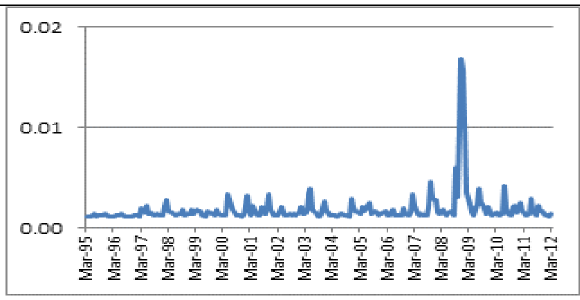


Chart 4

Estimate of Volatility – IMF Commodity Prices



6.2 Estimating the impact of excess monetary liquidity on commodity price using Vector Autoregression Model

In this section attempt has been made to estimate the impact of excess liquidity on commodity prices through a Structural VAR (SVAR) model. The model includes the variables output and equity price. To capture the impact of the recent financial crisis in 2008, a dummy variable has been used. The dummy takes a value “1” from September 2008 onward, prior to which it take a value “0”. For empirical analysis, we have used the excess liquidity measure, both based on M1 and M3.

For the SVAR model, it is assumed that output will be impacted by all other variables with a lag. Commodity price is impacted by output contemporaneously. Equity priceis assumed to be contemporaneously impacted by output and commodity price, while global excess liquidity is assumed to have been impacted by all other variables contemporaneously.

Using both the measures of excess liquidity, the AIC suggest the lag length at 2, while SCB suggest the lag length of the VAR model at 1 for excess liquidity measured using M1 and 2 for M3 respectively. The residuals are found to be white noise when the lag length has been taken as 2 and as such the lag length of the SVAR model has been considered as 2. Table 3 and Table 4 present the forecast error variance decomposition of the CRB commodity price, under the two SVAR model, based on the Excess_Liquidity1 and Excess_Liqudity3 respectively, up to 16 months.

From the variance decomposition it is observes that the excess liquidity condition has the ability to explain the movement of commodity price. Excess liquidity, estimated using M1 has better explaining power to forecast error variance of the commodity price than M3. After a period of 12 months, M1 based Excess Liquidity explains approximately 11% of variance decomposition compared to around 7% based on M3 measure. The empirical analysis thus indicates that during the sample period, commodity price is better explained by M1 than M3.

Table 3 **Variance Decomposition of Commodity Prices (CRB)**					
Steps	**Standard Error**	**dLog(IIP)**	**dLog(CRB)**	**dLog(MSCI)**	**Excess_Liquidity1**
1	0.033	0.800	99.200	0	0
2	0.036	1.812	90.941	7.095	0.151
3	0.037	3.130	88.638	6.828	1.404
4	0.037	3.882	85.841	6.732	3.545
5	0.038	4.281	83.329	6.782	5.608
6	0.038	4.527	81.398	6.787	7.288
9	0.039	4.768	78.551	6.701	9.979
12	0.039	4.794	77.864	6.670	10.672
16	0.039	4.794	77.734	6.662	10.811

Table 4 **Variance Decomposition of Commodity Prices (CRB)**					
Steps	**Standard Error**	**dLog(IIP)**	**dLog(CRB)**	**dLog(MSCI)**	**Excess_Liquidity3**
1	0.034	1.018	98.982	0	0
2	0.036	2.443	91.156	6.401	0.000
3	0.037	5.011	88.636	6.173	0.180
4	0.037	6.468	86.348	6.092	1.092
5	0.038	7.003	84.395	6.221	2.381
6	0.038	7.193	82.805	6.261	3.740
9	0.039	7.092	80.392	6.133	6.383
12	0.039	7.189	79.944	6.094	6.772
16	0.039	7.322	79.751	6.103	6.824

The impulse response functions of shocks given to the excess liquidity on the commodity prices indicate significant impact of excess liquidity on CRB commodity prices (Chart-5 and Chart-6). An increase in the excess liquidity, based on both the alternative measures, caused to an increase in the commodity price. The impact is found to be significant from 2 to 15 months in case of M1, while from 2 to 11 months in case of M3. The confidence bands are constructed using Markov Chain Monte Carlo (MCMC) method assuming the coefficients of the SVAR to follow beta distribution and the covariance matrix of the residuals to follow inverse Wishart distribution. Further, the impact on commodity price is found to be immediate in case of M1 based excess liquidity, while in case of M3 the impact starts after one month.

Chart 5

Impulse Response Function of Commodity Prices (CRB) to Excess Liquidity (M1)

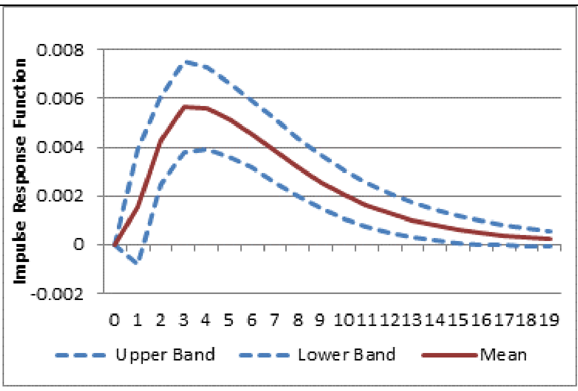
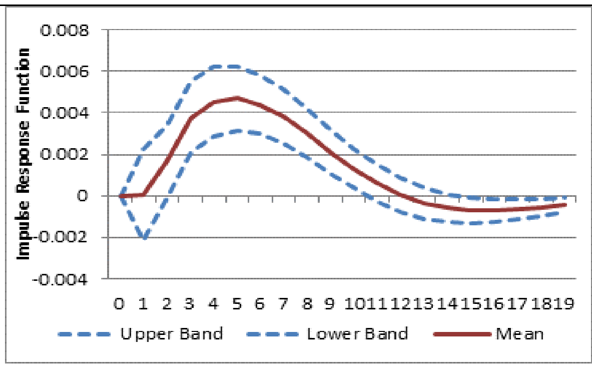


Chart 6

Impulse Response Function of Commodity Prices (CRB) to Excess Liquidity (M3)



Next, an attempt has been made to estimate the impact of global liquidity on IMF commodity prices (IMF). Interestingly, it is found that the World Equity prices, that explain the CRB Commodity price by between 6.0 per cent to 7.0 per cent, can explain from around 11.0 per cent to 12.0 per cent of the forecast error variation of IMF commodity price. Among the two measures of liquidity, excess liquidity measured using M1 has better ability to explain the IMF commodity price than M3. Both the measures of global liquidity have almost similar ability to explain the commodity price variation, measured.

Table 5

Variance Decomposition of Commodity Prices (IMF)

Steps	Standard Error	dLog(IIP)	dLog(IMF)	dLog(MSCI)	Excess_Liquidity1
1	0.036	1.228	98.772	0	0
2	0.039	1.838	85.556	12.285	0.321
3	0.040	2.690	82.905	12.706	1.699
4	0.041	3.346	80.360	12.464	3.830
5	0.041	3.671	78.249	12.300	5.781
6	0.042	3.861	76.698	12.194	7.247
9	0.042	4.072	74.592	11.956	9.379
12	0.043	4.109	74.096	11.888	9.907
16	0.043	4.116	73.987	11.872	10.025

Table 6 Variance Decomposition of Commodity Prices (IMF)					
Steps	**Standard Error**	**dLog(IIP)**	**dLog(IMF)**	**dLog(MSCI)**	**Excess_Liquidity3**
1	0.037	1.458	98.542	0	0
2	0.039	2.445	86.396	11.159	0
3	0.040	4.459	83.886	11.393	0.262
4	0.041	5.880	81.522	11.163	1.435
5	0.041	6.383	79.409	11.089	3.119
6	0.042	6.485	77.775	11.034	4.705
9	0.042	6.356	75.719	10.736	7.189
12	0.042	6.512	75.392	10.706	7.391
16	0.043	6.636	75.145	10.719	7.500

The impulse response functions of shocks to the excess liquidity on the IMF commodity prices are found to be very similar to those of CRB commodity prices (Chart-7 and Chart-8). An increase in the excess liquidity, based on both the alternative measures, caused to an increase in the IMF commodity price. The impact is found to be significant from 2 to 15 months in case of M1 and from 2 to 11 months in case of M3. The impact on IMF commodity price is found to be immediate in case of M1 based excess liquidity, while in case of M3, the impact starts after one month.

Chart 7

Impulse Response Function of Commodity Prices (IMF) to Excess Liquidity (M1)

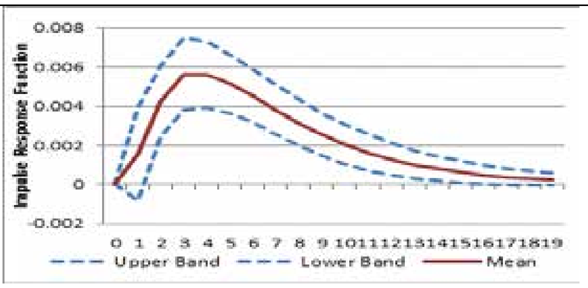
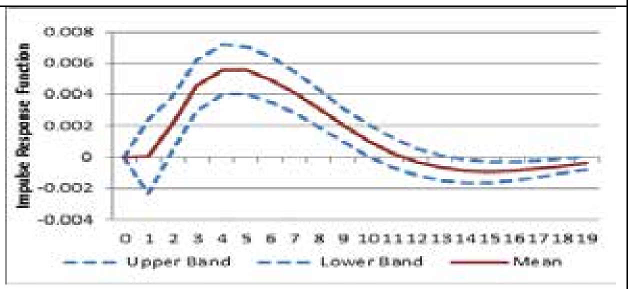


Chart 8

Impulse Response Function of Commodity Prices (IMF) to Excess Liquidity (M3)

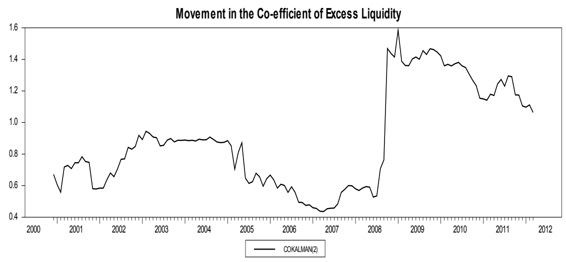
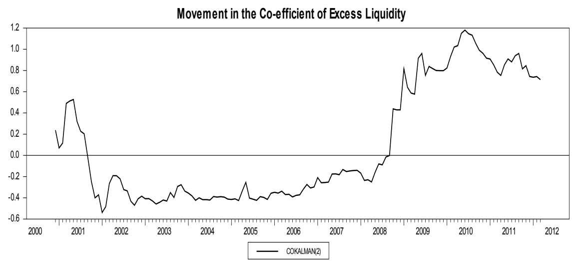


6.3 Estimating the impact of excess monetary liquidity on commodity price using State Space Model

Further, exploration has been made to measure the impact of the excess liquidity on commodity prices (CRB) through the time varying parameter approach under a State Space Model, assuming constant volatility. Excess liquidity has been found to have significantly impact the CRB commodity price after 2 months. For this, the following specification has been made,

$$dLog(CRB)_t = a_t + b_t(Excess\_Liquidity)_{t-2} + g_t dLog(IIP)_t + d_t dLog(MSCI)_t + u_t$$
$$a_t = a_{t-1} + u_{1t}$$
$$b_t = b_{t-1} + b_{t-2} + u_{2t}$$
$$g_t = g_{t-1} + u_{3t}$$
$$d_t = d_{t-1} + u_{4t}$$

The estimates of the coefficient of excess liquidity on commodity prices (CRB) are presented in Chart-9 (M1 based) and Chart-10 (M3 based). The coefficient of M1 based excess liquidity has been found to be positive over the sample period and increased sharply during the crisis period and thereafter started to fall gradually. Thus an increase in the excess liquidity is expected to lead to significant increase in the commodity prices after 2 months and the impact has gone up sharply post financial crisis period compared to pre financial crisis period. The coefficient of excess liquidity, measured using M3, on commodity prices, was found to be negative in the pre-crisis period that became positive after the financial crisis. Post 2008, the coefficient of both the measures of excess liquidity on commodity prices has been found to be positive, indicating that an increase in the liquidity from its optimum path leads to an increase in the commodity prices. In the recent period from 2010 onwards, the coefficient of excess liquidity has shown a declining trend, suggesting lesser impact of liquidity on the commodity prices in the recent time period. The sharp increase in the estimate of the coefficient of excess liquidity on commodity price during the crisis period of 2008 lead to the suspicion of the constant volatility assumption.

Chart 9 **Movement of coefficient of Excess Liquidity (M1 based) on Commodity Prices (CRB)**	Chart 10 **Movement of coefficient of Excess Liquidity (M3 based) on Commodity Prices (CRB)**
	

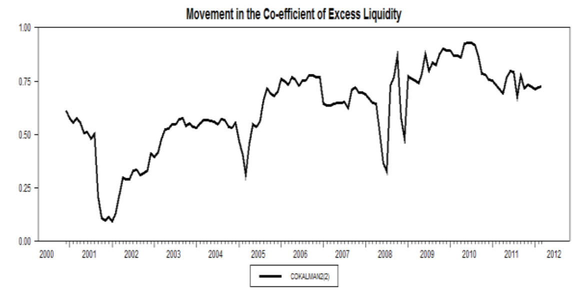
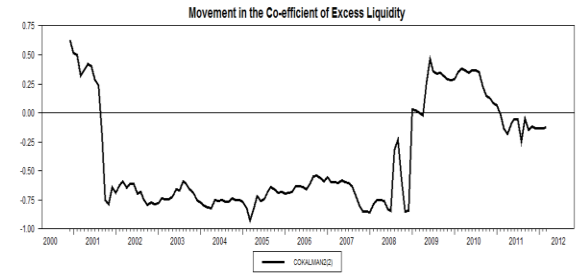
Similarly, exploration has been made to measure the impact of the excess liquidity on IMF commodity price under the same State Space Model, with significant impact of excess liquidity on commodity price has been found to be contemporaneous. For this, the following specification has been made,

$$dLog(IMF)_t = a_t + b_t(Excess\_Liquidity)_t + g_t dLog(IIP)_t + d_t dLog(MSCI)_t + u_t$$
$$a_t = a_{t-1} + u_{1t}$$
$$b_t = b_{t-1} + b_{t-2} + u_{2t}$$
$$g_t = g_{t-1} + u_{3t}$$
$$d_t = d_{t-1} + u_{4t}$$

The estimate of the coefficient of excess liquidity on IMF commodity price is presented in Chart-11 and Chart-12. The estimates of the impact of M3 based excess liquidity on both the measures of commodity prices are found to be very similar, while the impact of M1 based excess liquidity on IMF commodity prices is found to be volatile.

Chart-11 indicates that the impact of global excess liquidity, measured using M1, has shown an increasing trend since 2001, amid with a volatile movement. This suggests that an increase in the M1 based excess liquidity is expected to lead to an increase in the IMF commodity price.

Chart-12 presents the coefficients of M3 based excess liquidity on commodity price. The coefficient of M3 based excess liquidity that has been estimated to be negative from 2001 to 2008, had sharply increased to positive after the crisis of 2008. The coefficient of the measure has shown a declining trend since 2010, suggesting lesser impact of liquidity on IMF commodity price in the recent period.

Chart 11 **Movement of coefficient of Excess Liquidity (M1 based) on Commodity Prices (IMF)**	Chart 12 **Movement of coefficient of Excess Liquidity (M3 based) on Commodity Prices (IMF)**
	

6.4 Estimating the impact of excess monetary liquidity on commodity price using Time Varying Vector Autoregression with Stochastic Volatility (TVP-VAR) Model:

Alternatively, attempt has also been made to estimate the impact of excess liquidity on commodity price using Structural VAR with stochastic volatility model proposed by Primiceri (2005). A brief write-up on the methodology of TVP-VAR is given in Annex-I. The model consist of the variables output, commodity price, equity price and global excess liquidity. The model has been formulated as – output will be impacted by all other variables with a lag only. Commodity price is impacted by output contemporaneously. Equity price is assumed to be contemporaneously impacted by output and commodity price, while global excess liquidity is assumed to have been impacted by all the other three variables contemporaneously. One major advantage of the TVP-VAR methodology is its ability to measure the impact of shocks given to a variable on other variables at different time points. Accordingly, the impact of excess liquidity on commodity price has been presented at three time point viz. February 2001, September 2005 and August 2009. The last time point presents the impact of excess liquidity on commodity price after the financial crisis of 2008.

Chart-13, Chart-14 and Chart-15 presents the impulse response function of M1 based global excess liquidity on CRB commodity price during February 2001, September 2005 and August 2009 respectively. The thick line indicates the posterior mean of responses to shocks given to excess liquidity. The two dotted lines present the response of the 85th and 15th percentile of shocks given to excess liquidity on commodity price.

It is observed that a shock given to excess liquidity during February 2001 leads to an increase in the commodity price and reach its peak after three months and then starts decline gradually. As against this, a shock given during September 2005, leads to an increase in the commodity price from the second month and sustain the peak between the third to the fifth month. However, a shock given in August 2009 is found to be sharper and reach the peak after three months.

Chart-16 presents the sum of the coefficients of the excess liquidity on commodity price. From the chart it can be observed that the impact of excess liquidity on the commodity price has gone up since the mid of 2005 and remained flat since 2010 onwards.

Chart 13

Impulse Response Function of Commodity Prices (CRB) to Excess Liquidity (M1) in Feb-2001

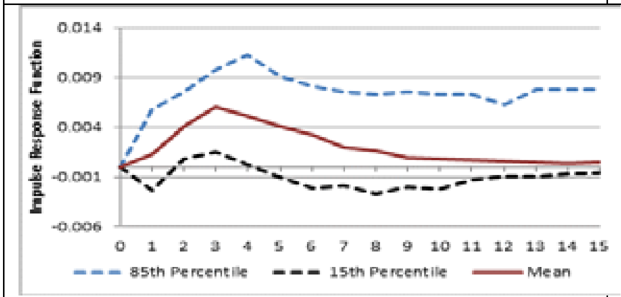


Chart 14

Impulse Response Function of Commodity Prices (CRB) to Excess Liquidity (M1) in Sept-2005

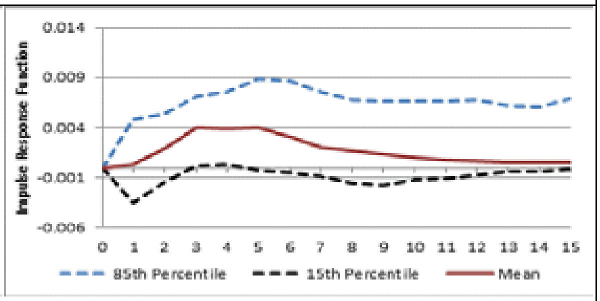


Chart 15

Impulse Response Function of Commodity Prices (CRB) to Excess Liquidity (M1) in Aug-2009

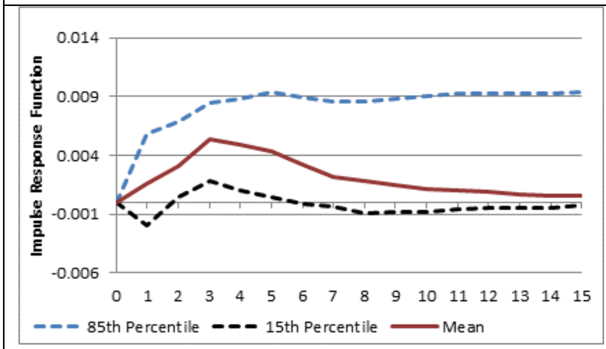


Chart 16

Coefficient of Excess Liquidity (M1) on Commodity Prices (CRB)

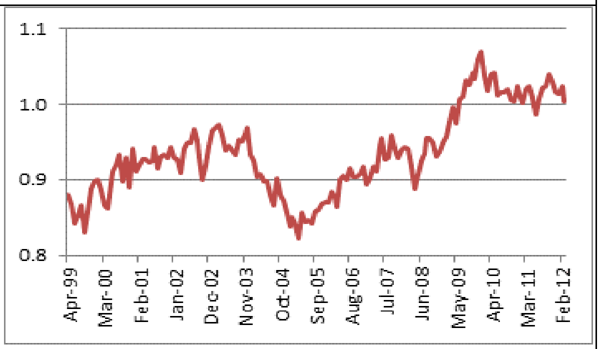


Chart-17, Chart-18 and Chart-19 presents the impulse response function of excess global liquidity, measured using M3, on CRB commodity price during February 2001, September 2005 and August 2009 respectively. Empirically, it has been found that M1 based excess liquidity on CRB commodity price is higher than the M3 based excess liquidity.

Empirically, it has been found that a shock to excess liquidity during February 2001 leads to a fall in the commodity price after one month, while a shock given during September 2005 is found to have no major impact on commodity price till one month and increases slowly thereafter. The impact is found to be more in September 2005 than February 2001. As against this, a shock given to excess liquidity in August 2009 is expected to lead to a sharp increase commodity price immediately. Further the impact during August 2009 is found to be higher than those prior to the financial crisis period of 2008. The maximum impact was observed after three months at all the three time points.

Chart-20 presents the sum of the coefficients of the M3 based excess liquidity on commodity prices. The impact of excess liquidity on the commodity prices has been found to have gone up since the mid of 2005 and thereafter started decline since 2010. The finding of moderation of impact of excess liquidity on commodity prices in the recent period is consistent with those estimated using State Space Model with constant variance in the previous sub-section. Further the impact is found to have been more for M1 based excess liquidity than M3.

Chart 17

Impulse Response Function of Commodity Prices (CRB) to Excess Liquidity (M3) in Feb-2001

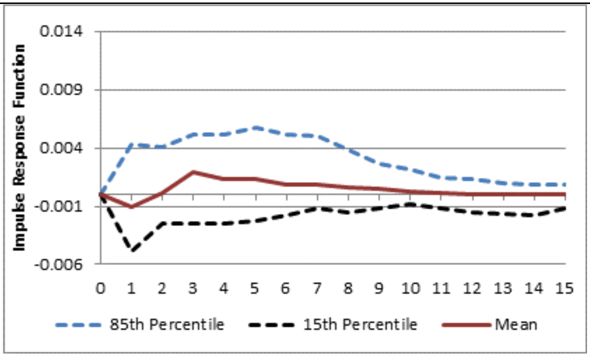


Chart 18

Impulse Response Function of Commodity Prices (CRB) to Excess Liquidity (M3) in Sept-2005

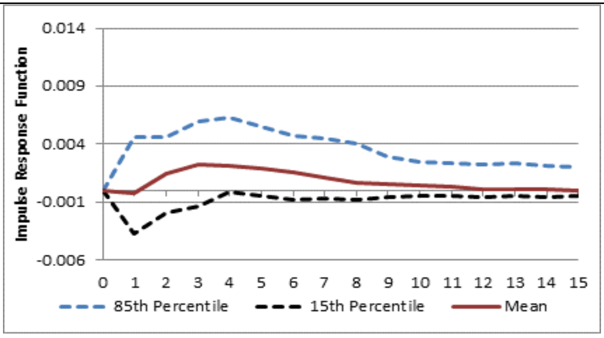


Chart 19

Impulse Response Function of Commodity Prices (CRB) to Excess Liquidity (M3) in Aug-2009

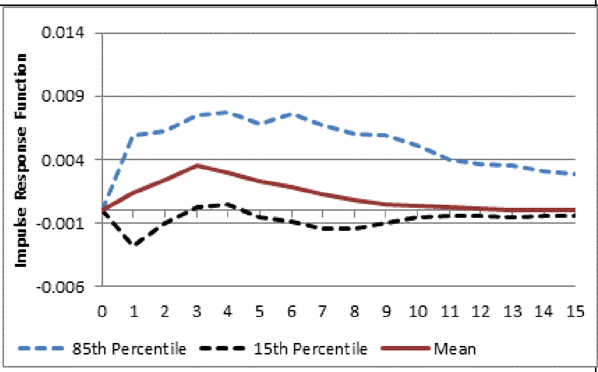


Chart 20

Coefficient of Excess Liquidity (M3) on Commodity Prices (CRB)

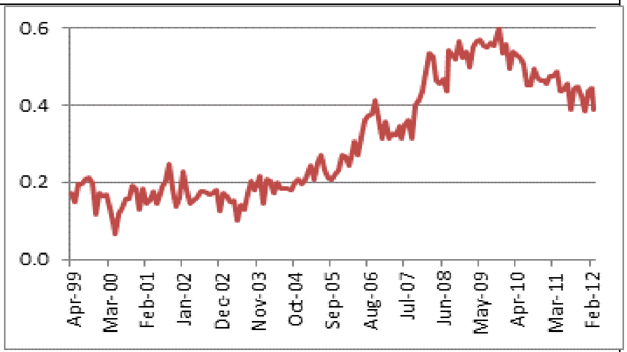


Chart-21, Chart-22 and Chart-23 presents the impulse response function of M1 based excess liquidityon IMF commodity price during February 2001, September 2005 and August 2009 respectively. The impulse response function indicates that a shock given in August 2009 to excess liquidity on commodity price is sharper and higher than the previous two time points.

Chart-24 presents the sum of the coefficients of the M1 based excess liquidity on IMF commodity price. The impact of excess liquidity on the commodity prices has been found to have gone up since the mid of 2005. The finding is found to have been in consistent with CRB commodity price.

Chart 21

Impulse Response Function of Commodity Prices (IMF) to Excess Liquidity (M1) in Feb-2001

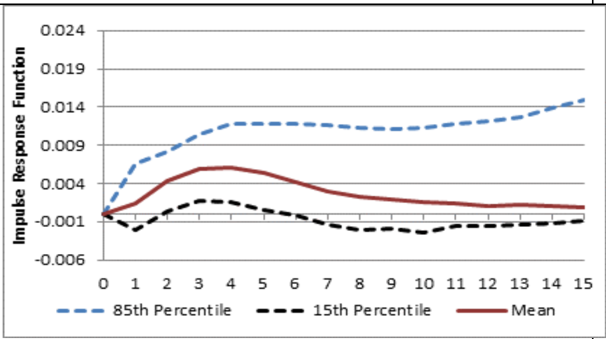


Chart 22

Impulse Response Function of Commodity Prices (IMF) to Excess Liquidity (M1) Sept-2005

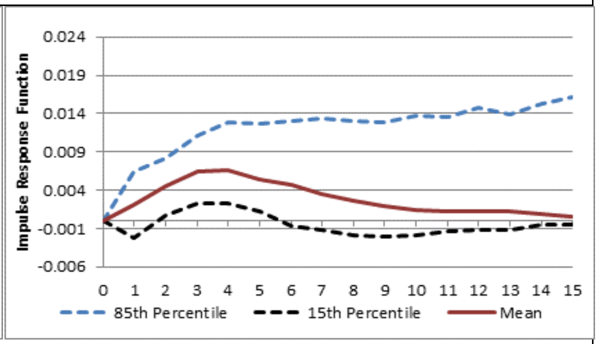


Chart 23

Impulse Response Function of Commodity Prices (IMF) to Excess Liquidity (M1) Aug-2009

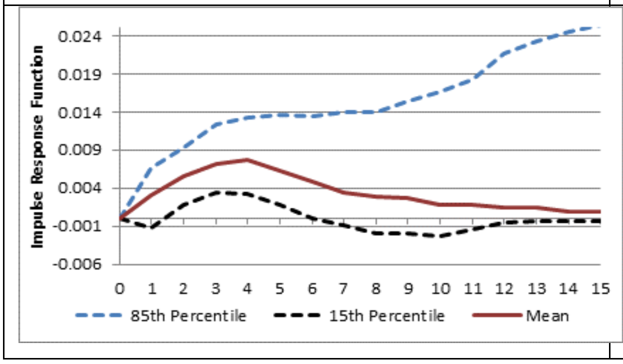


Chart 24

Coefficient of Excess Liquidity (M1) on Commodity Prices (IMF)

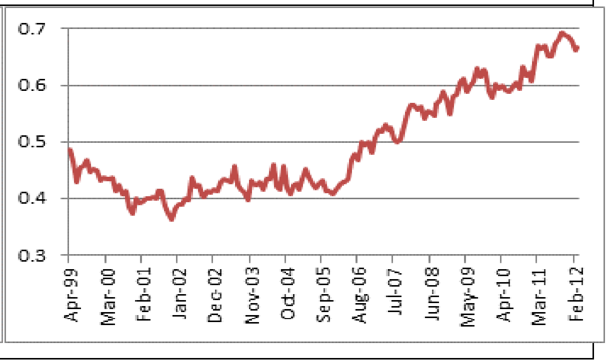


Chart-25 to Chart-27 presents the impulses response function of M3 based excess liquidity on IMF commodity prices for the same three time points. The impulse response function indicates that a shock given to M3 based excess liquidity on IMF commodity price is sharper and higher than the previous two time points. A shock given in February 2001 is expected to lead to an increase in commodity price at a slower rate than at the other two time points. Further, empirically it has been found that a shock to M1 based excess liquidity will have more impact on IMF commodity price than M3 based excess liquidity.

Chart-28 presents the impact of M3 based excess liquidity on IMF commodity price. It is observed that the impact of excess liquidity on commodity price has gone up since 2005 and remained firm since 2010.

Chart 25

Impulse Response Function of Commodity Prices (IMF) to Excess Liquidity (M3) in Feb-2001

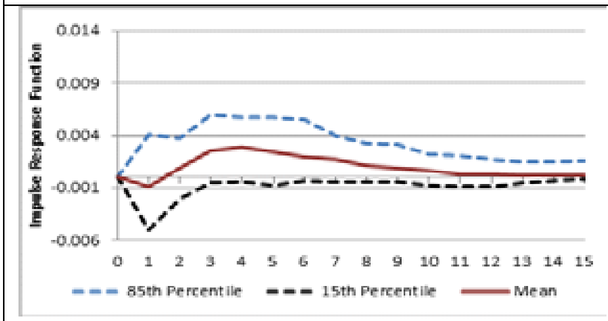


Chart 26

Impulse Response Function of Commodity Prices (IMF) to Excess Liquidity (M3) in Sept-2005

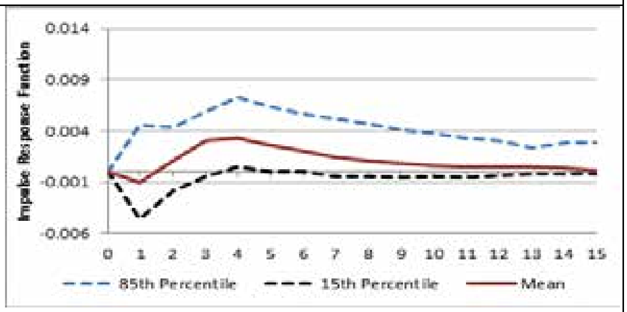


Chart 27

Impulse Response Function of Commodity Prices (IMF) to Excess Liquidity (M3) in Aug-2009

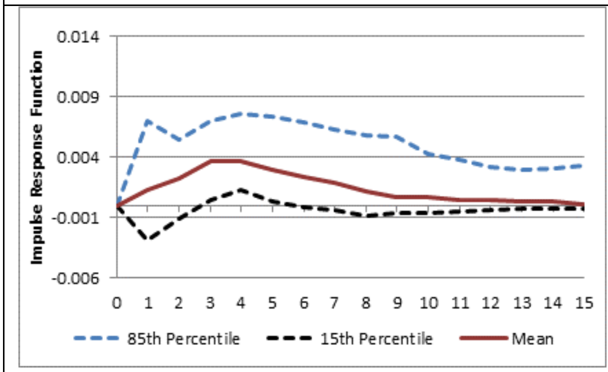
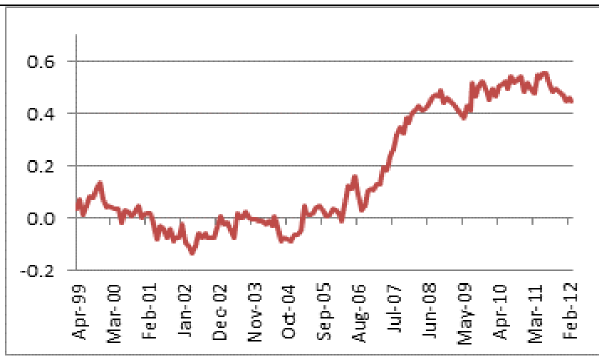


Chart 28

Coefficient of Excess Liquidity (M3) on Commodity Prices (IMF)



7. Conclusions

In the recent time, the international commodity prices have experienced large fluctuations. Steep rise in commodity prices were observed till the financial crisis of 2008 and was followed by a sharp decline during the peak of the financial crisis. Since the early 2009, prices of major groups of commodities rose at a historically high level. Alternative views exist regarding the drivers of the commodity price developments. One view attributes the fundamental demand-supply factors while the other view attributes financialisation of commodities as the drivers of commodity price. In this background, this paper tries to explore whether global liquidity has a role in driving the commodity prices and also to test whether the speed of impact has changed post financial crisis of 2008. For empirical analysis, this paper uses the Time Varying Structural VAR- with Stochastic Volatility (TVP-VAR) to measure the impact of global excess liquidity on commodity prices. The estimates of TVP-VAR have been compared with the Simple Structural VAR and State Space Model assuming constant volatility. Empirical analysis suggests excess global monetary liquidity plays a significant role in explaining surge in both spot and future commodity prices. Excess liquidity, measured using M1 has been found to have more impact on commodity prices than M3. Further impact of shocks given to excess liquidity on commodity prices has also been found to have been sharper and higher post financial crisis of 2008 than the pre-crisis period. Also, empirically it has been found that, the impact of excess liquidity on commodity prices has gone up since 2005. The impact of M1 based excess liquidity on IMF commodity prices have found be increasing throughout the sample period while those of M3 based excess liquidity have been remained firm at the same level since 2010. As against this, the impact of M1 based excess liquidity on Reuter-Jeffery CRB commodity price has remained at the same level since 2010, while M3 based excess liquidity has declined since 2010.

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Commercial property prices: what should be measured?

Sebastian Keiler[1, 2]

1. Introduction and motivation

The real estate sector plays a major role for the real economy, the financial system, financial stability and not least the monetary transmission process. However, unlike the case of residential property, official data on commercial property markets is hardly available. This asset class is usually defined through the generation of an income stream from its possession. The focus is thus more investment-oriented than in the case of owner-occupied residential property. Commercial objects are frequently categorised by their main forms of usage. Common clusters include: office property, retail property, industrial property and – if developed for commercial purposes – residential property. Roughly 34% of all fixed assets of German non-financial corporations were classified as real estate in 2009 (Deutsche Bundesbank 2011). Naturally, commercial property often serves as collateral; around 50% of all loans in Germany are secured by mortgages.[3] According to BulwienGesa AG, a German real estate consulting firm, total market value of commercial property accounted for over €2.1 trillion in 2009 – almost the same size as the economy's activity in terms of gross domestic product at current prices. At €960 billion, retail and office properties correspond to roughly 45% of total commercial property value. The largest share is represented by industrial real estate amounting to €1.1 trillion.

The IMF included commercial property prices in its Financial Soundness Indicator set (IMF 2006). In spite of this, due to limited data availability and methodological difficulties, indicators on commercial property have hardly been published yet. The IMF and the Financial Stability Board brought up this issue again in their report on the financial crisis and information gaps to the G-20 finance ministers and central bank governors and recommended the collection of price indicators on commercial property (FSB 2009). As one result, an international conference on commercial property price indicators was jointly organised by the BIS, the ECB, Eurostat, the IMF and the OECD in June 2012 (ECB 2012). Eurostat envisaged the compilation of a "Handbook on Commercial Property Price Indicators"; with the intention of defining the methodological framework for reconciling the efforts towards an indicator set at an international level, in order to eventually bridge the data gap.

This paper argues that, despite the quest for swiftly disseminated indicators, it is of utmost importance to set up a valid and reliable methodological framework first. The various data users make substantially different demands on the index concepts. These, in turn, need to be tailored for the distinctive purposes. In what follows, different approaches to the measurement of commercial property prices are presented. Furthermore, the paper seeks to

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[2] This paper represents the author's personal opinions and does not necessarily reflect the views of the Deutsche Bundesbank or its staff. The author would like to thank Jens Mehrhoff for valuable comments. All remaining errors are, of course, the author's sole responsibility.

[3] The ratio is calculated as mortgage loans by banks in Germany to domestic non-financial enterprises and households over total lending.

outline the operationalisation of the theoretical framework. Available price indicators for Germany are discussed and classified according to statistical criteria in a separate section. Selected data uses are briefly reviewed thereafter. The final section concludes and outlines the challenges ahead.

2. Measurement aims

A (commercial) property is a bundle of goods. To determine its value, one can take different vantage points (Rosen 1974). From a producer's perspective, the property value is driven by the costs of purchasing the land and building the structure on that lot. From a purchaser's view, the value of a property is the sum of his willingness to pay for each component, i.e. the land and the structure. From a commercial bank's view, properties are valued as collateral in order to reduce credit risk. Various professions and stakeholders observe real estate. The perspectives vary and, therefore, property price indices need to be tailored to the needs of data users. First, however, it is necessary to analyse the composition of real estate prices and possible indices derived from a land-structure split and the decomposition of values into price and volume components.

2.1 Land-structure split

At the beginning we concentrate on two main components of any (commercial) real estate. A developed property's value is determined by the cost of the land and the cost of the structure – the building itself. For example for the purpose of National Accounts, land values are commonly excluded since land does not represent a produced asset (Lequiller and Blades 2006). Hence, a land-structure split as in Equation (1) is applied.

$$\text{Property value} = \text{Land value} + \text{Structure value} \quad (1)$$

Values of land and structures are driven by various factors and types of use. To begin with, indicators based on the value of land are largely governed by location characteristics. A specific lot obtains its value from various determinants such as the proximity to the city centre, the economic structure of the surrounding area or its shape and size (Özdilek 2011). In comparison, the value of the structure is defined by the costs of producing the characteristics such as office and retail space, technical facilities or logistic areas.

However, both components are rather difficult to separate in practice. The value of commercial property is determined by the (expected) income stream, i.e. the sum of the discounted cash flow of the rents. Should this approach be applied to the structure value one ignores that rents, too, are driven by location. Hence, a structure value thus determined will also be influenced by land-specific characteristics. The issue of whether or not the land value should be part of an index has also been addressed for owner-occupied housing as well (Eurostat 2011a).

In order to answer the question for the measurement aim, “what should be measured?”, and to categorise available information on commercial property into a statistical framework, it is not enough to differentiate between the land and the structure value. In fact, it is necessary to reconsider implications from index theory for discriminating sharply between the value, the price, the volume and the quantity of commercial property.

2.2 Components of an index

The market value provides a nominal measure for commercial property. In what follows values might refer to those of structure and land, respectively, or both, i.e. the whole property. If quantities (floor space or lot size in square metres, say) are available, dividing the value in euro by that quantity yields a so-called unit value in euro per square metre. Thus, the value can be split up as follows:

Value = Unit value × Quantity. (2a)

However, the unit value in Equation (2a) depends on the quality of the building and not just on floor space, or the location of the lot and not only its size. Since price indices aim for a quality-adjusted indicator prices here denote a constant quality numéraire.[4] As will be discussed at great length in the next section, it is possible to decompose the value into a constant-quality price and a volume measure that inherits quality changes:[5]

Value = Price × Volume. (2b)

Therefore, an index for property prices in its pure form will reflect movements in prices that are stripped of quality changes. The latter are included in the volume as shown in Equation (2b). Eventually, the ultimate statistical goal is splitting up the value into a quality-adjusted price, the quality component itself and a quantity measure independent of quality.

$$\text{Value} = \underbrace{\text{Price} \times \overbrace{\text{Quality}}_{\text{Unit value}} \times \text{Quantity}}^{\text{Volume}} \tag{2c}$$

Following Equation (2c), the value is obtained via multiplying the constant-quality price of a unit by a dimensionless mark-up (or mark-down) for the desired level of quality and the nominal quantity of the structure or the land. This mark-up can reflect characteristics such as the age of the building or its year of construction.

2.3 Aggregation of values and prices

So far the basic components of a specific property's value (land and structure on the one hand; price, quality and quantity on the other) have been introduced. The next step towards the compilation of an index is the aggregation of values and their (price) components. The first half of this process is described in Equation (3). For each time period t, the summation runs over the distinct properties i.

$$\sum_{i \in I} \text{Value}_i^t = \sum_{i \in I} \text{Price}_i^t \times \text{Quality}_i^t \times \text{Quantity}_i^t \tag{3}$$

This sum can be calculated over two different populations, denoted by the index set I in the equation. Firstly, this is the building stock, i.e. all commercial properties in an economy are at the centre of interest. Secondly, building flows, i.e. transactions of newly built, or used and transferred commercial property, may be relevant for market analysis. The distinction between the two is essential. While flows tend to better depict market activity and movements, stock-based figures reflect the endowment of the economy with commercial property. In a stringent system of accounting the nominal stock at the beginning of the period plus the net flow in this period yield the stock at the beginning of the subsequent period. In order to obtain such equality, gross flows need to be adjusted for depreciation or demolition of buildings, and for appreciation, i.e. renovations.

Then again, changes in nominal values of either the stock or flows are not the same as changes in real terms. The difference is the price component – the second half of the

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4 Valuers, however, have a different notation of the terms used in official statistics. The Royal Institution of Chartered Surveyors, for example, makes the following distinction between values and prices (RICS, 1997): Where the value indicates an estimate of the obtainable price in the event of a transaction, the price reflects the actually observed amount of money at the time of the transaction.

5 At a given point in time, constant quality means some sort of average quality at a building level. For intertemporal price comparisons, this means that the quality of a particular building is held constant.

aggregation process. Yet the construction of the price index at the aggregate level from individual data depends on its use. A Paasche-type price index will be the appropriate measure for deflating value aggregates yielding Laspeyres-type volume measure, e.g. in National Accounts in Europe (in the framework of chain indices). In spite of this, a Laspeyres-type price index, as displayed in Equation (4), is more appropriate for analysing "pure" price developments (European Commission 1995). Therefore, and in line with other statistical price indices, a CPPI should adequately follow this method.

$$P_L = \sum_{i \in I} (p_i^1 / p_i^0) \times w_i^0 , \sum_{i \in I} w_i^0 = 1 \quad (4)$$

The choice of what should be used for weighting price information (the w's) has to be governed by the actual application of the index. Transactions at market values can serve as weights for a price index based on flows in order to reflect market movements across regions, say. Transaction-weighted indices place a higher weight on more liquid markets. Weights derived from economic activity such as regional income or output figures can step in if information on transactions is not provided in sufficient detail. In contrast, for price indices relating to the building stock weights linked to the nominal stock or the number of enterprises (in absence of precise data on the stock) will generally be more appropriate.

The observation of values and prices generally yields different results. The change in market values between two consecutive periods does not necessarily reflect the pure, i.e. quality-adjusted, change in prices. It is rather a mixtum compositum of quality changes due to depreciation and renovation as well as the quality-adjusted change in prices; if quantities remain the same. Let, for example, the population be equal in the two periods under consideration. Due to depreciation the quality of all buildings will be lower on average. Ceteris paribus, it follows that in such a situation values decrease although quality-adjusted prices have remained constant. The concepts developed in this section are summarised in Table 1.

Table 1

Different aggregates and the respective uses

Measurement aim	Aggregate type	Use for the concept
Value	Transaction-based	Nominal wealth traded on the market
	Stock-based	Nominal wealth in the whole economy
Price	Transaction-based	Pure price movements
		Deflation
	Stock-based	Pure price movements
		Deflation
Volume	Transaction-based	Real wealth traded on the market
	Stock-based	Real wealth in the whole economy
Quantity	Transaction-based	Number of transactions
	Stock-based	Physical stock of the economy

As commercial property is even more heterogeneous than residential property, say, the observation of prices for identical items – independent of any quality change – is hardly possible if at all. Therefore, in order to operationalise measurement, statistics are in need of alternatives, particularly, quality adjustment methods. These concepts are described below.

3. Operationalisation methods

In order to measure price developments, it would be ideal if the whole building stock in an economy were transacted in an (information) efficient market once in each period at a constant quality (without depreciation or renovation) and prices for the structure and land were reported separately. Due to the segmentation, the degree of heterogeneity and complexity, a lack of transparency and non-fungibility of real estate it is hardly possible to obtain reliable measures for the value and the price (Geltner et al. 2007). Therefore, this section first turns to the issue of obtaining a constant-quality price index. The discussion then addresses the problem of obtaining a value for land (or, at least, how to adjust for land characteristics). Last, the problem of unobservable prices for the building stock and in the case of illiquid markets is discussed.

The academic literature offers a broad variety of treatments on the matter of constant-quality prices (Malpezzi 2008). The most common quality adjustment methods include stratification, the repeat-sales method and hedonic regressions. Where stratification methods measure price movements within comparable strata under the assumption that within these groups qualities remain constant, the repeat-sales method measures price changes between two consecutive sales of the same objects. Hedonic regressions build upon the perception that a property consists of various characteristics (see the discussion in the previous section) which are measurable and that these carry implicit prices. Then, the value V is a function of the price p, several quality characteristics C, and the quantity q (to reiterate, these are the components of the value defined earlier):

$$V = f(p, C, q). \tag{5}$$

Provided building values along with certain characteristics are obtainable, Equation (5) can be estimated and will provide quality-adjusted prices. However, land values are in general not available for whole properties and land will only seldom be transacted in certain regions. In such a case, valuation-based estimates can be drawn on. A valuer's assessment of a building should, at least theoretically, yield a market price. Certainly, for the case of land values, it is hard to obtain reliable assessments since comparables are rare. Additionally, indices constructed from valuations tend to be smoothed and lagged compared to those based on transaction prices (Geltner 1991). This has consequences for data users as risk management concepts, for example, are heavily founded on volatility measures.

Property values are decomposed into the main drivers for land and for the structure by applying a land-structure split. We therefore build upon the above exposition and split the (observed) property values into land values V^L and structure values V^S. The characteristics in Equation (6) strictly separate between location-specific aspects that pertain to the land and structure-specific aspects that pertain to the building itself (Eurostat 2011).

$$V = V^L + V^S = f(p^L, C^L, q^L, p^S, C^S, q^S) \tag{6}$$

However, values for existing buildings are only available for the small part of the stock that is transacted in a period. What is more, just a fraction of these transferred objects will be observed. Therefore, it is necessary to either impute from the transactions at hand to the whole stock and the entire flows or, again, rely on valuations. Still, in order to impute from samples (of size n) detailed information on the population (of size N) must be available. Only this way can the estimated values be used for drawing conclusions on the whole stock or all transactions. The nominal value of the building stock and flows is then estimated in Equation (7) as the sum of observed and estimated values.

$$V = \sum_{i=1}^{n} V_i + \sum_{j=n+1}^{N} \hat{V}_j \qquad (7)$$

The reliability of market aggregates may be assessed from the liquidity of the market measured by the number of transactions. Obtaining aggregates for illiquid markets is a major challenge. Illiquid or small markets have few or close to no transactions (depending on the length of the period deemed as appropriate). Hence, observation of trustworthy market values is very problematic. In any case, illiquid markets are more susceptible to biases from structural effects and to an increased volatility due to random shocks. For liquid markets it is more likely that the latter cancel out while structural effects receive lesser weight because of the increased number of transactions. Then again, valuations may be suitable to fill the gap for illiquid markets – similar to the situation for the building stock.

4. Sources

The conceptual approach provided in the previous sections is confronted in practice with available data sources. Data on commercial real estate is rather sparse and hardly available for some property types such as industrial property. This section seeks to classify the data provider's approaches within the taxonomy derived in sections 2 and 3. A straightforward categorisation is not always feasible since methodology for some indices is not disclosed and the terminology differs between official statistics and real estate professionals.

For Germany, three index providers publish data at a national level. BulwienGesa AG, a German real estate consulting firm, builds upon various data sources such as media coverage, valuers and brokers. A second index is provided by vdp, the association of German mortgage banks. They compile indices from transaction data enclosed to credit applications. Investment Property Databank (IPD) delivers so-called performance indices from data supplied to their data base by institutional investors. The index approaches differ across the firms and the nomenclature used cannot be seamlessly integrated into the concepts discussed in section 2.

To begin with, vdp provides an index with a hedonic quality adjustment which is labelled as capital value index. In the terminology of official statistics, however, it could be treated as a price index. BulwienGesa AG offers data on capital values from a stratified sample. Therefore, this indicator can also be compared to a constant-quality price index. Unfortunately, the weighting schemes are not fully disclosed and the weighting methodology cannot be classified into a standard framework. IPD compiles the indicator in its current form from their data base with a changing composition via chaining and no quality adjustment. Sticking to the methodology developed above this resembles an index for values but from an arbitrary sample. Table 2 summarises the three data providers along with the main attributes of the respective indices.

Table 2

Data providers in Germany and the characteristics of their aggregates

	BulwienGesa AG	vdp	IPD
Provider's label	German Property Index	Capital value index	Capital Growth Index
Coverage	125 cities	Germany, roughly 40% of market value	Germany, roughly 14% of market value
Quality adjustment	Stratification	Hedonic	None
Property types	Office, residential, industry, retail	Office, residential (upcoming), retail (upcoming)	Office, residential, industry, retail
Aggregation	Weighted average over regions	Not applicable[a)]	Unweighted average of sample
Frequency	Annual	Annual/quarterly	Annual
Time series start	1991	2003/2008	1995
Timeliness	t-15 days	t+40 days	t+90 days
Transparency	Limited	Higher	Lower
Origin of data	Various sources[b)]	Transactions	Valuations
Classification	Constant-quality price index type	Constant-quality price index type	Nominal value index type

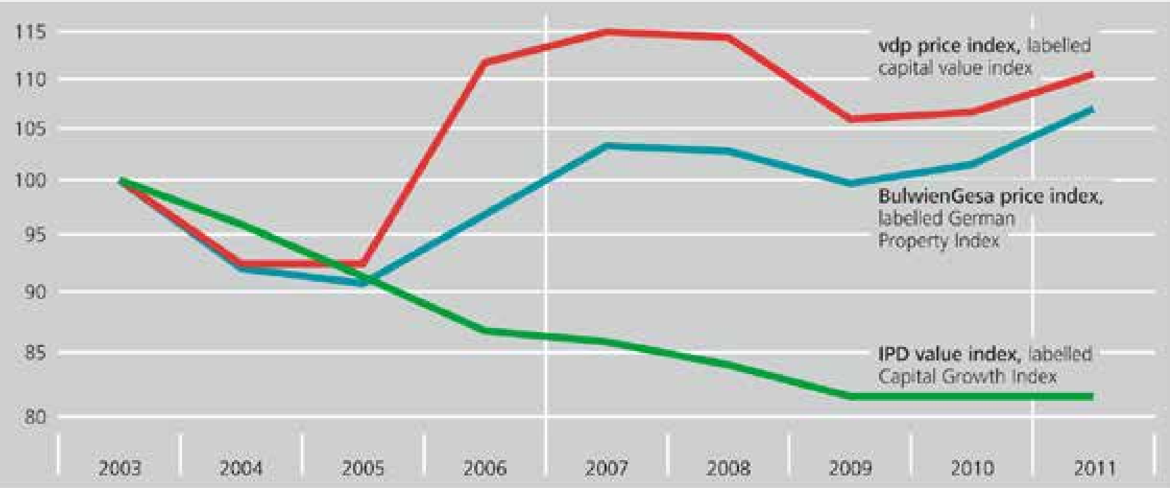
a) The indices are constructed from time dummies. This method does not rely on weighting schemes and aggregation.

b) BulwienGesa AG uses various sources such as media coverage, market reports, valuers, internet platforms and others.

Thus, all three indices vary inter alia in market coverage and origin of data. Furthermore, all providers construct their indices in a different way. In order to inspect the differences between the index construction types further, Figure 1 depicts the three annual indices for office properties. Regarding growth rates, the BulwienGesa AG price indicator and the vdp time series show the same sign of change in almost every year over the whole 2003-2011 period. However, during 2006, for example, the BulwienGesa AG time series still shows an upswing, while vdp figures flatten. Also the absolute magnitude of vdp growth rates often exceeds those reported by BulwienGesa AG. The IPD index on a changing portfolio, in comparison, shows a steady decline up to 2011. The diversity in operationalisation complicates the comparison, particularly between IPD on the one hand and BulwienGesa AG and vdp on the other. Price indices by BulwienGesa AG and vdp have an inherently different interpretation than IPD's value index. Due to depreciation without renovation, nominal values from a constant sample are prone to show negative rates of change on average. In contrast, price indices are not determined by age effects. This mechanism may help exploring the patterns observed in the figure. Furthermore, the results emphasise the importance of index construction methodology.

Price and value indices for office property in Germany

2003 = 100, annual data, log scale



Sources: BulwienGesa AG, IPD and vdp.
Deutsche Bundesbank

S3IN0241.Chart

A valuable source, though with less detailed data, is provided by the National Accounts. National wealth accounts in Germany provide data on the nominal and real building stock at replacement costs (Schmalwasser and Schidlowski 2006). By applying the perpetual inventory method, the net stock at the beginning of the period is obtained as the sum of the net stock from the beginning of the period before and the net fixed capital formation during this period. National wealth accounts offer data on the gross and net stock of dwellings and other buildings and structures. This source, therefore, does not allow a breakdown into types of usage. Aggregates include forms of usage such as undeveloped land and property holders (e.g. the public sector) that may not be in the main focus of a CPPI.

5. Selected data uses

Data analysts eventually have to choose the most suitable aggregate by purpose of their research. Nominal aggregates – such as aggregated values – are probably best for comparison with other figures in current prices. Nominal stock may best be compared to other economies at this level. Loan-to-value measures will be most appropriately calculated in nominal terms since loans are secured with buildings at market values. The nature of nominal values proposes the use of these figures for users such as banking supervisors. An economy's real wealth will be reflected with volume measures since these depict building values adjusted for price effects. Price developments are naturally reflected in the constant-quality price component. Constant-quality price indices will most probably be used by monetary transmission analysts in order to obtain pure price changes. The challenge of separating fundamentally justified changes in prices from price bubbles is key for financial stability.

6. Conclusion

It has become evident that different uses (e.g. monetary transmission analysis or banking supervision, National Accounts and Financial Accounts) require different data (unit value indices, nominal stocks, pure price indices). The question for the measurement aim matters greatly. Substantially different market movements are observed for Germany depending on whether prices or values are analysed (both are confusingly termed capital values by commercial data providers). Growth rates between 5% and 10% or declines of over -15% over an eight year period up to 2011 are currently being reported. In such a surrounding, statistics need to appropriately classify and describe existing indicators offered by real estate professionals. The detailed description of metadata enables data users to make informed choices on the most suitable indicator for the respective analysis.

For international comparisons a stock-taking of existing sources and a classification according to common terms from index theory (price, unit value, value, volume) would be useful. Based on this inventory of indicators international aggregates can be calculated in the future. In conjunction with further information on statistical quality (coverage and the like) it might be possible to describe these indicators along with the relevant metadata. Testing the time series and comparing their features e.g. with macroeconomic developments is indispensable. All in all, there is still a lot of hard work to do for statisticians in this field, but the way forward seems promising.

Annex 1:
Origin of data

IPD data

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vdp data

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Measuring the commercial property prices in Italy: a first evidence from a transaction based approach

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After reviewing the main features of the commercial property market in Italy and the main sources of statistics about cyclical developments in its single sectors, we provide a first indicator of the commercial property prices based on a transaction approach. In particular we integrate several pieces of evidence on prices actually paid to transfer property of different commercial properties in order to obtain a quarterly indicator covering the period since 1995Q1. In a preliminary validation exercise, we put forward a basic analysis of the cyclical patterns of our indicator compared with developments observed in Italy in both the residential property market and in the general economy.

1. Introduction

Over recent years there has been an increasing interest in the academic, institutional and market analyst community to monitor the developments of the commercial property markets for manifold reasons. In the first place, like the residential units the commercial premises show a key role as collateral in the provision of funds by financial intermediaries, thus enhancing the interdependence between the real and financial sectors at the macro level. From this standpoint, both aggregate cycles and financial stability conditions may be heavily affected by the developments in the real estate sector. The correlation among the two economic pillars has apparently increased over time, and it shows up even stronger during the episodes of financial crisis.

In the second place, unlike residential property, which enters the households' utility function as it provides accommodation to its owners, thus receiving an intrinsic reservation value, the price of commercial property is mostly determined by the expected value of future rents. Accordingly, the demand for commercial property is more likely to be affected by the business environment and economic confidence. In addition to some specific characteristics of the commercial compared with the residential property (such as longer construction lags, longer leases and different funding methods), this aspect may cause distinct cyclical behaviour in the two segments of the real estate market, as well as different channels to interact with the financial system and the real economy (ECB, 2000; Davies and Zhu, 2005, Panetta et al. 2010).

In the third place, banks may play a larger role in the financing of commercial than the residential real estate, as they lend for the purchase of land for development and existing buildings, they finance construction projects; they lend non-financial firms based on real estate collateral; moreover the cross border holding of commercial assets by banks is by large higher compared with residential assets, showing an increasing pattern in recent years. As a consequence, a declining trend in commercial prices may exert stronger and more geographically widespread effects on the macroeconomic dynamics and the stability conditions of the financial system.

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Despite the increasing importance in the theoretical analysis, empirical evidence about the role of the commercial property in affecting macroeconomic developments is traditionally scarce due to the limited availability of data on both prices and numbers of transactions. Focusing on European countries, where the information gaps were initially very large regarding the real estate sector as a whole, some important statistical progresses have been recently achieved about the residential property, with the dissemination of quarterly data on house prices to be eventually started by early 2013 by most countries based on a harmonized methodology agreed within Eurostat. However data remain pretty scarce for the non-residential sector, whose delineation is even controversial in official statistics due to the changing coverage across countries of prices, the number of transactions and the stock size in the different segments of the commercial property (e.g. retail, industrial, and office units).

In this framework, a larger use of price indicators of the commercial property has been included in the 20 recommendations listed in a joint report by the Financial Stability Board and the IMF to the G20 (2009), in order to enhance the ability to assess the world cyclical developments and financial stability. As recalled in the conclusions of the joint ECB and Eurostat Conference on commercial property prices indicators held in Frankfurt in May 2012, a first step is to exploit the mass of information that can be gathered from commercial data providers, albeit it is based on different sources, coverage and methodology across countries and regions.

Indeed most commercial property price indicators that are currently available are based on a valuation approach, as they deliver an estimate of the asset value in line with finance models but with possible deviations from the prices actually paid in transactions. From the one side the valuation approach allows to overcome the low liquidity issue of the commercial property that may bias the measurement of market prices, even more so during financial crisis when the number of transactions dramatically declines. From the other side, valuation based indicators are highly dependent on the domestic regulatory frameworks, and they hardly deals with the granularity of the commercial property markets, whose pattern may vary a lot over time; in addition, they may suffer from a delayed detection of the cyclical turning points in the commercial property markets (Geltner, 2012). Ideally, the indicators based on actual prices paid in transactions would closely match the users requirements regarding the analysis of the commercial property, but their compilation currently proves very challenging from the producers' standpoint due to the lack of basic information. This could call for an urgent investigation regarding all candidate sources of data, primarily in the administrative domain, in order to pave the way for an early compilation of transaction based price indicators.

This paper puts forward experimental estimates of commercial property prices in Italy based on the transaction approach. For this purpose we exploit a variety of data provided by private organizations and Government agencies, that we combine to retrieve quarterly price indicators covering a relatively long time horizon (since 1995), suitable for analysing cyclical patterns of the commercial property market in Italy, and understanding the main determinants.

Following a brief sketch in Section 2 of the main features of the Italian commercial property market, Section 3 reviews the most important data providers in Italy, by comparing the different sources, methodologies, time and market segment coverage. In Section 4 the compilation strategy of experimental data is presented in details, and a preliminary validation of the ensuing price indicators is discussed in Section 5. A summary of main results and themes for future research concludes.

2. Main features of the Italian commercial property market

According to data released by Agenzia del Territorio, the government agency dealing with the real estate sector, in 2011 the total construction stock in Italy was around 63 billions of units, or 2.3 per cent higher than the figure registered in the previous year. The largest share was made by the residential units that stand for around 85 per cent of the total if box, cellars and the alike are considered (Table 1). Within the non-residential buildings, those used for office, retail and industrial destination proxy as a whole 7 per cent of total stock, with the largest number referring to the office units. An additional share of around 5 per cent of total stock is made of an heterogeneous aggregate of non-residential buildings, such as hospitals, schools, spa, gyms, for which statistics are however much less systematic and reliable. Accordingly, these units are not included in the delineation of the commercial property market considered in this paper.

Table 1

Stock and transactions of construction units in Italy - 2011

(thousands of units where not otherwise specified)

Destination of use	*Stock* (A)	*% shares*	*Transactions* (B)	*% shares*	*Turnover* (B/A)
Residential	**33,174**	**52.7**	**598**	**45.3**	**1.8%**
Box, cellars and others	**22,196**	**35.3**	**477**	**36.1**	**2.1%**
Office	**652**	**1.0**	**14**	**1.1**	**2.1%**
Retail	**2,800**	**4.4**	**35**	**2.6**	**1.2%**
Industrial	**702**	**1.1**	**12**	**0.9**	**1.8%**
Not else classified	**3,415**	**5.4**	**194**	**14.7**	**5.4%**
Total	**62,939**	**100**	**1,321**	**100**	**2.1%**

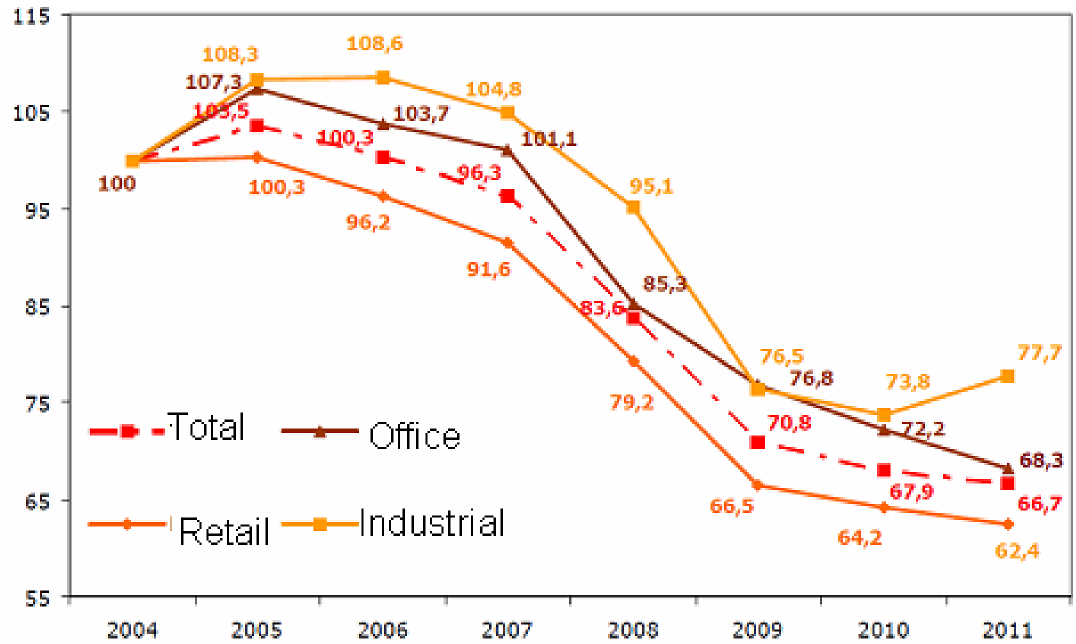
Source: elaborations based on data Agenzia del Territorio and Assilea

In terms of number of transactions, which totaled 1.3 billions in 2011 (–1.9 per cent lower than in 2010), residential units reasonably confirm the highest share (81 per cent of total market), followed by office (2.6 per cent), retail and industrial units (around 1 per cent for each category). Interestingly, the ratio of the number of transactions to stock, a statistics that proxies a turnover index useful to assess the asset liquidity, does not largely differ for non residential units compared with the residential ones, apart from the retail segment. However, it is likely that the official register (Catasto) improperly classifies part of this segment under the “Box cellars and others” as it often happens that some space in residential units are used for commercial destination, mostly in the case of small shops, even more so when they owned by producer households. As this category shows a high turnover index, it is likely that that statistics for the retail property is underestimated when we adopt the official property classification by destination.

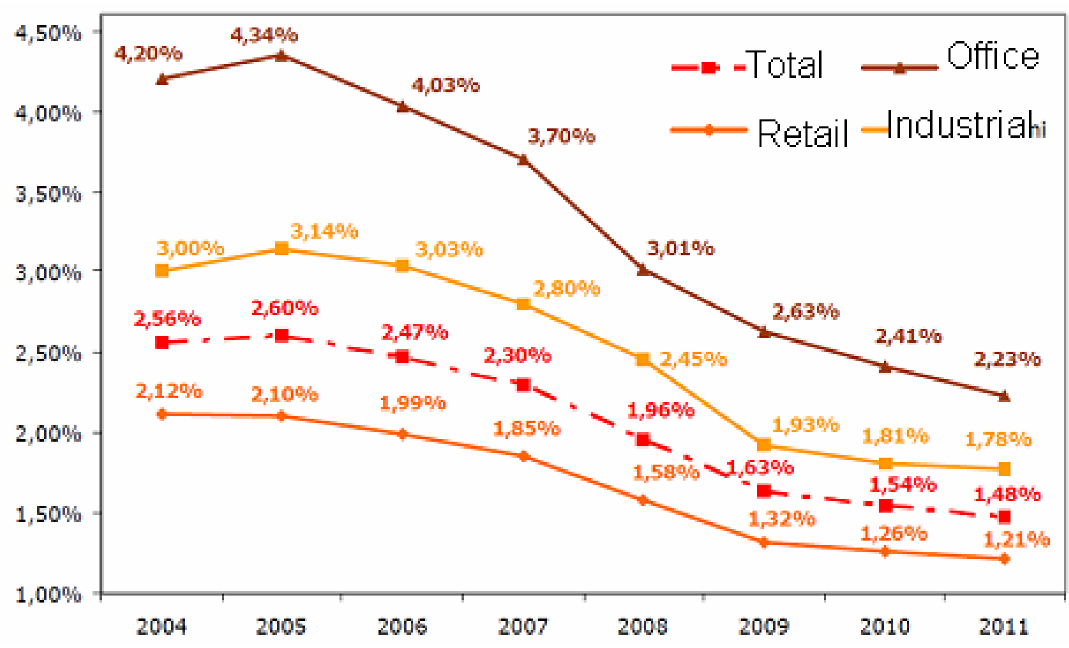
Figure 1

Recent developments on the non residential markets

A. Number of transactions; indices 2004=100



B. Ratio of number of transactions to stock



Source: Agenzia del Territorio and Assilea (2012)

Despite the possible statistical bias affecting the retail sector, it is worth noting that the turnover index reads 1.5 per cent in 2011, a value just marginally lower than in the residential segment. This preliminary evidence may mitigate the risk that adopting a transaction based approach to measure price development in the commercial property could lead to biased result due to the scarce asset liquidity; in particular, such risk may not be dramatically higher compared with the residential property, whose prices are almost unanimously assessed based on market transactions.

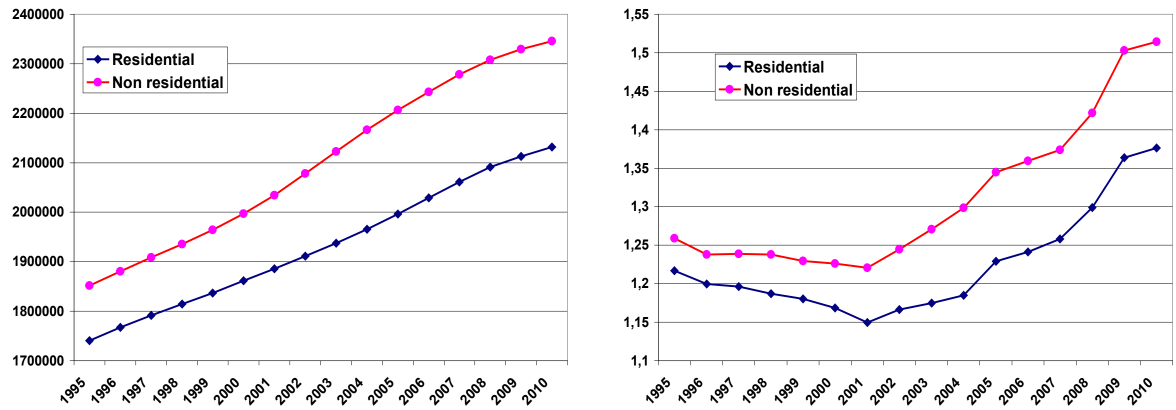
The reassuring picture about the limited liquidity issue affecting the Italian commercial versus the residential property is somewhat reinforced by considering that since 2007 transactions followed a pronounced negative trend for all real property assets (except from a partial recovery recently registered in the industrial segment, following quite a brisk fall; see Figure 1.A), thus pushing the turnover index down to a low in 2011 from 2.5 per cent averaged between 2004 and 2006 (see Figure 1.B). In the same period the average value was 2.8 per cent for the residential property, thus implying that the recent crisis did not cause a widening gap of liquidity of the commercial compared with the residential units.

Turning from the number of units to the value of the construction stock, the size of non-residential property proves larger than the residential assets. Based on national accounts, at the end of 2010 the value of the former was around 235 billions Euros against 215 for the latter; both real property components show a positive trend since mid-nineties, with some acceleration for the non-residential assets (see Figure 2.A). In terms of GDP, at the end of 2010 the value of the stock value exceeded 150 per cent for commercial constructions and was just below 140 for the residential ones; both components marked a clear increase since 2001, when they were close to 122 and 115 per cent of GDP, respectively (Figure 2.b). The large size of the estimated value of commercial property adds interest in compiling reliable indicators to monitor its price developments, hopefully matching the promising progress recently made by the European statistical community in the field of house prices.

Figure 2

Construction stock in national accounts

A. Millions euro (2010 chained values) **B. Percentage Ratios to GDP**



Source: elaborations based on data from Istat and Bank of Italy.

3. Available sources on commercial property prices in Italy

The current picture of statistics about non-residential property prices is very unsatisfying in Italy, as well as in most European countries, even more so concerning data publicly available. For the time being, in Italy there are no official data covering commercial property prices. Some estimates can be obtained by commercial providers based on a valuation approach, but their regular and timely dissemination to the general public is quite restricted due to property rights.

Other data are released by public or private organizations specialized in property transactions both to the subscribers to their reports and, under a reduced scale, to the general public through press conferences. In general, the geographical coverage, the type of property considered, the time horizon, the collection frequency and the sample design of the available data largely differ depending on their sources. In view of our purposes, namely to put forward an experimental indicator of the commercial property prices based on the transaction approach, we can identifies three main sources of basic data. They are two private research institutes (*Nomisma* and *Scenari Immobiliari*) and a government agency (*Agenzia del Territorio*) jointly with *Assilea* (Association of Italian leasing operators). All of them provide some price statistics for commercial property in Italy by mostly using data on actual transactions.

Nomisma collects data on prices actually paid in transactions directly from a sample of real estate agencies; the time horizon starts in the early nineties and covers 13 large municipalities and 13 intermediate ones over all the country. Data are released semi-annually one month after the end of the reference period. *Nomisma* monitors Retail and Office units, providing simple average prices across municipalities for the two kinds of properties in isolation.

Scenari Immobiliari computes average prices based on public advertisements under the assumption that a property is sold when it ceases to be offered, its sale price is estimated by a mathematical model that considers the time it has been on the market and any change in the price (calculated by reference to a single location) during the concerned period.[2] Accordingly, data do not refer to the actual prices reported on transaction contracts, but they are an estimate of the interval within which the selling price may fall. *Scenari Immobiliari* computes average prices since the middle nineties for virtually all province capitals and major non capital municipalities, with a monthly frequency and one month delay with respect to the end of the reference period. Although the basic estimates refer to single components (Retail, Office and Industrial units), as the use destination of a specific unit is not codified and matches the description reported in the public advertisements, price data are publicly available for the sole total commercial property.

Agenzia del Territorio (jointly with *Assilea*) collects data from individual transaction and leasing contracts, and disseminate data virtually covering all the country, but with only a limited coverage of the overall market value. In particular, in 2011 the number of registered contracts actually monitored was around 8000, making almost 20% of the total value of the estimated turnover in the commercial market. As for the property coverage, data refer to three categories (Retail, Office and Industrial units) and adopt a classification by use destination in line with the national register (*Catasto).* The dissemination strategy is twofold: i) annual data, for single segment of the commercial property by main locations and national aggregates, are made available in public reports with 5 months delay for years starting in 2007; ii) semi-annual data for individual contracts, covering periods since S1-2003, are provided to subscribers with a delay of around three and four months respectively for the first and the second semester.

4. Towards the computation of a quarterly price indicator

By combining data available from three different sources we aim at computing an experimental indicator of the commercial property prices in Italy that would meet as closely as possible the following desired properties:

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[2] The starting point is the prices requested by sellers as reported in advertisements mainly published on the internet; these are then updated at three different points in time, based on the hypothesis that when the advertisement no longer appears, the house has been sold. The published values are finally obtained using non-linear interpolations reported for each reference area in a given period. In respect of residential dwellings located in semi-central areas only, the data are aggregated in a national index using a weighting system based on the stock of dwellings of each municipality.

i) a clear delineation of targeted markets

ii) representativeness of country-wide trends

iii) relatively high reliability and accountability

iv) good time coverage

v) high frequency and timeliness

In this section we describe the strategy we followed to estimate a price indicator based on transactions actually made on the commercial market, and discuss the preliminary results. It is worth stressing that at this stage the indicator is experimental as the source data are heterogeneous under many respects, and a significant progress is required mostly in order to improve representativeness in terms of location and type of commercial property. The main purposes of our experimental indicator are to provide a first input for the analysis and understanding of the developments in the non-residential real sector, and to signal the potential contribution that administrative data can provide in computing a transaction based price indicator.

4.1 The computation strategy

We start from the annual data released by *Agenzia del Territorio-Assilea* (AdT henceforth) for years since 2007 as we believe that they better match properties i) to iii), and we exploit the informative content of data provided by *Nomisma* and *Scenari Immobiliari* in order to progressively move towards properties iv) and v).

Regarding *AdT* data, it is however worth mentioning that they are themselves to be considered preliminary estimates as they are currently fraught with the difficulties mostly related to the limited representativeness (even if higher in comparison with alternative data source) of the whole country, that was already mentioned in the previous section, and to the controversial reliability of the unit classification made by the national register (*Catasto*). In this respect, while the delineation of the commercial property is clearly identified by AdT according to the cadastral codes (Table 2), the national register is occasionally unreliable as some large, residual categories include construction units that could be imputed to specific use destination under a better scrutiny or the register receives with a huge delay (or misses receiving at all) changes in the use destination.[3]

Table 2

Classification of the commercial property

	Office		**Retail**			**Industrial**
Unit type	Offices	Banks	Shops	Commerc. Departments	Hotels	Sheds
Cadastral codes	A10	D5	C1 and C3	D8	D2	D1 and D7

Under these caveats, the **first step** in computing our indicator was to combine the annual *AdT* data available only since 2007 for main cities, all regions and the whole country with the semi-annual micro-data, that are released by *AdT* upon request, regarding a sample of contracts settled since the first semester 2003. In particular, we aggregated the individual

[3] In addition to the possible bias in registration of the retail units that was already mentioned in Section 2, the number office units could also be underestimated as many units actually used for office destination are included in a sub-group of the D cell ("Non ordinary units").

semi-annual data to obtain country-wide annual data for each commercial asset (Office, Retail and Industry), and we used them to retropolate back to 2003 the original annual data.[4, 5] In this way we obtained annual data covering years since 2003 for all the three components of commercial property over the country as a whole; we turned them into the semi-annual frequency by applying standard technique for temporal disaggregation, using as semi-annual indicator the nation-wide average value of the individual semi-annual series. As a result, we obtained semi-annual data for prices of the Office, Retail, Industry and Total commercial property (weighted average over the three components) covering the whole country since S1_2003.

In the **second step** we retropolated the semi-annual series from S1_2003 back to S1_1995 based on trends of *Nomisma* data, that are available only for Office and Retail units. Accordingly we first calculated semi-annual series for the prices of the two categories of commercial assets since S1_1995, then we aggregated them as a weighted average to proxy the trend in prices of total commercial property, that was imputed to the semi-annual series of total units for periods prior to S1_2003.

In the **third step** we used the quarterly data on construction costs released by ISTAT and on price of non-residential property estimated by *Scenari Immobiliari* to obtain, through temporal disaggregation techniques, a quarterly indicator of the Total commercial property prices covering the whole country since Q1_1995.

As a result, we obtained semi-annual indicators of prices of the Office, Retail and Total commercial assets in Italy since S1_1995 and a quarterly indicator for only the Total since Q1_1995. All indicators are based on transaction prices and refer to the whole country; the latter may be an important limitation of our indicators as they do not allow monitoring the dynamic granularity of the commercial property market.

A further limitation of our calculations comes from the heterogeneous methods, quality and sample design underlying the different data sources we adopted. Accordingly, the trend in the different price indicators could significantly differ, thus affecting the reliability of both the retropolation and the temporal disaggregation used in our computation strategy. At a first scrutiny, however, divergences in dynamics of the basic price series are not dramatic on average, even if they occasionally prove relatively large as, for example, in the case of retail units (Figure 3).

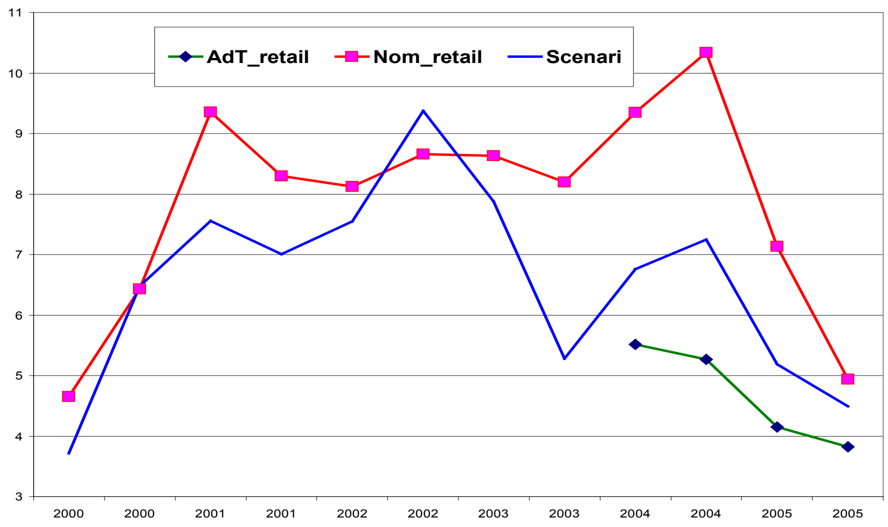
4 Due to data limitations, in order to average the individual semi-annual series we adopted the same weighting scheme for every asset, based on the number of total transactions of commercial property by province capitals; the elementary unit was the simple mean of individual data on prices by province capital and commercial asset. Alternatively, we adopted an unweighted mean of individual price data by commercial asset, finding virtually negligible discrepancies with the weighted mean. However both series, taken as yearly average, differ from the original annual data as the latter are obtained based on estimates of the stock shares, that are not currently circulated by *AdT* as still under scrutiny.

5 Retropolation of the annual aggregate series was simply obtained by imputing for years prior to 2007 the dynamics of annual (and national) averages of the semi-annual micro data.

Figure 3

Price Indicators for Retail Units (Total property for Scenari Immobiliari)

(percentage yearly changes**)**



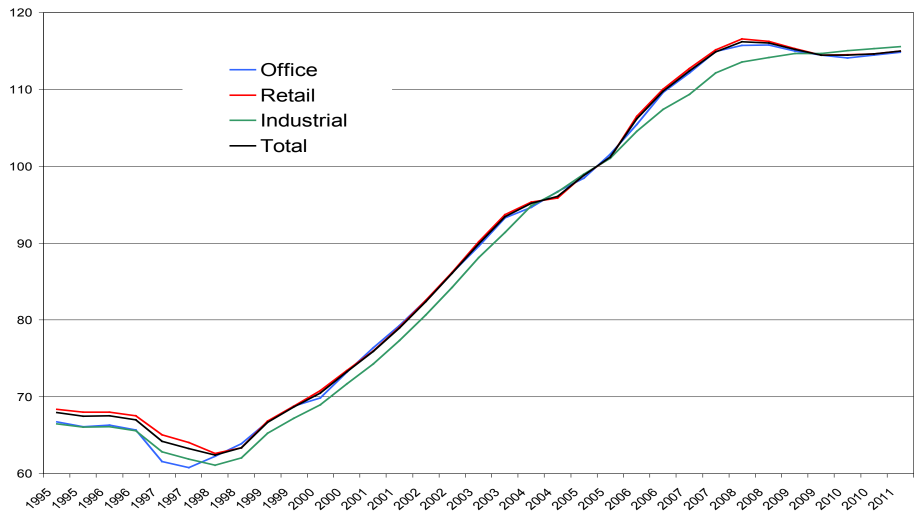
4.2 Preliminary results

According to our calculations, in Italy commercial property registered a bold revaluation between the first semester 1999 and the first semester 2008, by an annualized rate of around 5 per cent per period in nominal terms (Figure 4). As the financial crises deepened, commercial property prices went down, by an annualized rate of around 0.5 per cent per period until the second semester 2010, followed by a virtually stagnation over the following year (Figure 4). The expansionary phase was common to all commercial assets, proving however less pronounced for the industrial property since the mid 2000s, likely in line with the first signs of cyclical slowdown in the industrial production. Interestingly, the downward correction during the recent financial crisis was more limited compared with the deflation that followed the currency and financial turmoil in the nineties.

Figure 4

Price indicators for commercial property in Italy

(semi-annual data; indices 2005=100)



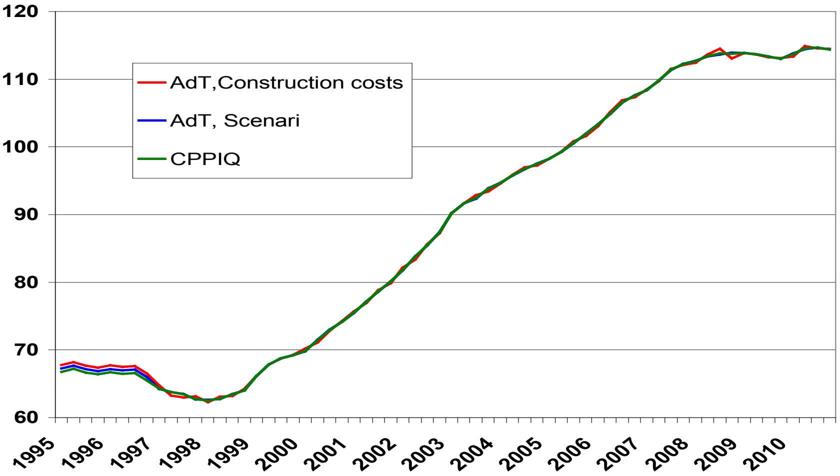
Source: elaborations on data Istat, Agenzia del Territorio-Assilea and Nomisma

Regarding the quarterly price indicator, that we were able to calculate only for all commercial property and for the whole country, we first notice that its developments are not significantly affected if the temporal disaggregation of the semi-annual indicators is based on price data estimated by Scenari Immobiliari (blue line in Figure 5), on the Istat index of the costs of construction (red line) or on both indicators (green line). We adopted the latter as our reference indicator to take account for both valuable information on costs and margins of developers.

Figure 5

A quarterly indicator for commercial property prices in Italy

(Total non residential market; index 2005=100)

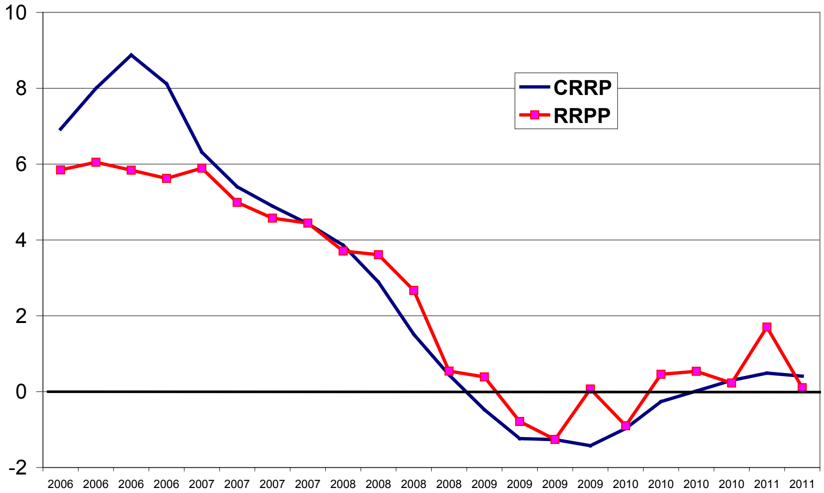


Focusing on more recent developments, our quarterly indicator shows that yearly growth rate of commercial property prices in Italy peaked in the late 2008 (8.3 per cent in the third quarter; line blue in Figure 6), followed by a progressive and pronounced reduction, which lead to negative changes in the first quarter of 2009. The decline become particularly severe in the last quarter 2009 (around –1.5 per cent) and continued until the early 2010; in following quarters commercial prices posted a moderate increase, although largely below producer inflation.

Figure 6

Prices of the commercial and residential property

(y-o-y percentage changes)



Source: this paper for commercial prices (CRRP), elaborations on data from Banca d'Italia Agenzia del Territorio and Istat for residential price (RRRP)

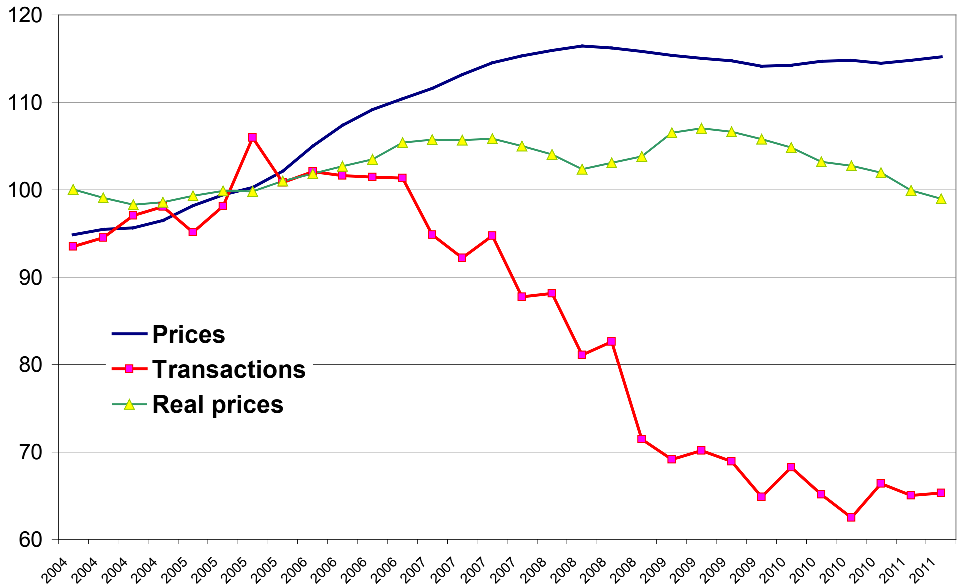
Compared with residential property price dynamics (red line in Figure 6), both the accelerating phase in the mid 2000s and the declining one in late 2000s appear more pronounced for commercial property prices, likely signalling a higher sensitivity to changes in the economic climate in line with the recent literature.

A common property of commercial and residential property prices in Italy is a significant rigidity, at least when they are valued in nominal terms, to adjust to a downward correction in the number of transactions. Indeed, commercial transactions briskly declined since late 2006, showing some signs of stabilisation only in recent quarters (Figure 7). At the same time nominal commercial prices kept increasing until late 2008, albeit with a slowdown, and show a relatively moderate reduction just over the following year. Like in the residential sector (Nobili and Zollino, 2012), the decrease in commercial prices was more pronounced and prolonged in real term (or net of producer inflation): between the second quarter 2011 (or the latest data currently available) and the same quarter 2009 the overall fall in real prices of commercial property exceed 7.5 percentage points.

Figure 7

Prices and transactions on commercial property markets

(Indices 2005=100)



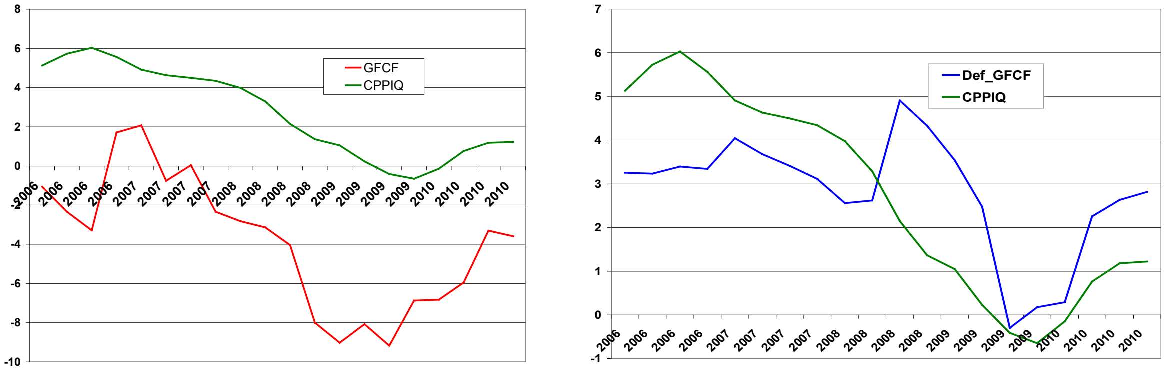
As a further preliminary test for a reliable information content of our indicator of commercial property prices we see that its developments are not at odds with data in the national accounts regarding both volume and deflator of non residential investment. From the one side the deterioration in property price trend may contribute explaining the contraction in investment since the late 2000s, whose intensity moderated in recent quarters as property prices somewhat improved (Figure 8A). From the other side, abstracting from volatility in quarterly data, developments of property prices reasonably matches underlying trend in deflator of non residential investment (Figure 8B).

Figure 8

Commercial property prices and non residential investment in national accounts

A. Property prices and investment spending **B. Property prices and investment deflator**

(percentage changes year on year)



5. Agenda for future research

At the current stage of research, our quarterly indicator of commercial property prices in Italy is a very preliminary outcome, that mostly suggests that combining pieces of information currently available from several sources can be a promising strategy towards a transaction based price index. There is however important progress still to be made to improve reliability and representativeness of the source data, and thus of the final price indicator.

Computing an experimental indicator, albeit largely imperfect yet, on commercial property prices may be a valuable step in order to fill an important information gap regarding a large segment of the real estate sector. In the short run, it provides the only input currently available in order to monitor cyclical developments in the Italian commercial property prices and to analyse the main determinants. In perspective it may help that the official computation of a proper price index is soon established, in line with the success story of house prices. Indeed, in most European countries they were first proxied by imperfect indicators selected or estimated by users before being part of a larger project supported by Eurostat, and eventually the dissemination of official house price index in Italy has started in early autumn 2012.

In the time still required before an official index may be produced, on top of our agenda for future research there is a sounder validation of the source data used to compute the experimental indicator through a severe scrutiny of the underlying methodology. Some progress in this direction has been already achieved, but much work is still to be done.

In the same vein, comparison between trend in our indicator and indicators based on a valuation approach could provide further insights as soon as those indicators become available for Italy in a reasonably long time horizon. At that time, an accurate econometric analysis could compare the performance of transactions versus valuation based commercial prices to explain developments of non residential investments in Italy as well as the credit flow to developers.

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Measuring the opinion of firms on the supply and demand of external financing in the euro area

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Sébastien Pérez-Duarte,[1] Nadine Schmitt

Introduction and review of existing evidence

At present times, problems and obstacles in the access to external finance can pose a serious threat to the existence and success of companies in the euro area, especially for small and medium-sized enterprises which are particularly dependent on external funds (for empirical evidence, see, among others, Ferrando and Griesshaber 2011). This is supported by the recently growing literature on firm growth which clearly identifies the experience of financing obstacles as well as problems in the access to finance to negatively affect growth (e.g. Becchetti and Trovato 2002; Beck et al. 2005; Ayyagari et al. 2008).

This paper finds its place in the empirical literature aimed at capturing the existence of financing constraints, which started with the seminal work of Fazzari et al (1988). One strand of the literature relies on balance sheet information and financial statements in order to derive a priori classifications to distinguish between financially constrained and unconstrained firms. As consequence, different classifications have been developed, mainly based on firm criteria related to information costs and information asymmetries which are supposed to serve as proxies for the existence of financing obstacles.

The problem with relying on balance sheet data and financial statements only is that it is often not possible to perfectly infer on financing constraints based on these sources (Beck et al. 2006). Moreover, resulting samples of firms are likely to be biased towards large and listed companies, often neglecting smaller firms for which such data is harder to obtain.

A second strand of the literature focuses more closely to the results of survey data on firms' perceived experience of financing obstacles. Based on the World Business Environment Survey (WBES), Beck et al. (2006) capture financing obstacles i) through firms' perceptions on how much of an obstacle financing poses with respect to the operation and growth of the business and ii) through detailed assessments on how problematic certain aspects related to access to finance are. Ordered probit regressions show that firm age, size and the ownership structure (used for a-priori classifications in previous contributions) are indeed effective predictors of financing obstacles among firms. In addition, higher levels of financial, economic and institutional development seem to reduce financing obstacles with the latter being the most important country characteristic in this respect.

Coluzzi et al. (2012) follow a similar approach using the WBES data for five major euro area countries (i.e. Germany, France, Italy, Spain and Portugal). Their analyses reveal that firm characteristics, which can be linked to higher opacity from the perspective of the lender, are associated with increased probabilities of facing financing obstacles. Especially small and young firms are found more likely to experience financing obstacles compared to larger and older companies. Interestingly, the results also show strong differences across sectors with

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firms in the construction and manufacturing sector being more affected (similar to the finding of Westhead and Storey 1997).

Angelini and Generale (2008) investigate the relationship between survey measures of financial constraints and firm size using a sample of Italian firms. Financial constraints are captured through firms' answers on whether they experienced certain difficulties in financing their investment or in obtaining requested financing. While the authors find a significant link between financial constraints and firm size (firms that perceive themselves as financially constrained on average tend to be smaller), constraints seem to be only a real problem for a small fraction of the firms. Apart from this finding, constraints appear to be more frequent among young firms, confirming the importance of firm age.

Finally, Ferrando and Griesshaber (2011) use the second wave of the new ECB-European Commission Survey on the Access to Finance of small and medium-sized Enterprises (SAFE), which was conducted in the second half of 2009. Using a sample of 5,320 firms from 11 euro area countries, the authors investigate the determinants of financing obstacles (measured as firms' self-assessment of access to finance being the most pressing problem) among euro area firms. Their results point to the relevance of firm age and ownership, while firm size and the economic sector appear less important.

The current paper builds on this recent line of research, investigating the existence and determinants of financing obstacles among euro area firms between 2010 and early 2012. While existing research thereby mainly relies on a simple judgement by firms whether they experience obstacles related to their access to finance, this paper specifically focuses on the congruence between demand and supply in external financing markets of euro area companies.

Using data from various waves of the SAFE, the paper develops a new composite indicator that combines firm-level information on perceived changes in external financing needs and availability across a broad set of financing instruments, providing a single measure on current changes in the external financing market of firms. The new indicator combines information based on different questions in the survey regarding the needs and availability of external financing in order to identify a potential external financing gap from the perspective of firms. Compared to the idea of a financing gap that can be calculated based on macroeconomic statistics like the financial accounts, which would reflect broadly the difference between saving and capital formation of non-financial corporations, the present concept also considers the supply side of financing. While a financing gap based on the financial accounts reflects firms' external financing needs to cover real investment beyond what they can finance out of internal funds, the measure discussed in this paper reflects the mismatch between external financing needs and the availability of such financing to the firms. At the same time, instead of capturing the actual size of financing gap, the measure developed here rather provides information on perceived changes (i.e. increases or decreases) in the match (or mismatch) between external financing demand and supply.

The paper also analyses the role of certain firm characteristics and recent financing experiences regarding the perceived mismatch in external financing. This helps to indicate which firms suffer the most from an increasing gap between financing needs and availability. The consistency of the results with previous approaches which aimed to investigate the underlying determinants of financing obstacles is checked, and the robustness of the results is tested across different estimation techniques (i.e. OLS, ordered probit) as well as across various model specifications.

The results clearly indicate a growing gap in external financing of euro area firms, showing an increasing mismatch between external financing needs and availability during the financial crisis (similar to Campello et al., 2010). Firms which experience declines in turnover and profit margin as well as to a slightly less extent firms that make financially autonomous decisions appear to suffer more when external financing becomes difficult. Furthermore, younger firms and firms that are not-listed are also more affected. At the same time, our results do not show clear effects for firm size or sector of activity, which have been identified as important determinants of financing obstacles in the literature. Finally, not surprisingly, southern euro area countries such as Spain, Italy, Portugal and Greece as well as Ireland seem to experience strongly growing mismatches in their corporate financing markets, especially in the more recent past.

Finally, the financing gap based on the SAFE is compared with evidence on the match (or mismatch) between external financing demand and supply from the euro area bank lending survey (BLS), which reports on the supply and demand of bank lending from the euro area banks' perspective. While both surveys show an increase in the financing gap towards the end of 2011, underlying developments in supply and in particular, in the demand for bank financing partly deviate.

The remainder of the paper is organized as follows. Section 2 describes the data and further reports some descriptive statistics on the change in external financing needs and availability. Section 3 then develops a new composite indicator that combines financing needs and availability in order to capture firms' perception of the change in the mismatch between demand for external financing and its supply. Section 4 presents the results of empirical investigations to identify which firms actually experience an increasing gap in external financing. Section 5 introduces some comparisons on the evidence of the gap between demand for external financing and its availability based on the euro area bank lending survey. The last section concludes.

1. The SAFE: a dataset on access to finance in the euro area

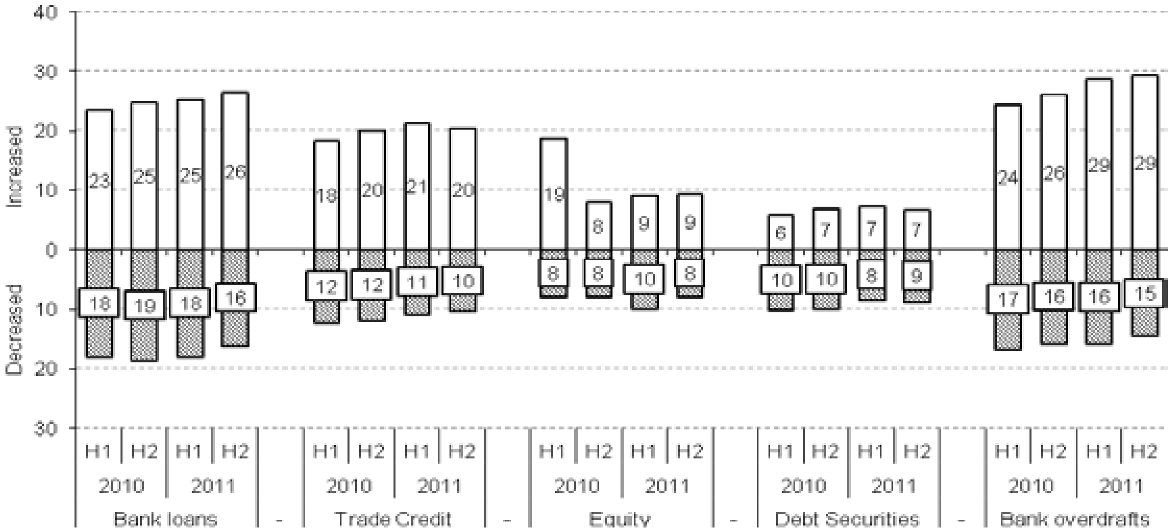
The data used in the present study is taken from a firm-level survey on the Access to Finance for Small and Medium-sized Enterprises (SAFE) which is conducted by the European Central Bank (ECB) in cooperation with the European Commission (EC). The survey started in summer 2009 and since then, a core module of the survey is run by the ECB every six months in the 11 largest countries of the euro area. The survey is mainly focused on the situation of small and medium sized enterprises (SMEs), defined as having less than 250 employees. Nevertheless, each wave also contains a comparable sample of large firms. All companies are non-financial corporations randomly selected and the final sample is stratified by firm size (based on the number of employees), sector and country. We restrict the analysis to data from wave 3 onwards. This is due to the fact that some changes to the questions most relevant for the present research have been introduced after wave 2, affecting comparability of our indicators between the first two waves and subsequent rounds of the SAFE. Some basic unweighted summary statistics for the respective waves are provided in annex 1.

In order to capture developments regarding a potential gap between external financing demand and supply we draw on questions Q5 and Q9 of the SAFE which ask firms to assess whether their external financing needs for six different financing instruments (i.e. bank overdrafts, credit lines and credit card overdrafts; bank loan; trade credit; equity investments in the firm; debt security issuance; other) have increased, remained unchanged or decreased during the previous six months (Q5 of the SAFE), as well as whether the availability of the respective instrument has improved, remained unchanged or deteriorated over this period (Q9 of the SAFE).

Chart 1

External financing needs of euro area firms

(change over the preceding six months, weighted percentage of respondents)



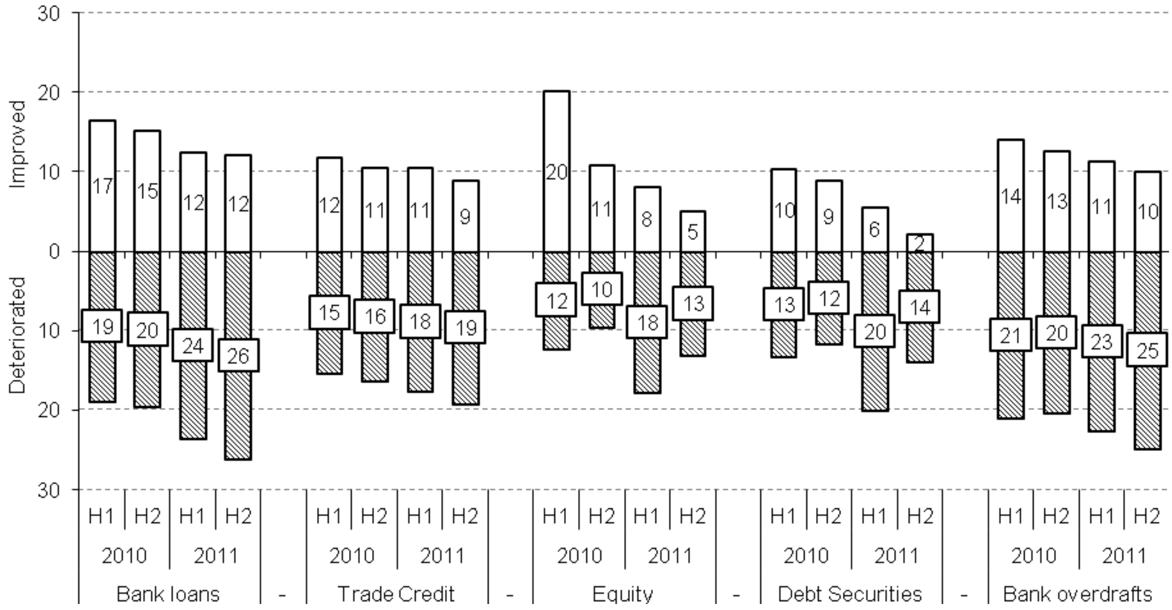
Base: All firms excluding companies for which the respective instrument is not applicable

If we take a look at changes in the external financing needs among euro area firms (see Chart 1) it can be observed that on balance needs for bank loans and for bank overdrafts, credit lines and credit card overdrafts (hereafter referred to as bank overdrafts) seem to be clearly increasing in the euro area in all four rounds of the SAFE that are investigated here. A similar picture is obtained for trade credit. Regarding equity and debt security issuance, while during the first half of 2010, on balance, needs appear to have increased, there seems to be no considerable change during the later periods. However, percentages of firms reporting these two instruments as being not applicable to them are quite high, leaving the base of firms from which these developments are obtained relatively small.

Chart 2

Availability of external financing to euro area firms

(change over the preceding six months, weighted percentage of respondents)



Base: All firms excluding companies for which the respective instrument is not applicable

To meet increasing needs for external financing, especially with respect to bank-related financing sources, improved supply seems to be required. Yet, the availability of bank loans and bank overdrafts seems to have worsened in 2010–2011 (see Chart 2). Similar tendencies are observed for the availability of trade credits and debt security issuance. For the case of equity issuance, just as before, there are significantly less firms for which such instrument is applicable (meaning a much smaller base of firms) compared to other instruments such as bank financing. Overall, there seems to be a deterioration in the availability of external financing in the period 2010–2011.

Overall, there are signs of an increasing financing mismatch. As it is not clear whether firms that perceive their needs as increasing are also the ones that regard the availability of financing to have deteriorated as well as whether firms that experience unchanged needs in external financing also perceive no change regarding the availability of such, the construction of an additional measure combining both indicators appears necessary in order not to run the risk of over- (or under-) estimating the growth in the financing gap.

2. Developing a composite indicator on the financing gap

This section focuses on combining firms' responses on the change in their financing needs with those on the change in the availability of such. There are many ways in which a composite indicator can be constructed; several are standard in business tendency surveys (e.g. OECD 2003). Tarantola and Mascherini (2009) argue that their construction should proceed through several steps, starting from a theoretical framework, the selection of variables, the normalization, the relative weighting of the variables, and robustness checks.

In order to construct an indicator that reflects the perceived change in the gap between demand and supply of external financing, we investigate two approaches. The first one adopts a common sense approach in combining the different questions of the survey on demand and supply, and is described below. The second approach attempts to derive a common factor between the different questions through a principal components analysis, and is described in box 1.

For each external financing instrument covered in the SAFE, we distinguish between firms that perceive increased needs and deteriorated availability, only perceive an increasing gap due to a specific change in either needs or availability, firms that regard the situation as unchanged, and those firms that see an improvement in the situation either due to a decrease in needs, an increase in availability or both. In order to appropriately translate this distinction into a symmetric scale, firms which experience a two-sided increase (decrease) in the financing gap for a certain financing instrument are assigned a value of 1 (–1) whereas firms which perceive a one-sided increase (decrease) are ascribed a value of 0.5 (–0.5). Firms which report no change in both, needs and availability of a specific instrument are assigned a value of 0 for that respective instrument (see Table 1).

Finally, it has to be noted that the indicator is computed only for those firms for which the respective type of external financing is relevant, i.e. those firms which have some previous experience with that sort of external financing (captured through question Q4 of the SAFE). An overview of the distribution of this new indicator for each financing instrument is given in annex 2.

Table 1

Indicator of perceived change in the gap between financing needs and availability

Coding	Change in Financing Gap	Conditions
1	Increasing financing gap (both sides)	- increased needs & deteriorated availability
0.5	Increasing financing gap (one side)	- increased needs & unchanged availability
		- unchanged needs & deteriorated availability
		- increased needs & availability don't know
		- needs don't know & deteriorated availability
0	Situation unchanged	- increased needs & improved availability
		- decreased needs & deteriorated availability
		- needs & availability unchanged
		- needs unchanged & availability don't know
		- needs don't know & availability unchanged
-0.5	Decreasing financing gap (one side)	- decreased needs & unchanged availability
		- unchanged needs & improved availability
		- decreased needs & availability don't know
		- needs don't know & improved availability
-1	Decreasing financing gap (both sides)	- decreased needs & improved availability
.	Instrument not applicable	- not applicable for needs or availability
99	Don't know	- needs & availability don't know

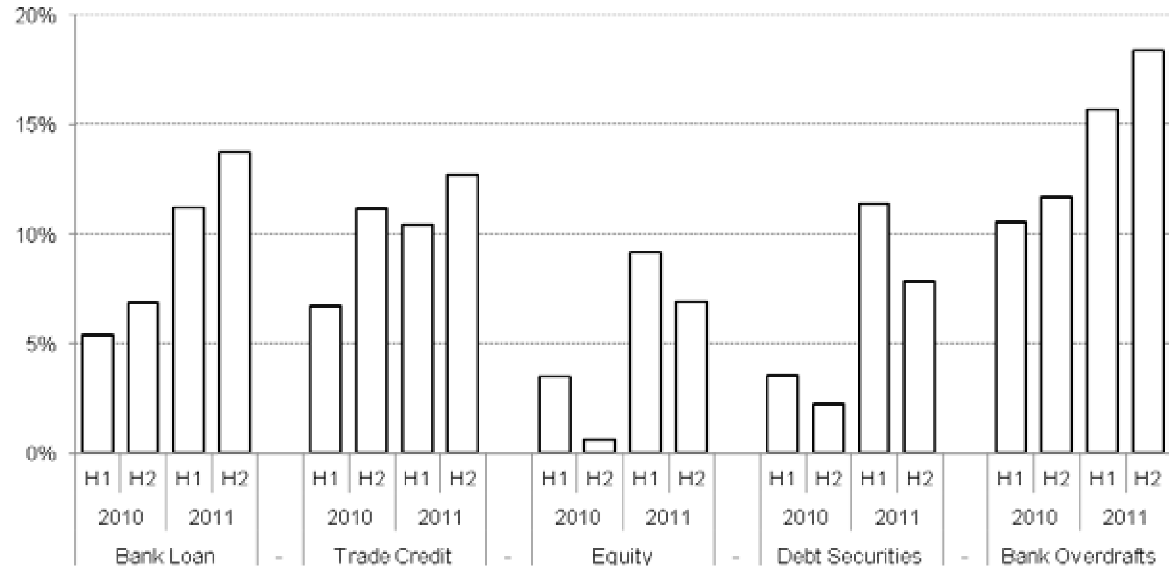
The indicator is constructed separately for each of the 5 financing types. It is computed only for firms which have used the respective instrument in the last 6 months or have not used it in the last 6 months but used it in the past (from Q4 of the SAFE).

Chart 3 shows weighted averages of the new indicator on the perceived change in the mismatch between demand and supply of external financing, separately for each external financing instrument covered in the SAFE (the category other external financing is not considered). Averages are multiplied by 100, so that the resulting figures equal the net percentages of firms' perceptions when accounting for the different intensities of changes in the financing gap that are covered in the new indicator.

Chart 3

Financing gap indicator by financing instrument, net balances

(weighted average in %)



Base: All firms which have used the respective instrument in the last 6 months or have not used it in the last 6 months but used it in the past (from Q4 of the SAFE); "Not applicable" and "Don't know" answers excluded; Original measure (ranging between -1 and 1) is multiplied by 100 to obtain net balances in %

Results clearly indicate an increasing mismatch between financing needs and availability when it comes to bank loan financing, trade credits and bank overdrafts. Moreover, the degree to which the financing situation deteriorates appears to rise over time.

In order to finally derive a composite measure $FinGap_i$ for the perceived change in the overall gap of external financing of an individual firm i, the average of the constructed financing gap indicators is taken across those instruments that are relevant (previous experience with the financing type) to the respective firm:

$$FinGap_i = \frac{1}{k} \sum_{j=BL}^{OvD} InstrGap_{j,i}$$

where k equals the number of the relevant external financing instruments and j includes the instruments bank loan, trade credit, equity, debt securities and bank overdrafts if relevant. The resulting index therefore also ranges between –1 (decreasing gap on both sides with respect to all relevant financing instruments) and 1 (increasing gap on both sides with respect to all relevant instruments). A brief descriptive summary of the distribution of this new composite indicator capturing firms' perception regarding the change in the external financing gap aggregated over all instruments is reported in Table 2.

Table 2

Composite measure of perceived change in the external financing gap

	2010 H1	2010 H2	2011 H1	2011 H2
Firms perceiving a decreasing gap	23.37	23.48	20.85	17.89
Firms perceiving situation as unchanged	40.41	36.97	38.46	37.58
Firms perceiving an increasing gap	36.21	39.55	40.69	44.53
Net balance (i.e. weighted average in %)	6%	9%	11%	14%

Weighted percentages displayed; Base is all firms which have used the respective instrument in the last 6 months or have not used it in the last 6 months but used it in the past (from Q4 of the SAFE); "Non-applicable" and "Don't know" answers are excluded

Looking at the average of the composite financing gap indicator (displayed in %), firms seem to be increasingly confronted with a growing mismatch between demand and supply of external financing. The average perceived increase in the external financing gap thereby grows from 6 to 14% over the two years. Hence, overall, there appear to be clear signs of a growing gap between demand and supply of external financing during the financial crisis.

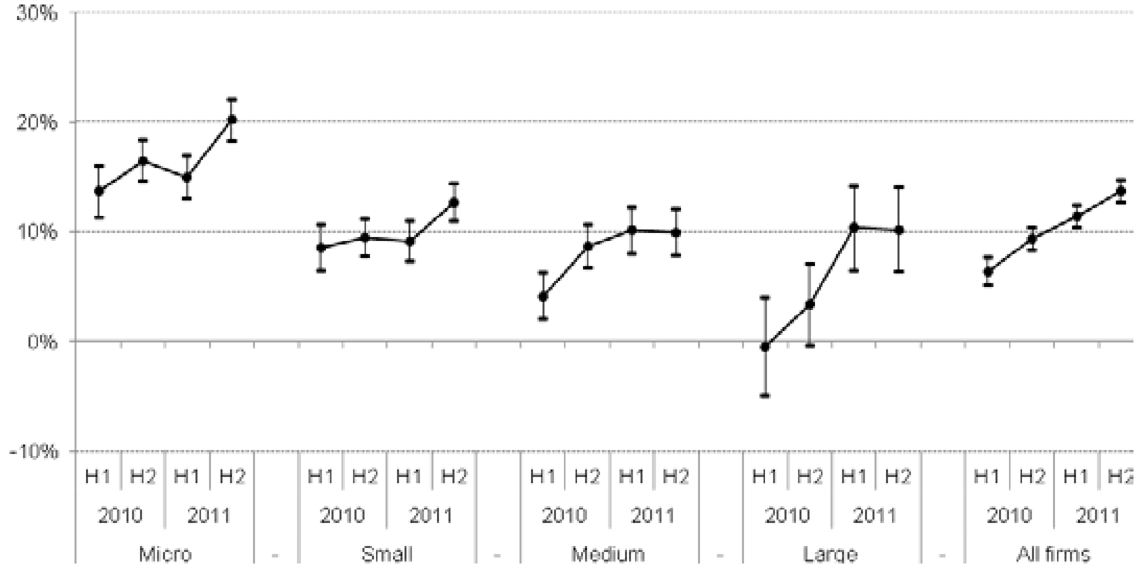
Turning to potential differences in the perceived changes of the financing gap among different size classes (see Chart 4), the perceived growth in the overall financing mismatch seems to increase with decreasing firm size. Hence, especially micro firms (defined as having less than 10 employees) appear to experience a strongly increasing mismatch between their needs regarding relevant external financing instruments and the availability of such. This result is rather worrisome since it is mostly smaller firms that rely more heavily on external financing.

In order to investigate possible country differences, Chart 5 shows the average change in the financing gap for the 4 biggest euro area countries separately, as well as for the remaining 7 euro area countries in the sample grouped together. Indeed, considerable differences between countries seem to exist. While there are no signs that the gap in external financing in Germany is growing, things are different in the other countries. Particularly among Spanish and Italian firms, the perceived gap in external financing has become larger over time at an increasing rate.[3]

[3] The indicator of the financing gap is not known in absolute terms; only its changes have a clear interpretation.

Chart 4

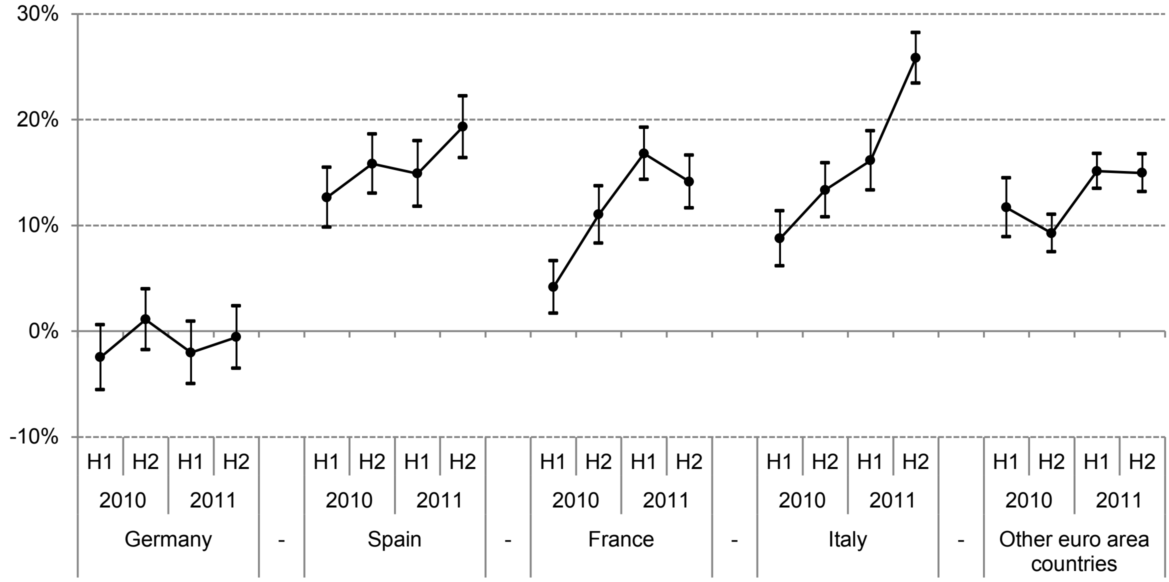
Perceived change in the external financing gap (by firm size)



Note: Weighted average of new composite measure displayed (with 95% confidence interval); Values multiplied by 100 to obtain weighted net balances in %.

Chart 5

Perceived change in the external financing gap (by country)



Note: Weighted average of new composite measure displayed (with 95% confidence interval); Values multiplied by 100 to obtain weighted net balances in %.

Box 1

Alternative derivation of a composite indicator

In order to determine the combinations of variables with the highest explanatory power, a principal components analysis (PCA) was used on the same variables on the needs and the availability of external finance described in the previous section.

PCA is a technique used to reduce the dimensionality of data, by considering the linear combination of the variables which explain the highest fraction of total variance. The main directions thus detected are the eigenvectors of the covariance matrix. PCA is sometimes used in business tendency surveys to construct common factors across different variables (e.g. Hild 2002).

One particular difference with the previous section is that “Don’t know” and “Not applicable” were recoded as 0, while “Increased” was coded as 1, and “Decreased” was recoded as -1, “Unchanged” being also coded 0. This is required for the PCA to include all firms, and is consistent with the net percentages used in the regular ECB reports on the SAFE. An additional difference is the inclusion of “Other” forms of financing, which we include for completeness purposes. A final difference is that the actual experience with the financing types is not used in the PCA.

The first component of the PCA explains 31.0% of the variance, the second one adding 20.3%; the other components are all at 10% or below, and are marginally relevant according to the scree plot. The eigenvectors are displayed in table A below.

Table A

Eigenvectors of the principal component analysis

		Component	
		1st	**2nd**
Needs	Overdrafts	0.510	0.369
	Bank loans	0.496	0.482
	Trade credit	0.206	0.199
	Equity	0.044	0.050
	Debt securities	0.029	0.025
	Other	0.154	0.135
Availability	Overdrafts	-0.428	0.459
	Bank loans	-0.435	0.528
	Trade credit	-0.212	0.265
	Equity	-0.040	0.040
	Debt securities	-0.029	0.031
	Other	-0.074	0.096

Note: weighted PCA on waves 3 and higher.

The first component has all the components on the Needs side positive, and all the Availability ones negative. In spirit, it is thus very close to the Financing Gap described above, with weights reflecting the overall contribution of the different components: overall, higher (in absolute terms) for overdrafts, bank loans, and trade credit, which concern most firms, and lower for equity and debt securities. A positive 1st component score indicates an increasing financing gap.

The second component is less intuitively clear. It adds up parallel movements in needs and availability, and could therefore be interpreted as the intensity, or volumes, of financing activity in the economy; a positive value is associated with a booming demand and supply of financing. A score can be calculated on each component, shown across firm sizes in table B, and across countries in table C.

Table B

Component scores by wave and company size

			Micro	Small	Medium	Large	All firms
1st component	2010	H1	0.205	0.116	0.065	-0.011	0.097
		H2	0.239	0.146	0.125	-0.007	0.123
	2011	H1	0.224	0.134	0.143	0.152	0.170
		H2	0.324	0.211	0.161	0.150	0.220
2nd component	2010	H1	-0.056	-0.024	0.025	0.127	0.021
		H2	-0.049	0.011	0.057	0.059	0.015
	2011	H1	-0.051	-0.029	0.019	0.016	-0.014
		H2	-0.088	-0.004	-0.024	0.030	-0.023

Table C

Component scores by wave and country

			Germany	Spain	France	Italy
1st component	2010	H1	-0.024	0.213	0.041	0.159
		H2	-0.049	0.260	0.169	0.225
	2011	H1	-0.035	0.249	0.313	0.259
		H2	-0.025	0.308	0.257	0.493
2nd component	2010	H1	0.036	-0.045	0.119	0.091
		H2	0.018	-0.017	0.048	0.105
	2011	H1	-0.041	-0.026	-0.012	0.095
		H2	0.066	-0.091	-0.046	0.022

Just as in the Financing Gap, the 1st component shows an increasing financing gap over the two years covered by this study, with a particularly high increase for micro and small firms in the last semester. The 2nd component exhibits much smaller values in absolute terms; they are decreasing overall, but the pattern is less clear by company size. The overall picture seems to indicate a slightly decreasing intensity in the financing activity. When looking at the results by country, the biggest drop in the intensity of financing has taken place in France, which can be contrasted with the relatively limited increase of the financing gap in that country, compared to Italy and Spain. Intensity of financing remained slightly higher in Germany throughout the period of analysis (see table C).

Overall, the results of the principal component analysis vindicate the results of the previous section, and add an additional indicator of interest to the survey.

3. Which firms perceive an increasing financing gap?

After having identified a growing mismatch between perceived external financing demand and supply, indicating a negative development in the access to finance for firms in the euro area, the question arises which firms are affected most by such an increasing gap. As shown in the previous section through some simple descriptive analysis, firm size and country differences seem to play a role. In the following, we go a step deeper and we investigate the role of firm characteristics by estimating multiple regression models based on the following simple equation:

$$FinGap_{i,k} = a + b\ FirmCharacteristiccs_{i,k} + gCountry + e_{i,k}$$

where FinGapi,k represents the newly created composite measure indicating the view of firm i in country k on whether it perceives an increasing gap in the overall external financing that is relevant for it. FirmCharacteristics is a vector of major firm attributes (e.g. firm size, sector of activity, turnover and profit growth, ownership and log of firm age). Country is a vector of country dummies to control for country-specific impacts on firms' perceptions with respect to changes in the financing gap, εi,k represents an error term. Although FinGap can only take a finite set of values within its range from –1 to 1, it is treated as continuous throughout the remainder of this analysis. All estimations allow for error terms clustered by country and sector to control for sector and country-specific characteristics that might produce correlated residuals for firms within sectors of a certain country. No weights are included in the estimations.

Table 3 reports the multiple regression results individually for each wave. The models include some major firm characteristics expected to be important determinants of firms' perception regarding recent developments in the overlap of demand and supply of relevant external financing: i.e. firm size (in terms of employees), a dichotomous variable capturing whether a firm is an autonomous profit oriented enterprise that makes independent financial decisions, the sector of main activity (industry, construction, trade or services), the natural log of firm age as well as a dichotomous variable capturing firm ownership (family or entrepreneurs, venture capital firms, business angels or a single natural person versus listed firms or firms owned by other companies or business associates). In addition, recent developments in turnover and profit margins over the previous six months are considered to serve as proxies for recent firm growth, performance and credit quality.

The results show that, contrary to expectations based on findings of previous studies on the determinants of financing constraints (e.g., among others, Beck et al. 2006; Angelini and Generale 2008; Coluzzi et al. 2012) as well as on the descriptive analysis provided in section 3, firm size (in terms of the number of employees) is not significant. In this respect, the finding is more in line with Ferrando and Griesshaber (2011). Here it should be noted that there may be a link between firm size and turnover growth, which may be the cause of counterintuitive signs as well as the missing significance for size. Indeed, when changes in turnover and profit margin are excluded from the estimations, the expected relationship for firm size is retrieved in most cases, indicating smaller firms to be more likely to face a growing gap compared to larger companies (results available on request). So while this effect vanishes when changes in turnover and profit margin are controlled for, the later variables prove to be quite important, indicating firms with negative growth in turnover and profit margin to experience increases in the external financing gap. The importance of growth in turnover and profit margin appears reasonable, since enterprises that experience decreases in turnover and profit margin should i) be less likely to have internal funds available, and ii) are likely to be perceived as less creditworthy.

Table 3

Characteristics of the firm and the perceived change in the financing gap

	2010 H1	2010 H2	2011 H1	2011 H2
Small[a]	-0.023	-0.016	-0.031	-0.024
	(0.02)	(0.016)	(0.018)	(0.015)
Medium	-0.047*	0.008	0.011	-0.019
	(0.019)	(0.017)	(0.02)	(0.013)
Large	-0.063*	-0.003	0.031	0.022
	(0.031)	(0.022)	(0.031)	(0.021)
Autonomous profit oriented firm[b]	0.005	0.038*	0.045**	0.050*
	(0.019)	(0.018)	(0.014)	(0.018)
Industry[c]	-0.007	-0.005	-0.028**	-0.018
	(0.018)	(0.011)	(0.01)	(0.012)
Construction	0.011	0.005	0.007	0.001
	(0.02)	(0.019)	(0.012)	(0.016)
Trade	-0.039**	-0.019	-0.031**	0.004
	(0.012)	(0.015)	(0.009)	(0.009)
Log of firm age	-0.006	-0.029***	-0.021**	-0.016*
	(0.007)	(0.007)	(0.007)	(0.007)
Ownership[d] – Family, Entrepreneurs,	0.035*	0.028*	-0.008	0.022
Business Angel or Single Person	(0.013)	(0.011)	(0.014)	(0.016)
Change in turnover - Increased[e]	0.009	-0.032*	-0.01	0.004
	(0.019)	(0.013)	(0.011)	(0.017)
Change in turnover - Decreased	0.091***	0.048**	0.061**	0.066***
	(0.018)	(0.014)	(0.017)	(0.013)
Change in profit margin - Increased[e]	-0.062***	-0.068***	-0.044***	-0.038
	(0.015)	(0.011)	(0.011)	(0.02)
Change in profit margin - Decreased	0.101***	0.094***	0.119***	0.105***
	(0.013)	(0.014)	(0.012)	(0.013)
Austria[f]	-0.036	0.031	0.099***	0.047*
	(0.03)	(0.018)	(0.017)	(0.019)
Belgium	0.059	-0.006	0.029	0.044*
	(0.034)	(0.016)	(0.016)	(0.022)
Spain	0.002	0.064***	0.060***	0.095***
	(0.029)	(0.018)	(0.016)	(0.02)
Finland	-0.049	-0.049	0.01	0.023
	(0.038)	(0.035)	(0.022)	(0.016)
France	-0.002	0.091***	0.134***	0.082***

Table 3 (cont)

Characteristics of the firm and the perceived change in the financing gap

	(0.026)	(0.016)	(0.012)	(0.014)
Greece	0.104***	0.124**	0.263***	0.284***
	(0.029)	(0.036)	(0.014)	(0.023)
Ireland	0.167**	0.164***	0.191***	0.162***
	(0.051)	(0.022)	(0.013)	(0.024)
Italy	0.007	0.059**	0.130***	0.173***
	(0.027)	(0.018)	(0.01)	(0.015)
Netherlands	0.056	0.011	0.050***	0.009
	(0.032)	(0.02)	(0.012)	(0.019)
Portugal	0.092**	0.05	0.214***	0.257***
	(0.03)	(0.026)	(0.026)	(0.017)
Observations	3792	5428	5382	5448
Adjusted R^2	0.071	0.077	0.090	0.103

OLS regression results using a composite measure on the perceived change in the gap between needs and availability of external financing relevant to a firm as dependent variable. Missing elements for certain variables (i.e. financial autonomy, ownership, change in turnover and profit margins) are included as separate categories but not reported. Unstandardised regression coefficients reported, cluster robust (by sector within countries) standard errors in parentheses. Significance levels: *** p<0.001, ** p<0.01, * p<0.05

[a] Reference category for firm size is micro firms; [b] Reference category for firm type is part of a profit-oriented enterprise; [c] Reference category is service sector; [d] Reference category for ownership is firms listed on the stock market or firms owned by other firms or business associates; [e] Reference category is turnover/ profit margin remained unchanged during the previous 6 months; [f] Reference category is Germany

Another firm characteristic that has been given a lot of attention in the literature regarding its effect on financing obstacles is the age of the firm (e.g. Westhead and Storey 1997; Beck et al. 2006; Coluzzi et al. 2012; Angelini and Generale 2008; Ferrando and Griesshaber 2011). One would expect that it is mainly young firms which experience a growing problematic in their external financing situation as such firms are less likely to already possess an established network of good relations with lenders as well as a good credit standing. With exception of wave 3, where no significant effect of firm age is found, firm age proves to be significantly related to perceived changes in the external financing gap. In line with expectations, the younger the firm the more likely it is to suffer from an increasing gap.

Autonomous profit oriented firms that take independent financial decisions are, from wave 4 onwards, significantly related to higher values on the financing gap indicator, implying that they suffer more from an increasing financing mismatch compared to firms which are part of a profit-oriented enterprise (e.g. a subsidiary or branch) and which do not take fully autonomous financial decisions. Differences in the sector of economic activity overall appear fairly small and insignificant in most cases.

Concerning the potential effect of ownership, Ferrando and Griesshaber (2011) have shown that firms whose owners are a family or entrepreneurs, venture capital firms, business angels or a single natural person are more likely to face financing obstacles than firms that are listed on the stock market or owned by other firms or business associates. Indeed, inclusion of the same variable for firm ownership as potential determinant of perceived changes in the financing gap reveals a similar effect using rounds 3 to 4 of the SAFE, but does not considerably add to the explanatory power of the model for waves 5 and 6.

With respect to potential country specific differences, the patterns discussed in section 3 can be confirmed. Compared to German firms, companies in France, Spain and Italy seem to be significantly more affected by an increasing gap between external financing demand and supply (at least for the last 3 waves). Moreover, the difference with respect to German firms is increasing over time. Turning to the remaining euro area countries investigated in this study, not surprisingly, it is in the crisis-ridden countries of Portugal and especially Greece, and Ireland, where firms seem to perceive a strongly growing gap between demand and supply of external financing.

Overall, the explanatory power of the model increases in the later waves of the SAFE, indicating that the factors considered appear more important in the most recent past. Moreover, while firm size and ownership seem to play some role regarding firms' experience of changes in the external financing mismatch in the first half of 2010, it is mostly financial autonomy, firm age and especially country differences that, together with change in turnover and profit margin, present important determinants in the later waves.

4. Comparison with evidence from the euro area bank lending survey

The SME access to finance survey (SAFE) and the euro area bank lending survey (BLS) share some common features as both intend to collect qualitative information on the supply and demand of financing. Compared with the SAFE, the BLS focuses on bank lending only, but provides a higher frequency (i.e. quarterly) and a longer history as it started already in 2003. In addition, while the SAFE collects answers from the firms directly, the BLS collects the evidence from participating euro area banks, which may lead to some differences in the results.

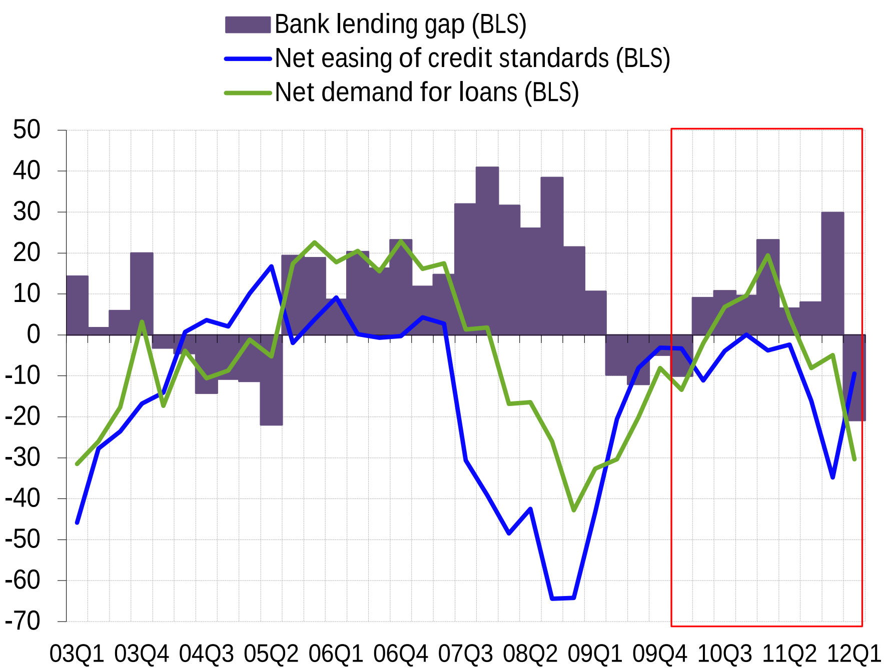
A financing gap broadly comparable with the evidence presented on the SAFE can be calculated for bank lending based on the BLS. As for the SAFE, the survey does not provide information on the level of the financing gap, but only on its change. The need for bank loans is captured by the net percentage of banks reporting an increase in the demand for bank lending by enterprises in the euro area. The availability of bank loans is captured by the net easing of credit standards (i.e. the inverse of the net tightening of credit standards) on bank loans to enterprises as reported by euro area banks. A net easing of credit standards should reflect an improvement in the availability of bank loans to euro area enterprises.

The BLS bank lending gap is then calculated as the difference between the net percentages of banks reporting an increase in the demand for bank loans and the net percentages of banks reporting an easing in credit standards. A higher need for bank loans combined with a decline in the availability of bank loans (i.e. a net tightening of credit standards) would result in an increase in the BLS bank lending gap.

Chart 6

Bank lending gap of euro area enterprises

(net percentages of reporting banks)



Source: Euro area bank lending survey.

Note: The bank lending gap is defined as the difference between the net demand for loans and the net easing of credit standards. Net easing of credit standards is defined as is defined as the difference between the sum of the percentages for "eased considerably/somewhat" and the sum of the percentages for "tightened considerably/somewhat" and can be interpreted as measure of the change in the availability of bank loans. The period marked with a red border is the one that can be compared with the results of the SAFE.

The BLS bank lending gap broadly increased in 2010 and 2011, as did the SAFE bank lending gap (see Chart 3), but in a more volatile manner (see Chart 6). The increase of the BLS bank lending gap in 2010 was mainly related to an increase in the net demand for loans and only in some quarters to a decline in the availability of bank loans. In 2011, the strong fall in the availability of bank loans was only partly reflected in a rising gap, due to a parallel decline in the net demand for bank loans in some quarters. The main increases in the gap in the first and fourth quarter of 2011 were due to parallel increases in net demand and declines in the availability of bank loans. In the period 2010–2011, both the BLS and the SAFE bank lending gap reached their highest level in the fourth quarter of 2011. At the same time, the longer history available for the BLS shows higher bank lending gaps in 2007–2008, in the early period of the financial crisis.

Overall, compared with the SAFE bank lending gap, the BLS bank lending gap also reveals an increasing gap in 2010–2011, but the development is more volatile. The decline in the BLS bank lending gap in the first quarter of 2012 mainly reflects an improved availability of bank loans possibly driven by the positive impact of the provision of the 3-year longer-term refinancing operations (LTRO) by the ECB, which may not yet be fully captured by the SAFE.

Conclusion

The current paper analysed recent developments in the external financing gap among euro area firms. Using SAFE survey data collected between August 2010 and March 2012, a new indicator on the (mis)match between demand and supply of external financing was introduced which combines information on changes in firms' external financing needs with perceived changes in the availability of such financing. The results for this new composite measure clearly indicate a growing gap, at an increasing rate, in external financing of euro area firms between 2010 and 2012, especially with respect to bank financing.

Although on balance, an increasing mismatch in external financing seems to exist among almost all types of firms, signs of structural differences regarding the extent of perceived changes in their financing gap were found for certain firm characteristics. Multiple regression analysis, aimed at relating firms' perception of the change in their financing gap to some basic firm characteristics, revealed that in particular firms which recently experienced decreases in turnover and profit margins, but also autonomous profit-oriented firms that take independent financial decisions seem to be affected by an increasing gap in their external financing. In addition, firm age and firm ownership play an important role. By contrast, firm size seems to be dominated by recent changes in turnover and profit margin, and mostly disappears once it is controlled for. The sector of activity does not seem to matter very much regarding the experience of a growing mismatch in external financing. Considerable country differences could also be identified. While on average, there seems to be no increase in the financing gap for Germany, countries like France, Spain and Italy and especially Portugal, Ireland and Greece, which are particularly affected by the financial crisis, appear to recently experience considerable growth in the overall mismatch between external financing demand and supply. Consequently, the difference with respect to German firms is increasing over time. Finally, evidence from the euro area BLS broadly confirms the existence of an increase in the mismatch between external financing demand and supply towards the end of 2011, although underlying developments in supply and in particular, in the demand for bank financing partly deviate.

Although the results presented here clearly promote a further use of the new indicator, they have to be qualified. One clear weakness of the financing gap indicator is that, while distinguishing between developments on both sides (demand and supply) and developments on one side only, it neglects the intensity of the individual effects. This means that, for example, firms which experience only slight increases in their financing needs and those that perceive a very large growth in the demand for external financing are treated equally. Moreover, the indicator exclusively focuses on the change in the financing mismatch and therefore is unable to reveal information on the actual degree of the mismatch, i.e. how bad (or good) the situation actually is. However, despite the mentioned shortcomings, the proposed indicator clearly captures overall developments in the perceived mismatch between financing needs and availability and therefore provides a valuable complement to quantitative hard data on the financial situation of euro area firms.

Annex 1
Main data characteristics across the different waves of the SAFE

Firm Characteristic	2010 H1	2010 H2	2011 H1	2011 H2
Country				
Austria	3.77	6.64	6.68	6.66
Belgium	3.82	6.86	6.65	6.70
Germany	18.83	13.28	13.38	13.31
Spain	18.83	13.28	13.32	13.31
Finland	1.88	6.64	6.65	6.66
France	18.88	13.33	13.33	13.38
Greece	3.77	6.64	6.65	6.66
Ireland	1.88	6.64	6.68	6.66
Italy	18.83	13.28	13.32	13.31
Netherlands	4.82	6.66	6.65	6.66
Portugal	4.71	6.76	6.68	6.70
Firm Size				
Micro (less than 10 employees)	30.16	33.32	33.83	33.94
Small (10 to 49 employees)	31.51	34.72	34.15	33.91
Medium (50 to 249 employees	30.69	24.11	24.72	24.94
Large (250 employees or more)	7.64	7.85	7.29	7.22
Sector				
Industry	29.61	26.02	26.33	27.13
Construction	9.75	10.18	10.20	10.41
Trade	25.43	27.51	27.63	27.52
Services	35.20	36.29	35.83	34.94
Annual Turnover				
Up to € 2 million	42.26	46.03	46.57	47.26
More than € 2 and up to € 10 million	28.01	26.59	27.22	26.57
More than € 10 and up to € 50 million	18.66	16.57	16.66	17.02
More than € 50 million	7.94	7.70	7.17	7.24
Don’t Know/ Not applicable	3.13	3.11	2.38	1.90
Firm Age				
10 years or more	76.32	77.59	74.55	75.4
5 years or more but less than 10 years	13.06	13.5	12.12	11.88
2 years or more but less than 5 years	8.28	7.5	6.57	5.45
Less than 2 years	2.01	1.17	1.25	1.05
Don't know/ No answer	0.32	0.24	5.51	6.23
Unweighted number of firms	**5,312**	**7,532**	**7,516**	**7,511**

The table shows unweighted percentages of firms in the respective samples.

Annex 2
Distribution of financing gap indicator by financing instrument

Perceived change in financing gap	2010 H1	2010 H2	2011 H1	2011 H2
Bank loan				
Strongly decreasing gap (both sides)	6.15	4.61	4.2	4.28
Decreasing gap (one side)	15.25	17.63	14.23	11.84
Situation unchanged	48.83	46.12	47.34	47.37
Increasing gap (one side)	21.06	22.49	23.34	25.13
Strongly increasing gap (both sides)	8.66	9.04	10.89	11.36
Don't know/ Not applicable	0.04	0.1	0.01	0.02
Number of firms	*3,173*	*4,377*	*4,246*	*4,423*
Trade credit				
Strongly decreasing gap (both sides)	2.5	1.58	1.58	1.12
Decreasing gap (one side)	10.83	10.06	10.43	9.98
Situation unchanged	63.77	61.03	61.04	60.36
Increasing gap (one side)	16.45	18.71	18.87	19.19
Strongly increasing gap (both sides)	6.42	8.45	7.75	9.24
Don't know/ Not applicable	0.04	0.17	0.33	0.13
Number of firms	*2,017*	*3,032*	*3,049*	*3,237*
Equity				
Strongly decreasing gap (both sides)	3.07	1.31	1.32	0.3
Decreasing gap (one side)	10.96	11.79	11.06	5.89
Situation unchanged	65.47	74.05	62.32	76.53
Increasing gap (one side)	16.94	9.7	18.58	13.6
Strongly increasing gap (both sides)	3.57	2.97	6.72	3.34
Don't know/ Not applicable	-	0.17	-	0.34
Number of firms	*595*	*437*	*361*	*415*
Debt Securities issuance				
Strongly decreasing gap (both sides)	5.33	0.67	2.69	-
Decreasing gap (one side)	6.13	20.35	10.95	9.97
Situation unchanged	68.04	59	53.76	67.97
Increasing gap (one side)	17.11	13.56	26.03	17.82
Strongly increasing gap (both sides)	3.39	6.33	6.58	3.93
Don't know/ Not applicable	-	0.09	-	0.3
Number of firms	*152*	*249*	*235*	*231*
Overdrafts				
Strongly decreasing gap (both sides)	5.41	3.65	2.94	4.11
Decreasing gap (one side)	14.2	15.93	14.55	10.63
Situation unchanged	46.03	45.54	44.57	44.65
Increasing gap (one side)	22.64	23.03	24.03	25.5
Strongly increasing gap (both sides)	11.73	11.82	13.91	15.08
Don't know/ Not applicable	-	0.04	-	0.03
Number of firms	*2,886*	*3,997*	*3,875*	*4,042*

Weighted percentages of firms which have used the respective instrument in the last 6 months or have not used it in the last 6 months but used it in the past (from Q4 of the SAFE); "Non-applicable" answers excluded

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Central Bank of Brazil's market expectations system: a tool for monetary policy[1]

André Barbosa Coutinho Marques[2]

1. Introduction

Aiming at getting subsidies for its monetary policy decisions, the Central Bank of Brazil conducts a daily survey of market expectations for the evolution of the main Brazilian macroeconomic variables.

The market expectations survey started in May 1999. At that time, the Research Department of the Central Bank developed the studies and econometric models that would be fundamental for the inflation targeting regime, formally implemented in June 1999. Market expectations for inflation then showed a strong disparity, due to the uncertainty that followed the collapse of the foreign exchange anchor.[3]

On an inflation targeting regime, expectations are crucial for most of the forecast inflation models. Thus, the knowledge of the behavior of market expectations is a key factor for conducting monetary policy. For this reason, the Central Bank created, in April 1999, the Institutional Communication Group (GCI), that had as main attribution to monitor permanently economic agents' expectations.

Initially, around 50 financial institutions and consultancies used to be contacted and the Central Bank had replies by telephone, fac-simile or e-mail for the annual forecasts for the main price indices (IPCA, IGP-DI, IGP-M e IPA) and GDP growth. Afterwards the survey was sophisticated, not only for the higher number of surveyed institutions, but also for the consideration of other variables (other price indices, exchange rate, basic interest rate, fiscal data and BoP variables) and for getting forecasts on monthly and quarterly bases.

With the growing importance of monitoring expectations for the monetary policy, in November 2001 the Market Expectations System was created, mainly aiming to expedite the process of collection and to prevent errors in the information. The data started to be informed on-line, at any moment, by previously accredited institutions, with specific password for accessing the System. In March 2010, after a detailed process of revision and enhancement, the modular structure of the System was replaced by an integrated application, more resourceful, agile and safe, resulting in the present version of the Market Expectations System.

From the collected data, the system may calculate real time statistics, generating daily reports for the Monetary Policy Committee (Copom) members. Moreover, a weekly Market Readout is produced and made available for the public through the Central Bank webpage (in Portuguese and in English).

[1] The views expressed in this work are those of the author and do not necessarily reflect those of the Banco Central do Brasil or its members.

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[3] For greater detail about the antecedents of the market expectations survey and the macroeconomic environment in the transition for the inflation targeting regime, see Bogdanski, Tombini and Werlang (2000).

In order to foster the commitment of the surveyed institutions to update the projections on a regular basis and to reward their analytical work, the Central Bank elaborates rankings with the best forecasters, classifying the institutions based upon their accuracy in short, medium and long term. The medians of the variables forecasted by the most well ranked institutions are also published at the Market Readout.

In the next section, the main characteristics of the system are presented, such as the variables collected and the surveyed institutions, emphasizing the high impact that the weekly Focus-Market Readout, a summary of its statistics, has in the media. The third section briefly describes the main procedures for inputting data in the system. The fourth section brings the methodology for the best forecasters' rankings, an incentive for the surveyed institutions to provide accurate and timely forecasts. The fifth section raises some questions about the efficiency of the market in anticipating the evolution of the main macroeconomic variables, under the recent Brazilian experience, and analyses some of the results of the calculations using the system database, besides bringing some issues on the international recognition the System has achieved, followed by the conclusion.

2. Presentation of the Market Expectations System

The Market Expectations System is an online tool, developed for the web, and accessed at www.bcb.gov.br/expectativa. This access is only permitted for Gerin (Investor Relations and Special Studies Department of the Brazilian Central Bank, that replaced the former GCI), as the system manager, and previously accredited institutions. Gerin reports to the Deputy Governor for Economic Policy. New institutions may be included in the survey under request by Gerin, which checks some basic information on the applicant´s profile, and provides to the newcomers specific logins and passwords. In principle, any entity (banks and other financial institutions, non-financial corporate, consultancies, class associations, universities, etc.) may ask for being included in the survey. As the survey is meant to be a professional forecasting survey, there must be an economist responsible for the economic projections.

Presently, around 120 logins are active in the system, mostly banks, brokers, asset managers, consultancies and other non-financial entities. There are also around 100 inactive logins that had already been on the survey in the past. Out of the universe of active logins, many update the forecasts at least twice a month for the IPCA (headline inflation). The system may be accessed at any moment, and there is not a pre-defined periodicity for the updates. However, data informed after 5:00 PM are considered in the calculation of the statistics of the next business day.

The system just considers data provided in the last 30 days. Thus, if an institution does not update its forecasts in 30 days, the system automatically disregards its projections when calculating the daily statistics. The objective of this filter is to avoid statistics influenced by old data, especially for variables with higher volatility. Thus, even if forecasts have not been modified by its models, in order to be considered valid, the providing institution shall confirm the data within 30 days.

The statistics generated by the system and published by the Central Bank are median, average, standard deviation, coefficient of variation, maximum and minimum. The median is the statistic more attentively monitored (including the recent graphic evolution) in the Focus-Market Readout, which is published every Monday, regularly at 8:30 AM, with data collected up to 5 pm of the previous Friday,[4] with high impact in the specialized media in Brazil.

The individual information in the Market Expectations System is confidential and just the members of the Copom and the managers of the system (Gerin staff) may get access to them. All the reports and series based on these data just consider consolidated data.

The Market Expectations System collects annual and monthly forecasts for the main price indices (IPCA, IPCA-15, INPC, IPC-Fipe, IGP-DI, IGP-M, IPA-DI, IPA-M), industrial output, exchange rate, and Selic rate, and annual forecasts for administered prices, variables of the BoP (external trade, current account balance and FDI) and fiscal results (primary result, nominal result and debt-to-GDP ratio). GDP growth forecasts are collected for the next 6 quarters and, similarly to other variables, for the next 5 calendar years. Table 1 summarizes the surveyed data.

Table 1

Market Expectations System – Summary of Surveyed Data

	Indicator	Projections
Price Indices	IPCA IPCA-15 INPC IPC-Fipe IGP-DI IGP-M IPA-DI IPA-M	18 monthly and 5 annual
Economic Activity	Industrial Output	18 monthly and 5 annual
	GDP GDP - Agriculture GDP - Industry GDP - Services	6 quarterly and 5 annual
Exchange and Selic Rates		18 monthly (end-of-period), 5 annual (average) and 5 annual (end-of-period)
Fiscal	Primary Result Nominal Result Public Sector Net Debt/GDP	5 annual
BoP	Exports Imports Trade Balance Current Account Balance FDI	5 annual

3. Data inputting

Projections made by accredited institutions may be provided to the Expectations System at any time. A specific website is formatted for registering up to 18 monthly forecasts for price indices, industrial output, Selic rate, exchange rate; up to 6 quarterly forecasts for the GDP growth and up to 5 annual results for these variables and exports, imports, trade balance, current account balance, net FDI (which shall include intercompany loans, deducted the respective amortizations), fiscal data, including expectations for primary result, nominal result and debt-to-GDP ratio (considering the consolidated public sector, including states,

[4] The use of median (and not the average or the mode) is justified by the asymmetry of the expectations distribution. For this regard, consult Bank of England (1999), pg 52.

municipalities, the Central Bank, state-owned companies and the central government), and regulated prices.

As part of the solutions of internal consistence, the fields relative to annual forecasts for inflation, industrial production and GDP for the current year and the next are automatically calculated when the institution informs all monthly forecasts for the respective year, for the first two variables, and all quarterly forecasts for the respective year, for GDP. In this case, the system accumulates effective data already known and forecasts for the remaining months/quarters of the current year, saving the result as the annual forecast. If all the monthly/quarterly forecasts are not informed for the year, the annual forecast may be informed.

The surveyed institutions may access the data they provide, besides the calendar considered by the system, their position in the top 5 rankings, the indicators to be published, dates of reference[5] for top 5 variables, and the information regarding themselves, such as name of the institution, address and name of the chief-economist.

The historical series of all variables of the system **may be accessed by the general public** at https://www3.bcb.gov.br/expectativas/publico/en/serieestatisticas. The presented screen brings two boxes of options where the indicator (trade balance, BoP, fiscal, price indices, inflation for the next 12 months, inflation for the next 12 months – smoothed, Selic target rate, GDP, regulated prices, industrial output, exchange rate, top 5 indicators) and the statistic (average, median, standard deviation, coefficient of variation, maximum or minimum) may be chosen for the consult. Choosing an indicator leads to a box of options to choose periodicity (monthly or annual; quarterly or annual, for GDP) – for the inflation in the next 12 months and inflation in the next 12 months – smoothed, there is not this choice. Choosing a price index or inflation for the next 12 months leads to the possibility of choosing one or more price indices (IGP-DI, IGP-M, INPC, IPA-DI, IPA-M, IPCA, IPCA-15 and IPC-Fipe). Choosing GDP leads to the possibility of choosing one or more sectors in the supply side of the economy (agriculture, industry, services or total). Choosing top 5 indicators leads to the possibility of choosing one or more indicators for which the top 5 ranking is made (IGP-DI, IGP-M, IPCA, exchange rate and Selic target rate) and the modality (monthly short term, monthly medium term, and long term).

Other inputs must be informed: a) starting and end date of the series (WHEN the forecasts were informed), with a maximum range of two years, between January 2000 and the date of the most recent Focus-Market Readout; and b) the period FOR WHICH forecasts refer (not chosen for the inflation for the next 12 months and inflation for the next 12 months – smoothed) – if the chosen period exceeds the period when forecasts are available, only the available data will be presented. CSV and XLS files may be generated. If periods are long, horizontal and vertical rolling bars are presented to help. There are options for generating results in a format adequate for printing.

Statistics for the inflation for the next 12 months are based upon the set of institutions that have monthly forecasts for **all** twelve months ahead. Thus, even though some proximity is expected between the accumulated medians of the forecasts for monthly inflation of the next 12 months and the median of the inflation for the next 12 months, both values might be different, since the sets of institutions that are part of each of these groups for which the median is calculated (month 1, month 2, ... month 12) are distinct.

Additionally, the System calculates the smoothed inflation for the next 12 months, that may be also consulted, and whose methodology was originally published in the Inflation Report of June 2005 (http://www.bcb.gov.br/htms/relinf/ing/2005/06/ri200506b5i.pdf). The smoothed

5 Dates of reference are dates on which projections are used for top 5 calculations – see Section 4.4.

series has the advantage of clearly delineating the subjacent trend of the expectations, without the discontinuities of the original series, which occurred when a certain price index was published and the series started to incorporate a new month ahead replacing the month for which the effective index had been known. This methodology turns the series more stable, without interfering on its trend along the period between two succesive publications.

The period of calculation of the forecasts for the inflation for the next 12 months, published in the Focus-Market Readout, changes automatically when the monthly price index is known. In such occasions, the period advances a month in the calendar, with the month for which the index was published being taken off and the equivalent month of the next year being included. Thus, the series of forecasts for the inflation for the next 12 months presents typical steps (exactly in the days when the inflation indices are published), due to the difference between the forecasts for the month that is included and for the month that is excluded.

An alternative to minor the effect of the steps on the trend for the inflation for the next 12 months is, in each period between two successive publications, to add to the forecasts for 12 months the difference between the forecast for the 13th month ahead (that will be the next to be included in the trailing 12-month indicator) and the forecast for the inflation for the month that will be excluded of the trailing period, weighted by the number of days in the period, in each day. Thus, the smoothed forecast for the next 12 months will be:

$$E'_{12m}(d)=\left(\left(\left(1+\frac{E_{12m}(d)}{100}\right)*\left(\left(1+\frac{E_{m13}(d)}{100}\right)\Big/\left(1+\frac{E_{m1}(d)}{100}\right)\right)^{(ndt/ndp)}\right)-1\right)*100,$$

where, for the period between the publication of the most recent inflation index until the eve of the day of publication of the next inflation index, for each institution in the survey:

d: current day;

$E'_{12m}(d)$: smoothed forecast for inflation for the next 12 months;

$E_{12m}(d)$: forecast for inflation for the next 12 months;

ndp: total number of days in the period;

ndt: current number of days passed since the last publication;

$E_{m13}(d)$: forecast, in d, of inflation for the 13th month ahead;

$E_{m1}(d)$: forecast, in d, of inflation for the 1st month ahead.

If there is a positive difference between the median/average of expectations for the 13th month ahead and the 1st month ahead, the smoothed expectations for the next 12 months will be positively changed, proportionally to the number of days in the period since the last publication of the index. As it gets closer to the next publication, there is more information (weighted) relative to the forecast for the month that will be included in the cumulated figure. The result is a smoothed series, with a clear trend, with no steps like in the original series.

4. Top 5 rankings

Gerin recognizes the excellence and timeliness of the forecasts provided by the surveyed institutions through short-, medium- and long-term rankings. All rankings are made for IPCA, IGP-M, IGP-DI, Selic target rate and exchange rate.

4.1. Original rankings

Top 5 rankings of short- and medium-term are released monthly. In the original short-term ranking, the accuracy of the projections is evaluated considering a 1-month lag to the release of the effective variable, in the last 6 months (Figure 1). The original medium-term ranking considers the average accuracy of projections in three consecutive periods of 4 months as compared to the effective results in three months – the reference month and the two previous months (Figure 2). The long-term ranking considers the accuracy of projections informed in 12 months for the annual variable released in the subsequent January (Figure 3). For the original rankings of short-, medium- and long-term, the statistics referring to the five best ranked institutions (or a few more, if there are ties) are available as historical series at the BCB webpage under the reference "top 5 institutions". The short- and medium-term rankings for the Selic Rate are released just for the months in which Copom meetings were held.

Figure 1

Original Short-Term Top 5

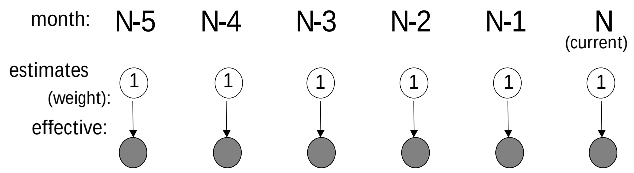


Figure 2

Original Medium-Term Top 5

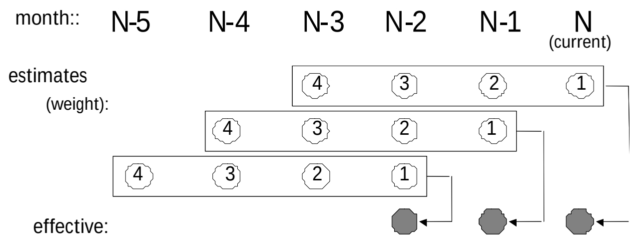
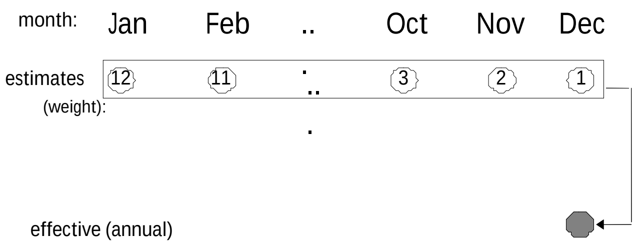


Figure 3

Long-Term Top 5



4.2. Annual rankings

Since January 2009, short- and medium-term annual rankings have also been annually released, in each January, considering, for each institution, a linear transformation of the deviations used for the original monthly calculations of short- and medium-term rankings, so that the institution with the lowest absolute monthly deviation in a specific ranking for a given variable in a given horizon gets 10 points; the institution with the highest absolute monthly deviation in the same ranking, for the same variable and the same horizon, gets zero point;

and the other institutions get points interpolated between zero and 10. The final score, used to rank the participants in the annual rankings, is the average of the monthly scores for the civil year that had ended. To be considered in a ranking for a specific year, an institution must have been ranked in at least six monthly rankings in this year, for a given horizon (having started its projections, as a consequence, up to the last day of June of that year) and also: a) for the short-term, the deviations for the parcels of calculations for each monthly ranking are equal to the absolute average deviation of the participating institutions for each of the dates prior to the start of its projections, calculating which deviation should be attributed to this institution if it were included in the rankings of these months – the linear transformation for the new ranking follows the already mentioned standard; and b) for the medium-term, instead of the absolute average deviation, the maximum absolute deviation is used. Thus, these procedures are coherent with the calculations used for the monthly short- and medium-term top 5, as described in the section 4.5. Hence, for each of the 12 months (or 8 meetings, for the Selic rate), variable (IPCA, IGP-DI, IGP-M, Exchange Rate and Selic Rate) and horizon (short and medium), institutions will have scores in the 0-10 range, and the average of these scores for the year is the basis for the ranking. The intermediate calculations of the deviations and the average scores are always rounded to the fourth decimal place.

4.3. Exclusion criteria

Some criteria apply to all rankings, defined with the aim of imposing penalties to institutions that do not comply with minimum requisites of timeliness and transparency on updating their projections: in the calculation of a monthly ranking, the institutions that had neither confirmed nor updated, in the 30 days previous to the last date of reference (or on each of the two last dates of reference, for Selic and Exchange Rates-details in section 4.4), at least three monthly and one annual projection, are excluded from the ranking. As an example, in the short-term ranking for Exchange Rate in January 2007, released in February 2007, the institutions that did not have any valid projections in both dates of reference referring to January–Dec 29th, 2006 (last business day of the previous month) and Jan 15th, 2007, were not ranked. If the Market Expectations System identifies, for any institution, that there are no valid projections on the dates of reference, this institution does not participate in this ranking, for this variable. Valid projections for a date must be understood as projections confirmed or updated in the system in the previous 30 days.

4.4. Dates of reference

The dates of reference, for each variable, are:

- IPCA: last business day before the IPCA-15 release date;
- IGP-DI: last business day before the 2nd 10-day IGP-M release;
- IGP-M: last business day before the 1st 10-day IGP-M release;
- Exchange Rate: last business day in the previous month AND last business day equal to or before the 15th day of the current month;
- Selic Rate: last business day equal to or before the Wednesday of the week previous to the Copom meeting AND last business day equal to or before the Wednesday of the 4th week previous to the Copom meeting.

To be considered on a specific date of reference, projections must be included in the Market Expectations System up to 5pm on this day, Brasília time, with no exceptions. These dates are the ones considered for the top 5 ranking calculations.

4.5. Penalties

All original rankings are based on equations that set penalties for each institution, considering the deviation of its projections from effective results of the variables: the lower the penalty, the better the ranking. For different horizons (short-, medium- and long-term), there are different lags between projections and releases of effective results (one, 1-to-4, and 1-to-12 months) and different weights for past projections.

For the monthly medium- and long-term rankings, the institutions with no valid projections in each date of reference are penalized on that date by getting the maximum absolute deviation among the other institutions. For the monthly short-term ranking, the penalty for missing information is the maximum absolute deviation if the institution had already been able, on the date of reference, to inform its projections to the system; if not, it will get the average absolute deviation.

For the Selic and Exchange Rates, with two dates of reference for each month/meeting, the penalties to be considered for each parcel in the equations will be the averages of the absolute deviations for the two dates of reference.

4.6. Equations for the calculation of the monthly deviations

4.6.1. Short-term

Institutions in the short-term ranking are ranked according to the value of y^{R}ST, as defined in Equation 1.

$$y^{R}ST = \sum_{t=N-5}^{N} \{(\text{avg. penalty})_{d_t}.(1-j_{d_t}) + j_{d_t}.[(\text{max. penalty})_{d_t}.(1-k_{d_t}) + \left|E_{d_t} t_t^R - t_t\right|.k_{d_t}]\}/6 \quad (1),$$

where:

y^{R}ST= penalty attributed to institution R;

t = month for which the deviation is calculated;

N= month referring to the last date of reference in the period;

d_t = date of reference of t in the month *t*;

$E_{d_t} t_t^R$ = projection of the institution R that is valid on d_t for t_t (for Exchange and Selic rates, there are two dates of reference);

t_t = effective result of the variable t in the month *t*;

$(\text{avg. penalty})_{d_t}$ = average absolute deviation of the projections valid on d_t, for t_t, as compared to the effective result in the month *t*;

$(\text{max. penalty})_{d_t}$ = maximum absolute deviation of the projections valid on d_t, for t_t, as compared to the effective result in the month *t*;

k_{d_t} = 0, when the institution has no valid projection on d_t;

1, when the institution has valid projection on d_t;

j_{d_t} = 0, if d_t is previous to the day when the institution was able to inform its projections for t to the System;

1, if d_t is equal to or after the day when the institution was able to inform its projections for t to the System.

4.6.2. *Medium-term*

In the medium-term ranking, institutions are ranked according to the value of y^RMT, as defined in Equation 2.

$$y^R MT = \left\{ \sum_{t=N-3}^{N} (N - t + 1).\sum_{w=1}^{3} [(\max.\text{penalty})_{d_{t-w+1}}.(1 - k_{d_{t-w+1}}) + \left| E_{d_{t-w+1}} t^R_{N-w+1} - t_{N-w+1} \right| .k_{d_{t-w+1}}] \right\} / 30 \quad (2),$$

where:

y^RMT= penalty attributed to institution *R*;

t = month for which the deviation is calculated;

N= month referring to the last date of reference in the period;

w= group of projections for the same monthly indicator;

d_{t-w+1} = date of reference of t in the month *t-w*+1;

$E_{d_{t-w+1}} t^R_{N-w+1}$ = projection of the institution R that is valid on d_{t-w+1} for t_{N-w+1} (for Exchange and Selic rates, there are two dates of reference);

t_{N-w+1} = effective result of the variable t in the month *N-w+1*;

$(\max.\text{penalty})_{d_{t-w+1}}$ = maximum absolute deviation of the projections valid on d_{t-w+1}, for t_{N-w+1}, as compared to the effective result in the month;

$k_{d_{t-w+1}}$ = 0, when the institution has no valid projection on d_{t-w+1};

1, when the institution has valid projection on d_{t-w+1}.

4.6.3. *Long-term*

In the long-term ranking, institutions are ranked according to the value of y^RLT, as defined in Equation 3.

$$y^R LT = \sum_{t=N-11}^{N} (N - t + 1).[(\max.\text{penalty})_{d_t}.(1 - k_{d_t}) + \left| E_{d_t} t^R - t \right| .k_{d_t}] / 78 \quad (3),$$

where:

y^RLT= penalty attributed to the institution *R*;

t = month for which the deviation is calculated;

N= month referring to the last date of reference in the period;

d_t = date of reference of t in the month *t*;

$E_{d_t} t^R$ = projection of the institution *R* that is valid on d_t for t (for Exchange and Selic rates, there are two dates of reference);

t = effective annual result of the variable t;

$(\max.\text{penalty})_{d_t}$ = maximum absolute deviation of the projections valid on d_t, for t , as compared to the effective result in the year;

k_{d_t} = 0, when the institution has no valid projection on d_t;

1, when the institution has valid projection on d_t.

4.7. Equations for the calculation of the annual scores

4.7.1. Short-term

Institutions in the annual short-term ranking are ranked based on the value of $\mathrm{NB}^{\mathrm{R}}\mathrm{ST}$, as defined in Equation 4, for each variable t :

$$NB^{R}ST = \sum_{m=1}^{12} \{\mathrm{Score}^{\mathrm{R}}\mathrm{STm}\}/12 \qquad (4),$$

where:

$\mathrm{NB}^{\mathrm{R}}\mathrm{ST}$ = annual score attributed to the institution R for the short-term;

$$\mathrm{Score}^{\mathrm{R}}\mathrm{STm} = 10 * (y^{R}STm - ySTm\,\mathrm{max})/(ySTm\,\mathrm{min} - ySTm\,\mathrm{max}) \qquad (5),$$

and

y^{R}STm= penalty attributed to the institution R, for the month m, according to Equation 1 in 4.6.1;

y STmmax= maximum penalty of the institutions, for the month m, according to Equation 1 in 4.6.1;

y STmmin= minimum penalty of the institutions, for the month m, according to Equation 1 in 4.6.1.

4.7.2. Medium-term

Institutions in the derivative medium-term ranking are ranked based on the value of $NB^{R}MT$, as defined in Equation 6, for each variable t :

$$NB^{R}MT = \sum_{m=1}^{12} \{\mathrm{Score}^{\mathrm{R}}\mathrm{MTm}\}/12 \qquad (6),$$

where:

$\mathrm{NB}^{\mathrm{R}}\mathrm{MT}$ = annual score attributed to the institution R for the medium-term;

$Score^{\mathrm{R}}\mathrm{MTm} = 10 * (y^{R}MTm - yMTm\,\mathrm{max})/(yMTm\,\mathrm{min} - yMTm\,\mathrm{max})$ (7), and

y^{R}MTm= penalty attributed to the institution R, for the month m, according to Equation 2 in 4.6.2;

y MTmmax= maximum penalty of the institutions, for the month m, according to Equation 2 in 4.6.2;

y MTmmin= minimum penalty of the institutions, for the month m, according to Equation 2 in 4.6.2.

5. Evaluation of the results

5.1. Investigations with Gerin Database

Data collected by Gerin allow advances in the investigation about the process of expectations formation in the Brazilian economy. This is a topic that has received some attention with regard to the academic research in the Brazilian Central Bank. Among the papers in this direction, Alves (2001) tests the efficiency of market projections for the IPCA with data up to Q32000, concluding that errors are reduced up to two quarters ahead. The paper also presents a comparison between the forecast capacity of the structural model then used by the Central Bank *vis-à-vis* market expectations.[6]

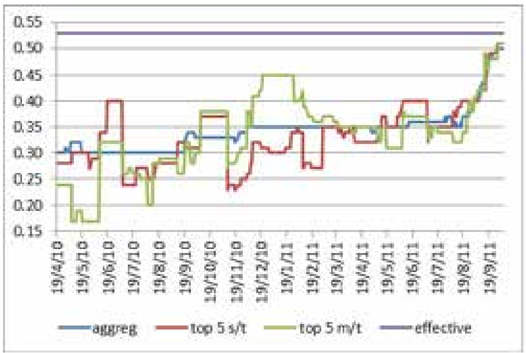
Freitas *et al.* (2002) come to two important conclusions based on the econometric examination of the market expectations for Jan/2000 to June/2002: (i) inflation targets effectively anchored expectations in the period, contributing decisively for the inflation control; and (ii) the monetary authority reacts to inflation expectations, conducting a forward-looking stance for the monetary policy.

A study held by Gerin, based upon the market expectations for the IPCA, collected between January 2006 and June 2012, shows that a significant parcel of the surveyed institutions has already been ranked as a top 5 best forecaster in this period – 72% as a short-term top 5 OR a medium-term top 5 (50% as a short-term top 5, and 64% as a medium-term top 5). Analyzing how good these institutions were at forecasting the IPCA in comparison to the whole universe of surveyed institutions, in the same period, shows that there is not a historical stability in the prevalence of one group over the other: there are periods in which the highest error comes from the aggregate group, as expected, but in other occasions the whole group has better forecasts than the top 5 institutions – see Graph 1.

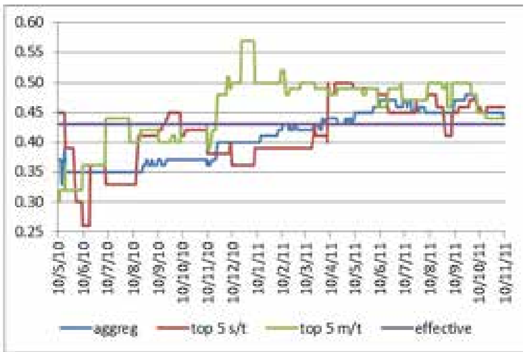
Graph 1

Monthly IPCA % p.m. – effective vs. projected (aggregate, top 5 s/t and top 5 m/t)

Sep 11



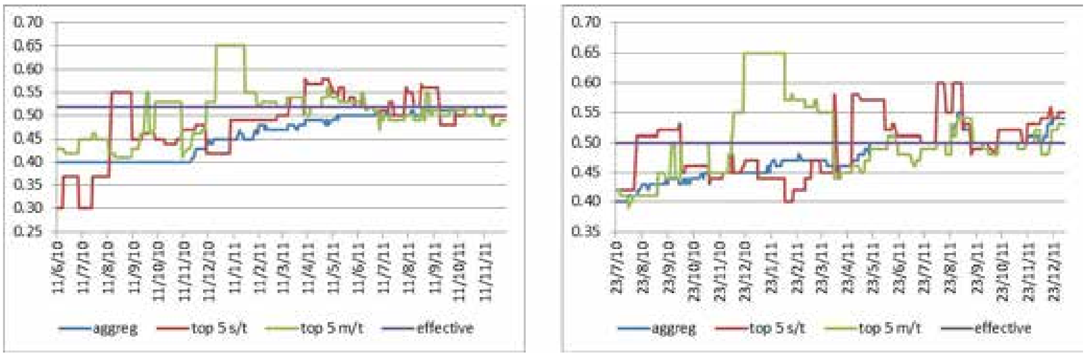
Oct 11



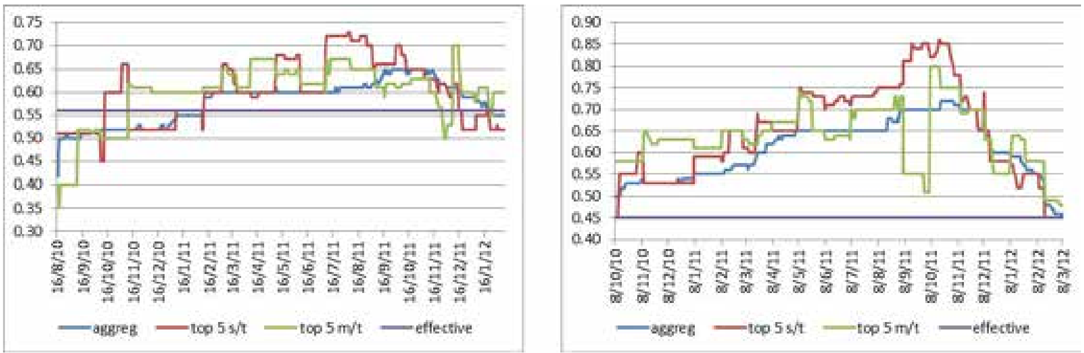
Nov 11

Dec 11

6 Partial update of this study, with data up to 2002, may be found in the Inflation Report of March, 2003.



Jan 12 Feb 12

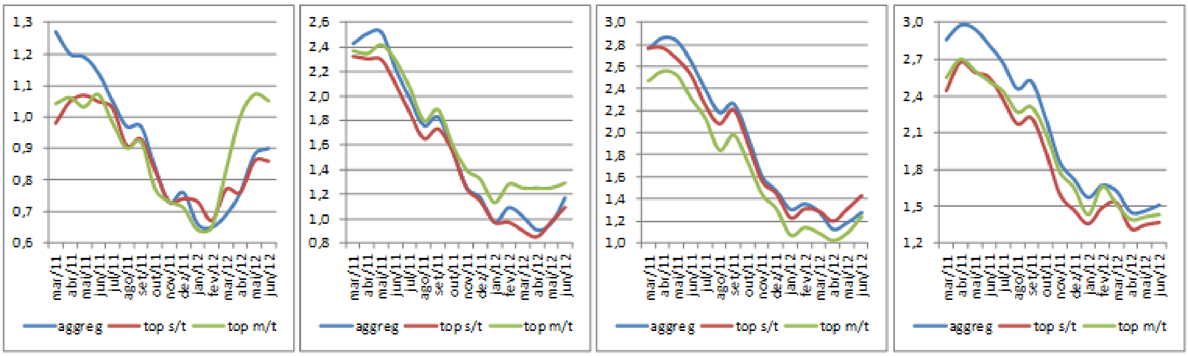


The 12-month trailing absolute errors[7] for the medians of aggregate, short- and medium-term top 5 groups in the most recent date of reference are shown in the first figure in Graph 2, for the period Mar/2011–Jun/2012. For different lags, shown in the following figures in the same graph and different points in time, aggregate, short-term and medium-term top5 have alternate best results, ratifying the previous conclusion of non-prevalence. Thus, it is not necessarily correct to affirm that those who forecasted better, based on a backward looking assessment, will have the best results, when forward looking is concerned.

Graph 2

12-Month trailing absolute error (percentage points, from Mar/11 through Jun/12)

date of reference date of ref-1m date of ref-2m date of ref-3m



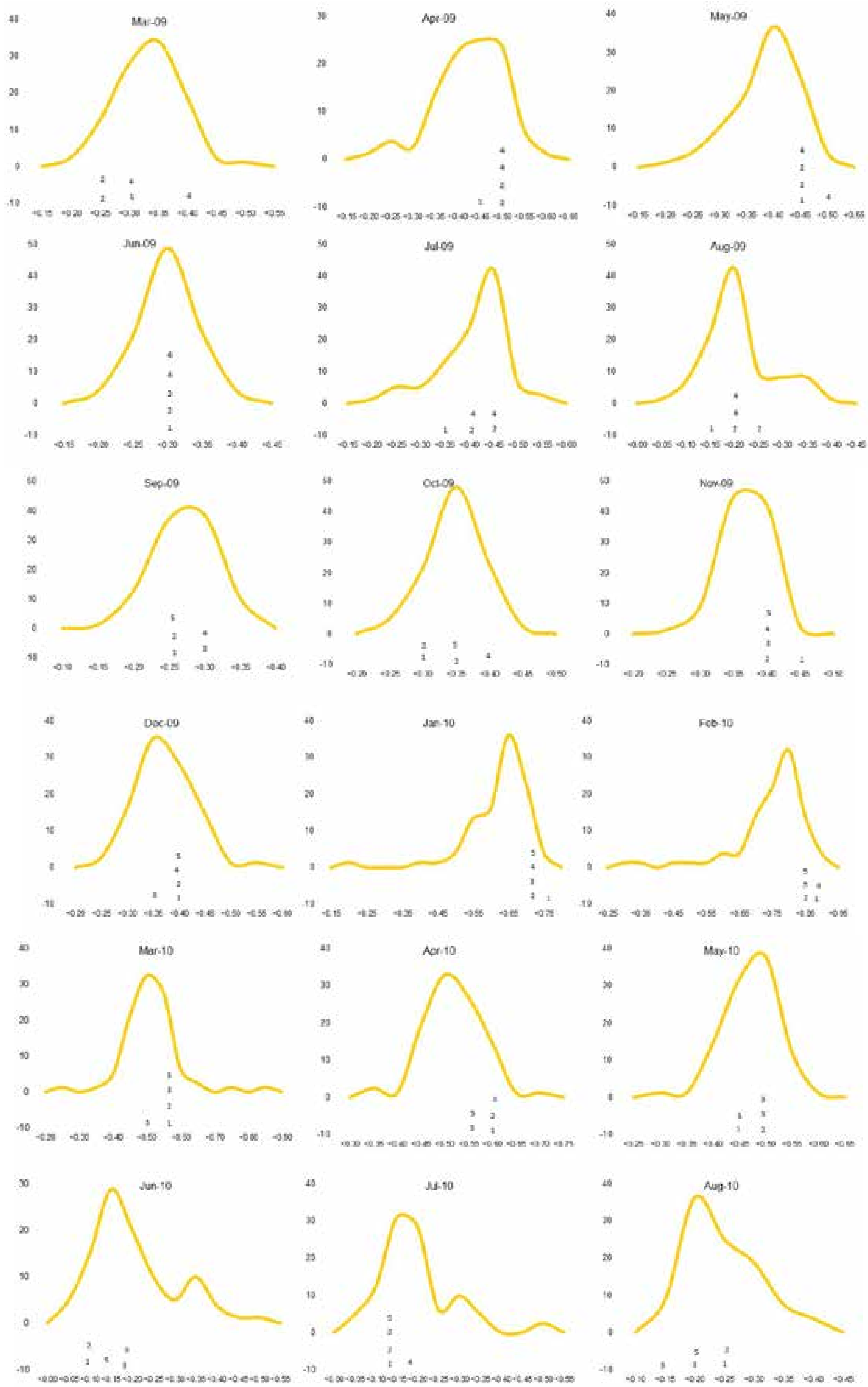
Another question regards a supposed incentive for extreme forecasts for the occasional benefit of performing better in the top 5 rankings, with some exclusiveness. Participants

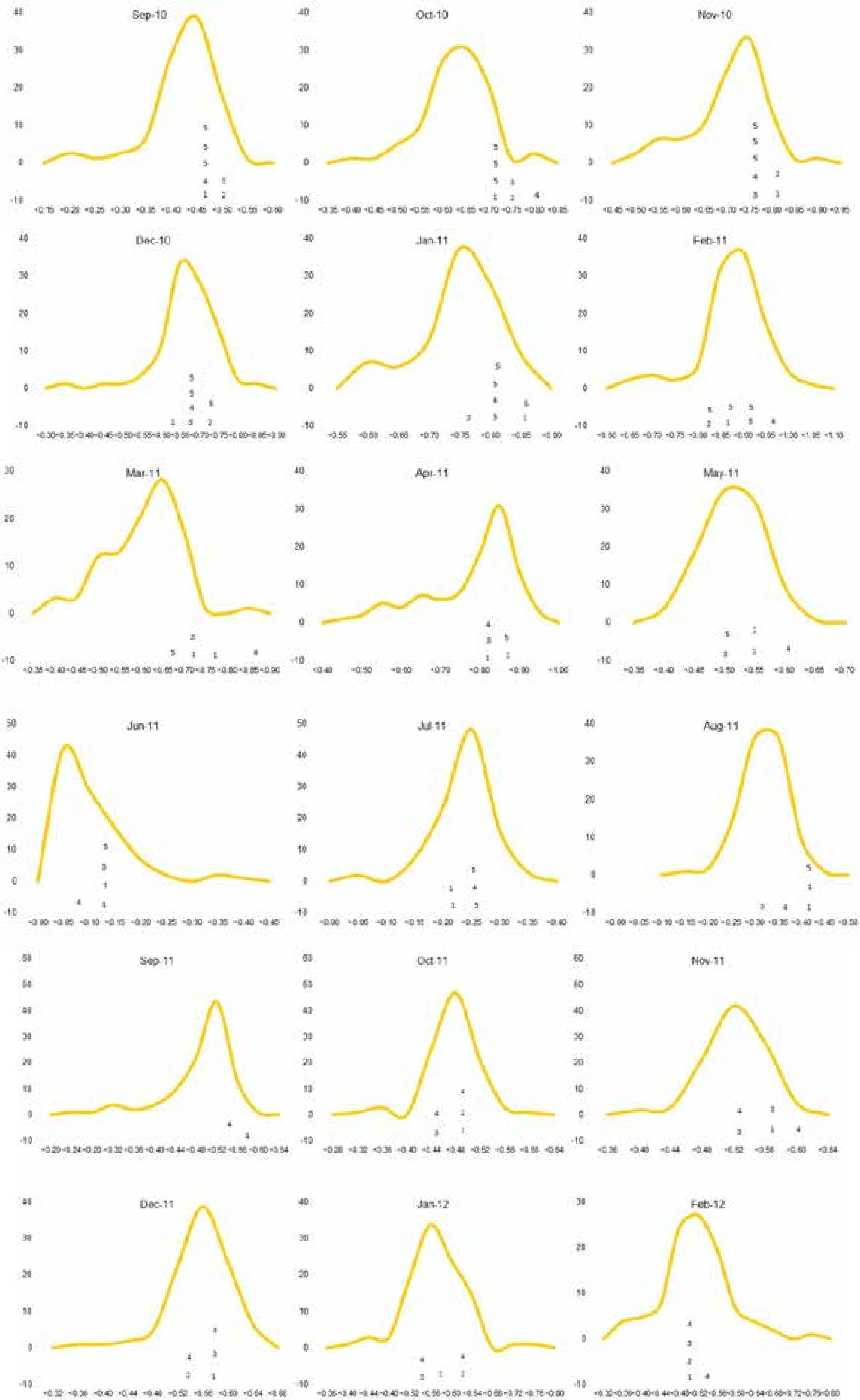
[7] The absolute difference between projections on the dates of reference and effective IPCA.

might have an incentive to inform projections in the tail of the respective frequency distribution, aiming at increasing their chances of being ranked as top 5, under the hypothesis that median projections would not differentiate from the group, even when guessing right, while extreme ones, if correct, would guarantee privileged positions in the ranking. But this is not supported by the practical results: Graph 3 shows the distributions of frequencies for the projections in the dates of reference from Mar/2009 through Feb/2012 and where the projections of the short-term top 5 best ranked institutions had fit in the curve, showing that the best ones rarely had their projections close to the tails.

Graph 3

Distribution of relative frequencies of projections for monthly IPCA in the date of reference with short-term top 5 institutions' projections positions



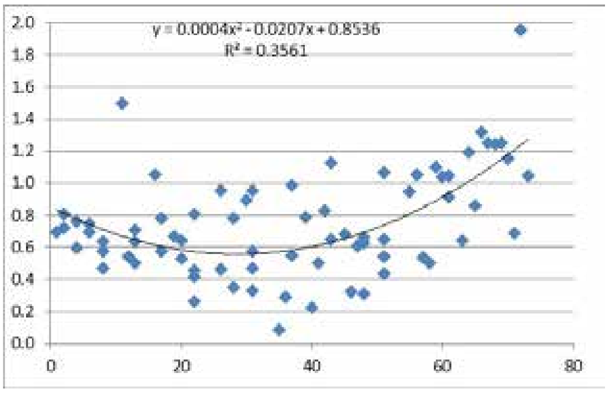

Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12

Confirming this result, Graph 4 shows the relation between position in the monthly short-term top 5 rankings (in the x-axis) and the average of the absolute standardized projections[8] (in the y-axis) in the six dates of reference for the respective short-term top 5 ranking, suggesting there is not a negative correlation. A similar study for the medium-term reached similar conclusions. Thus, better positions in the rankings did not mean extreme projections.

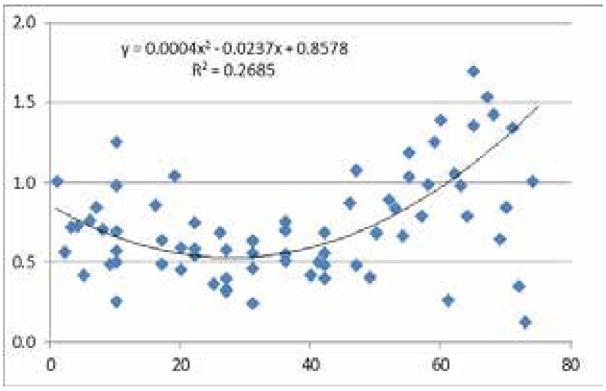
Graph 4

Relation between position in the short-term top 5 ranking (x-axis) and average standardized projections (y-axis)

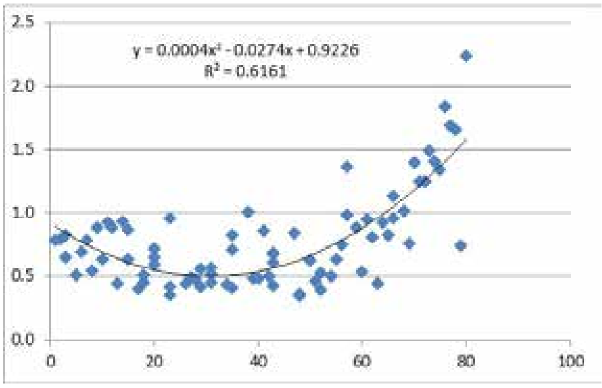
Aug 09



Feb 10



Aug 10



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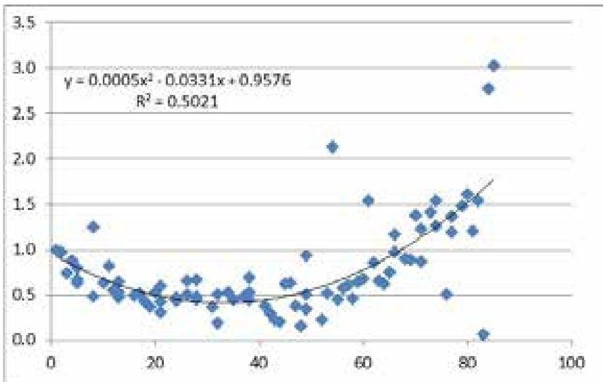

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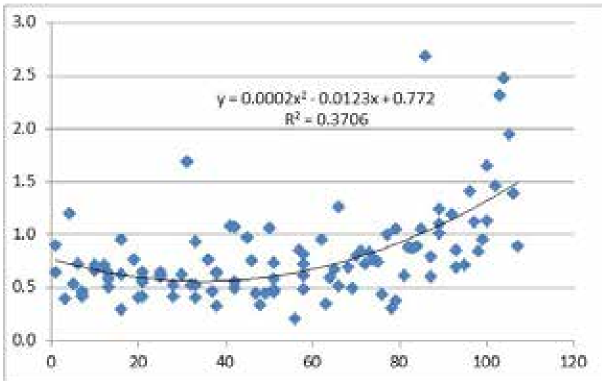
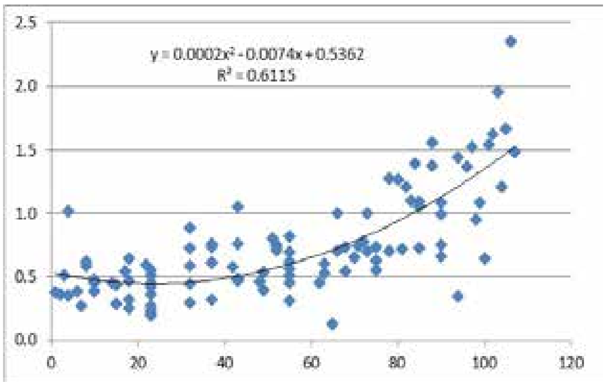


Feb 12

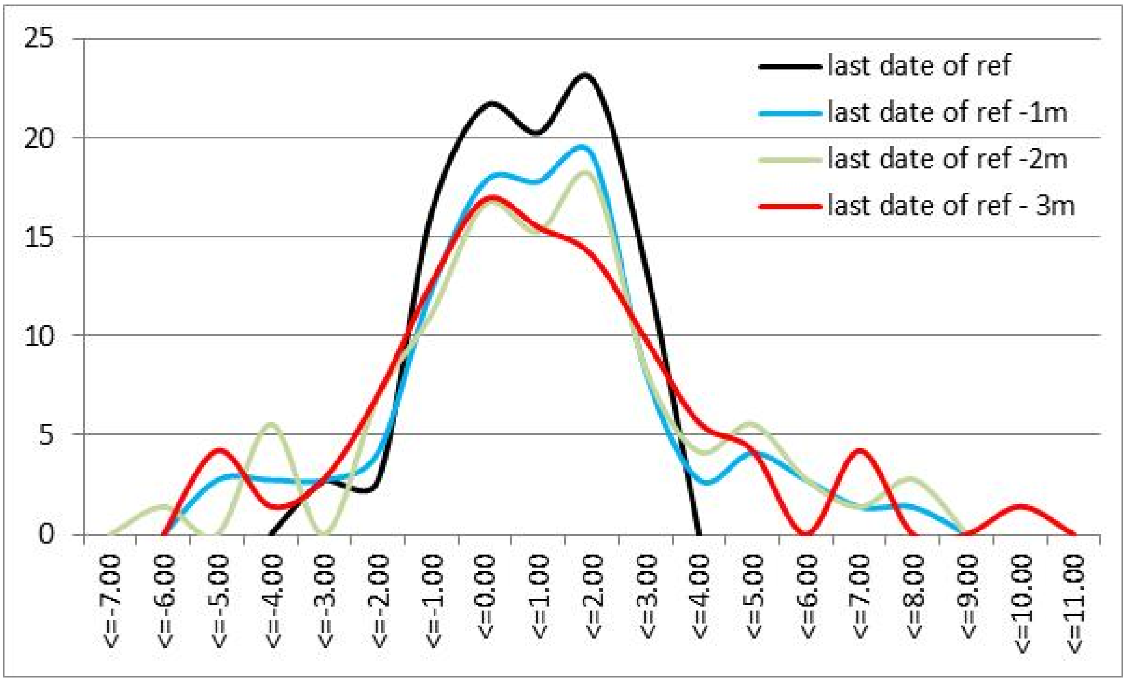


8 Standardized projection = (original individual projection – average of the projections)/standard deviation of the projections

From that, distributions of frequencies of the effective monthly IPCA standardized by the respective average and standard deviation of individual projections considering lags from 0 to 3 were plotted, aiming at investigating the distance, in standard deviations, between effective IPCA and average projections (in the last date of reference and in the 3 previous dates of reference). The idea was to verify the chance of an extreme projection to guess correctly the effective result of IPCA and therefore permitting a small error in the top 5 ranking calculation. Graph 5 shows consolidated results: considering the period between Jan 06 through Feb 12, more than 80% of the effective IPCA monthly results were less than 2 standard deviations far from the average of the projections in the last date of reference; with one more month back, the percentage falls to 67%; one more month back and the percentage reaches 60% (this result was the same for date of reference – 2m and date of reference – 3m). Thus, there is a small probability of guessing the effective IPCA for extreme projections in the last date of reference (the most important date of reference concerning short-term top 5), but the chance increases for bigger lags (for those lags with more importance for the medium-term top 5 ranking: last date of reference through last date of reference – 3m). This effect is reinforced by the fact that there are bigger weights for bigger lags in the medium-term top 5 ranking.

Graph 5

Distribution of frequencies of the monthly IPCA standardized by market projections' average and standard deviation in 4 different dates of reference

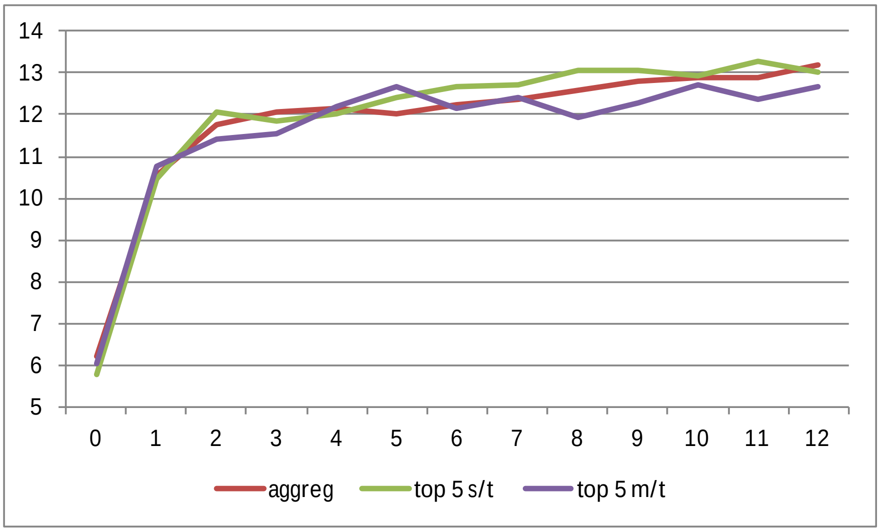


Graph 6 shows how the accumulated absolute error of the groups (aggregate, short-term top 5 and medium-term top 5) increases when the lag between the date of projection and the date of the effective release of the monthly IPCA increases. A 0 lag (in the x-axis) means the last date of reference – results are shown for the period Jan/06-Jun/12, for the last 36 months up to Jun/12 and for the last 12 months up to Jun/12. In the short-term, there is no prevalence of any group. Above the lag of 6 months, medium-term top 5 institutions are better forecasters (lower accumulate error). The increase in the accumulated absolute error from lag 0 to lag 1 is noticeable when larger periods are considered, showing how uncertainty grows for projections with more than 20 days before the effective result is known, which is the lag in the last date of reference.

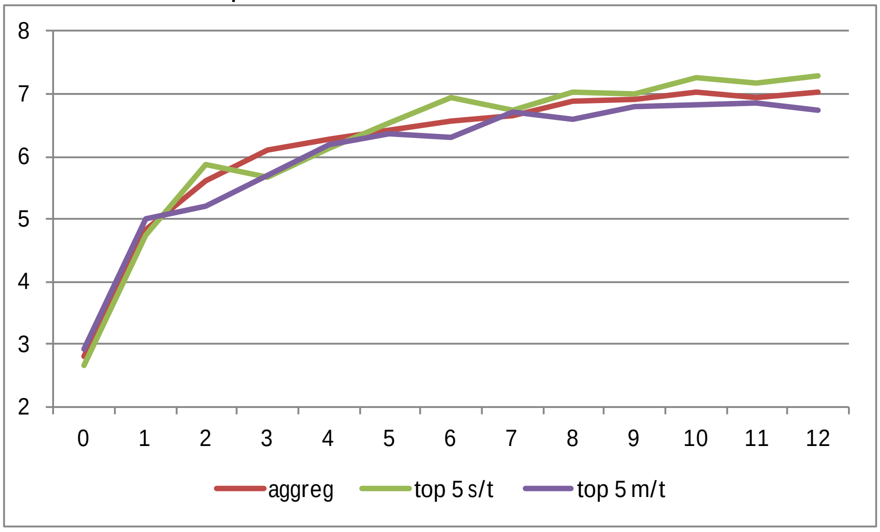
Graph 6

Accumulated Absolute Error vs. Lag between projection and effective result (in dates of reference)

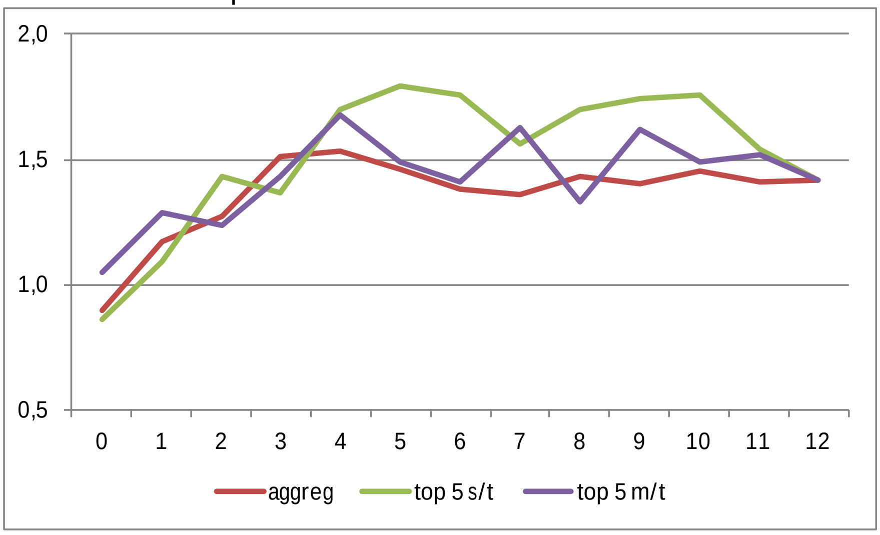
Jan 06–Jun 12



Last 36 months up to Jun 12



Last 12 months up to Jun 12



Another study shows that the frequency of forecasts updating is higher among top 5 institutions, vis-à-vis the other surveyed institutions during the six months previous to the release of each ranking. The top 5 institutions update their forecasts every 7 days, on average, while the remaining institutions do it every 12 days. The average number of updates is 13 institutions per day, reaching 50 in dates of reference.

Gerin, based on market expectations for 2011, verified the difficulty of projecting the result of economic variables in a longer time horizon. In the years 2010 and 2011, the uncertainty surrounding the international environment and its impact on the Brazilian economy, together with the unanticipated behavior of macroeconomic variables covered by the survey, resulted in the overestimation of the IGP-DI, the ratio of net public sector debt to GDP and the GDP growth for 2011, besides the target for the Selic rate (during most of the period), and the underestimation of the actual results of the exchange rate, trade balance and Foreign Direct Investment (FDI); the projections for the IPCA underestimated the actual result along 2010, converging to values close to the effective index in 2011. The commodities shock that hit the global economy in that period, with price increases over 50% in the domestic currency largely contributed to the higher forecasting error.

5.2. International recognition

The Market Expectations System developed in Brazil was used as a model to implement similar tools in other countries, and foreign delegations, such as those from Argentina and China, had the opportunity of visiting Brazil and taking the Brazilian experience as a benchmark for developing their own mechanisms of following up market expectations.

The World Bank, with support from the Department for International Development of the United Kingdom, launched in September 2007 the Regional Award for Innovation in Statistics (the first in its category at the international level). The competition aims to reward the statistical programs and activities that stand out for their quality, usefulness in the design, implementation and evaluation of public policy priority for development, and that contain clear elements of innovation. The award gives prestige and recognition for major advances in statistical development which are often unknown. It offers the opportunity to increase visibility of the work of the winners at the national, regional and international levels. Program winners and finalists are published to a wide audience of experts and international donors, government officials, academics and representatives of other important statistical community. The experiences of the winning programs are included in a publication of the World Bank and its website for international distribution. All proposals that meet the basic requirements of the award are part of a virtual inventory of good practices in the statistical development of the region. The Market Expectation System developed by BCB participated in the Second Regional Award for Innovation Statistics, which received over 170 entries by public and private entities from 26 countries in Latin America and the Caribbean. Entries closed on February 15th, 2010. Approximately 40 programs / activities regarding statistics were selected to enter the second stage of the competition, which consisted of completing a report with more detailed information about the activities, products and importance of statistical programs and the availability of an optional Internet video with explanation about the activity entered. This stage had the participation of institutions from Argentina, Brazil, Chile, Colombia, Costa Rica, Guatemala, Honduras, Trinidad & Tobago, Mexico, Panama, Paraguay, Peru, Dominican Republic, Saint Lucia and Uruguay. The second phase of the contest ended on May 7th, 2010, and 16 statistical programs were selected as finalists to attend the awards ceremony in Washington on May 20th, 2010. The Market Expectations System, representing the Central Bank of Brazil, won second place in the award, and received the Certificate of Innovation Statistics from the World Bank. The statistical programs and activities were assessed by the World Bank, IBRD, IDB, and Eurostaat National Statistics Institute of Spain.

6. Conclusion

The Market Expectations System developed by the Central Bank of Brazil is almost a unique tool. It gives valuable information for the monetary policy decision by authorities in Brazil that would not be so readily and comprehensively known from other sources. Statistics generated from this database are inputs for the inflation forecasting models developed by the Central Bank of Brazil. It is transparent and the online access to weekly updated information provides an important tool for any user that might be interested in knowing what the market expects for the main economic variables in Brazil.

The top 5 rankings stimulate the accuracy and timeliness of forecasts, and many studies may be done with the data collected by this System. It is important to know that those that had performed better as forecasters in the past do not guarantee the best performances in the future.

Many other studies may be developed based on the Expectations database. For instance, based on market expectations for 2011, Gerin showed the difficulty of projecting the result of economic variables in a longer time horizon. In the years 2010 and 2011, the uncertainty surrounding the international environment and its impact on the Brazilian economy, together with the unanticipated behavior of macroeconomic variables covered by the survey, resulted in the overestimation of the IGP-DI, the ratio of net public sector debt to GDP and the GDP growth for 2011, besides the target for the Selic rate (during most of the period), and the underestimation of the actual results of the exchange rate, trade balance and Foreign Direct Investment (FDI); the projections for the IPCA underestimated the actual result along 2010, converging to values close to the effective index in 2011. The commodities shock that hit the global economy in that period, with price increases over 50% in the domestic currency largely contributed to the higher forecasting error.

Therefore, along with other instruments – like inflation break-even rates extracted from financial assets, the information collected by the Market Expectations System provides the monetary policy with an online assessment of the expectations, which is a relevant aspect required by the inflation targeting framework. This is the great contribution of the market expectations survey: to know on a real-time basis the market sentiment for the main macroeconomic variables, providing a key input for the monetary policy decision.

However, there are still many open questions regarding the expectations formation in the Brazilian economy. For instance, how are expectations for the exchange rate formed and how do they interact with inflation expectations? Regarding expectations for the Selic rate, to what extent the market anticipates economic policy responses to adverse shocks? How are expectations for GDP growth formed? What are the factors that explain the inflation expectations dispersion? Are there any biases in the participants' forecasts? Summarizing, there is a vast field to be researched, enriched and deepened using data generated by the Brazilian Central Bank's Market Expectations System.

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Euro area exchange rate-based competitiveness indicators: a comparison of methodologies and empirical results[1]

Bernadette Lauro and Martin Schmitz[2, 3 4]

1. Introduction

Real effective exchange rates (REERs) are often used as measures of international price and cost competitiveness. They capture broad macroeconomic developments in the exchange rate and prices or costs and provide a comprehensive assessment of the international pressures on domestic firms over the medium term in respect of costs or prices. However, REERs do not include any firm-level data nor do they explicitly reveal factors relating to non-price competitiveness (such as product quality and reputation). The high relevance of the real effective exchange rate as a measure of competitiveness is also reflected by its inclusion in the scoreboard of the EU Macroeconomic Imbalance Procedure adopted in December 2011 (see European Commission, 2012).

The following dimensions shape REER indicators:

- Type of trade to be used as a basis of weights
- Group of trading partners
- Trade weight computations
- Frequency of updating of trade weights
- Choice of deflators in order to calculate price and cost competitiveness

REERs as calculated by various international organisations and central banks exhibit many similarities in their methodology, but also some differences. In this paper, we analyse REERs as calculated by the Bank for International Settlements (BIS), the European Central Bank (ECB), the European Commission (EC) and the International Monetary Fund (IMF). We complement the analysis of these indicators by performing some simulations where we construct effective exchange rates with specific characteristics in order to highlight the quantitative impact of certain methodological features.

The remainder of the paper is organised as follows. Section 2 compares the methodological approaches in calculating REERs focusing on trade weights and deflators. In Section 3, we present differences between various indicators and identify some of their drivers. Section 4 concludes.

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[2] European Central Bank.

[3] We would like to thank L. Nordquist, R. Oliveira-Soares, A. Schubert and conference participants at the IFC Conference 2012 for very useful comments. Any errors or omissions are exclusively our own responsibility.

[4] NOTE: This paper should not be reported as representing the views of the European Central Bank (ECB). The views expressed are those of the authors and do not necessarily reflect those of the ECB.

2. Overview of methodologies

Real effective exchange rates serve as indicators of international price and cost competitiveness. The REER of the euro is calculated as the geometric weighted average of bilateral nominal exchange rates which are deflated using relative price or cost measures:

$$REER^t = \prod_{i=1}^{N} \left(\frac{d^t_{euro} e^t_{i,euro}}{d^t_i} \right)^{w_i} \tag{1}$$

where N stands for the number of competitor countries in the reference group of trading partners, $e^t_{i,euro}$ is an index of the average exchange rate of the currency of partner country i vis-à-vis the euro in period t, d^t_{euro} and d^t_i are, respectively, the deflators for the euro area and partner country i, and w_i is the trade weight assigned to the currency of trading partner *i.*[5] In the remainder of Section 2, we discuss how trade weights are calculated by different institutions and which set of deflators are used.

2.1 Trade basis

In general, manufactured goods, commodities and services are the main trade flow categories. However, most of the available EERs are calculated on the basis of trade in manufactured goods as classified in Sections 5 to 8 of the Standard International Trade Classification (SITC). There are several reasons for choosing manufacturing trade. First, for most countries it accounts for the largest part of total trade in goods and services. For example for the euro area, manufactured goods had a share of about 61% of total exports and 49% of total imports of goods and services in 2009. Second, it is generally deemed being most responsive to developments in competitiveness. In addition, high quality bilateral data are available for a broad set of countries.

Commodities, on the other hand, are usually considered to be homogeneous goods whose prices are determined in global markets without being influenced by the competitiveness of individual countries. Indeed, including trade in agricultural or mining products may distort the competitiveness analysis, because these goods are often heavily regulated or subsidised. Data coverage on trade in services is less complete compared to manufacturing trade data. [6] As a consequence, the ECB's weighting scheme does not reflect patterns of trade in agricultural products, raw materials, energy products or services.

Table 1 shows which type of trade is included in the weighting schemes of different institutions. Besides the ECB (Schmitz et al., 2012) and the BIS (Klau and Fung, 2006), also the IMF (Bayoumi et al., 2005) uses manufactured goods as basis for the calculation of a narrow index vis-à-vis 26 trading partners. The IMF's broad index, vis-à-vis 184 trading partners, is also based on trade in commodities and services. However, services are effectively included only for those countries with a high incidence of tourism in the total trade; otherwise, the same bilateral weights for a country as for trade in manufactured goods is applied. The European Commission (2012) calculates EERs based on total trade in goods (hence including both manufacturing products and commodities).

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5 Schmitz et al. (2012) provide details on how the effective exchange rates of the euro are computed.

6 Schmitz (2012) computes experimental EERs based on trade in services for the ECB's EER-20 group (details are presented in Section 3.3).

Table 1

Overview of type of trade

Institution	ECB	European Commission	BIS	IMF	
Trade basis	Manufactured goods (SITC 5-8)	Total goods	Manufactured goods (SITC 5-8)	Manufactured goods (SITC 5-8)	Manufactured goods (SITC 5-8), commodities (overall weight in global markets), and services (same bilateral weights as manufacturing except for countries where tourism is important)

2.2 Trading partners

The different indicators offer a variety of trading partner composition. It is noticeable that for most institutions two groups of countries serve as the basis for EERs: a narrow group, covering mainly industrialised economies, and a broader group, including also emerging economies. The distinction is often necessary owing to the lack of long time series for data both on trade and on deflators.

Table 2 shows – by differentiating between four groupings of countries – which partner countries are included in the narrow and broad indices of different institutions: first, non-European countries that represent the major trading partners; second, EU countries that have not joined the euro area; third, non-EU countries that have lower trade weights with the euro area; and finally, euro area member states. It is worth noticing that:

- Among the major trading partners and non-euro area EU countries, the broad compositions (B61, EER-40, IC41, published by the BIS, ECB and EC, respectively), are rather homogeneous, with the exception that the ECB EER-40 group does not include single euro area Member States, while these are counted individually in the B61 and IC41;[7] however, Singapore is missing in the EC's indicator.
- The BIS and ECB's broad EERs also include a wide range of smaller trading partners (with a very similar coverage of countries), while EC indicators do not account for those.
- Narrow groups of trading partners (B27, EER-20, IC36) are more diverse. The BIS indicator excludes some major non-EU trading partners such as China, most of the EU countries (not belonging to the euro area), and part of the euro area Member States. As the EER-20 of the ECB, the B27 indicator does not include Turkey, while the IC36 does. However the latter excludes China, Hong Kong, South Korea and Singapore. The ECB EER-20 group does not comprise Mexico and New Zealand which are however included in the B27 and IC36 indices.

[7] Individual euro area Member States are included in the same group for the so-called Harmonised Competitiveness Indicators (HCIs) of individual euro area Member States as explained in Section 2.4.

Table 2

Overview of groups of trading partners

	BIS		ECB		European Commission	
	B61	**B27**	**EER-40 / HCI-40**	**EER-20 / HCI-20**	**IC41**	**IC36**
Major trading partners	Australia	Australia	Australia	Australia	Australia	Australia
	Brazil		Brazil		Brazil	
	Canada	Canada	Canada	Canada	Canada	Canada
	China		China	China	China	
	Hong Kong SAR	Hong Kong SAR	Hong Kong	Hong Kong	Hong Kong	
	Japan	Japan	Japan	Japan	Japan	Japan
	South Korea	South Korea	South Korea	South Korea	South Korea	
	Mexico	Mexico	Mexico		Mexico	Mexico
	New Zealand	New Zealand	New Zealand		New Zealand	New Zealand
	Norway	Norway	Norway	Norway	Norway	Norway
	Singapore	Singapore	Singapore	Singapore		
	Russia		Russia		Russia	
	Switzerland	Switzerland	Switzerland	Switzerland	Switzerland	Switzerland
	Turkey		Turkey		Turkey	Turkey
	United States	United States	United States	United States	United States	United States
European Union countries	Bulgaria		Bulgaria	Bulgaria	Bulgaria	Bulgaria
	Czech Republic		Czech Republic	Czech Republic	Czech Republic	Czech Republic
	Denmark	Denmark	Denmark	Denmark	Denmark	Denmark
	Latvia		Latvia	Latvia	Latvia	Latvia
	Lithuania		Lithuania	Lithuania	Lithuania	Lithuania
	Hungary		Hungary	Hungary	Hungary	Hungary
	Poland		Poland	Poland	Poland	Poland
	Romania		Romania	Romania	Romania	Romania
	Sweden	Sweden	Sweden	Sweden	Sweden	Sweden
	United Kingdom	United Kingdom	United Kingdom	United Kingdom	United Kingdom	United Kingdom
Smaller trading partners	Algeria		Algeria			
	Argentina		Argentina			
	Chile		Chile			
	Colombia					
	Croatia		Croatia			
	Iceland		Iceland			
	India		India			
	Indonesia		Indonesia			
	Israel		Israel			
	Malaysia		Malaysia			
			Morocco			
	Peru					
	Philippines		Philippines			
	South Africa		South Africa			
	Taiwan	Taiwan	Taiwan			
	Thailand		Thailand			
	Venezuela		Venezuela			
	Saudi Arabia					
	United Arab Emirates					
Euro area countries	Austria	Austria	Austria	Austria	Austria	Austria
	Belgium	Belgium	Belgium	Belgium	Belgium - Luxembourg	Belgium - Luxembourg
	Cyprus		Cyprus	Cyprus	Cyprus	Cyprus
	Estonia		Estonia	Estonia	Estonia	Estonia
	Finland	Finland	Finland	Finland	Finland	Finland
	France	France	France	France	France	France
	Germany	Germany	Germany	Germany	Germany	Germany
	Greece	Greece	Greece	Greece	Greece	Greece
	Ireland	Ireland	Ireland	Ireland	Ireland	Ireland
	Italy	Italy	Italy	Italy	Italy	Italy
	Luxembourg		Luxembourg	Luxembourg		
	Malta		Malta	Malta	Malta	Malta
	Netherlands	Netherlands	Netherlands	Netherlands	Netherlands	Netherlands
	Portugal	Portugal	Portugal	Portugal	Portugal	Portugal
	Slovakia		Slovakia	Slovakia	Slovakia	Slovakia
	Slovenia		Slovenia	Slovenia	Slovenia	Slovenia
	Spain	Spain	Spain	Spain	Spain	Spain

Note:

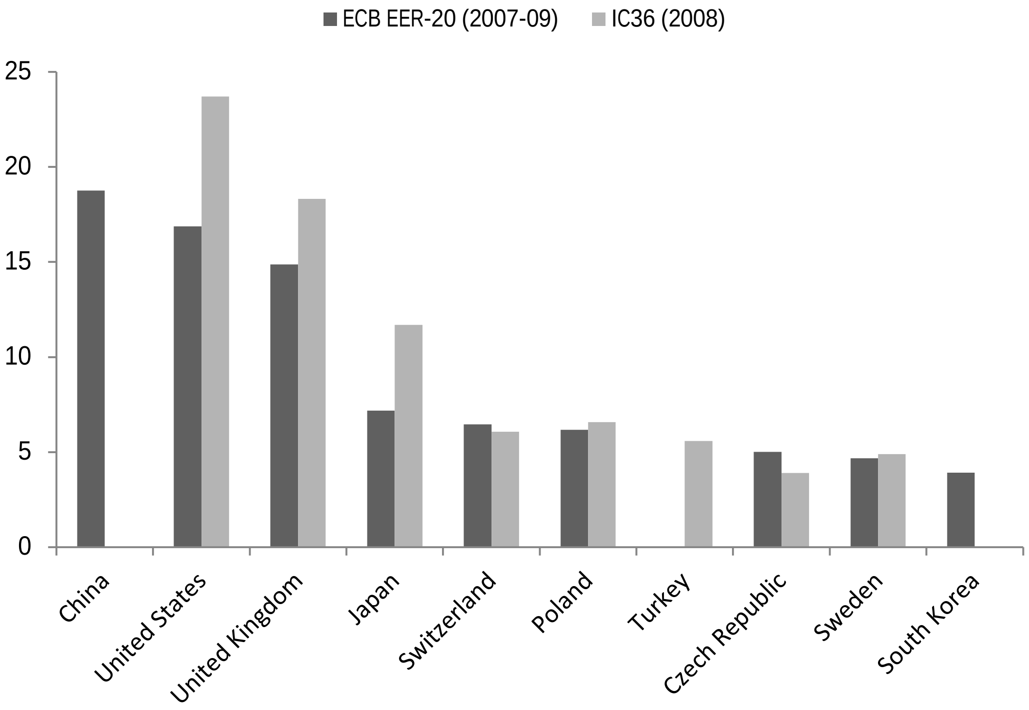
EER-20 and EER-40 groups of trading partners do not include euro area member states. These are included in the corresponding groups for the calculation of HCIs-20 and HCIs-40, which represent the harmonised competitiveness indicators for individual euro area countries.

Chart 1 compares the trade weights of the ten largest trading partners of the narrow groups as calculated by the ECB and the European Commission (EC). Both include, besides EU Member States, major industrialised countries and emerging economies (19 and 20 partner countries for the EC and ECB, respectively). It is however noticeable that China is not included in the EC's basket, while it is the largest trading partner of the euro area since 2007 based on the ECB index. Furthermore, South Korea is not featured in the European Commission's index, while Turkey is. The scoreboard indicators of the EC (see Section 3.2) are based on this group of trading partners. This different composition of the basket explains higher weights (in absolute term) assigned in the EC indicators for the remaining partners such as the United States and United Kingdom.

Chart 1

Top 10 trading partners of the euro area in the narrow EER groups

(percentages)



Note:

ECB (2007-2009) are trade weights in the period indicated referring to a group of 20 trading partners.

IC36 (2008) are trade weights of the European Commission in 2008 referring to a group of 19 trading partners.

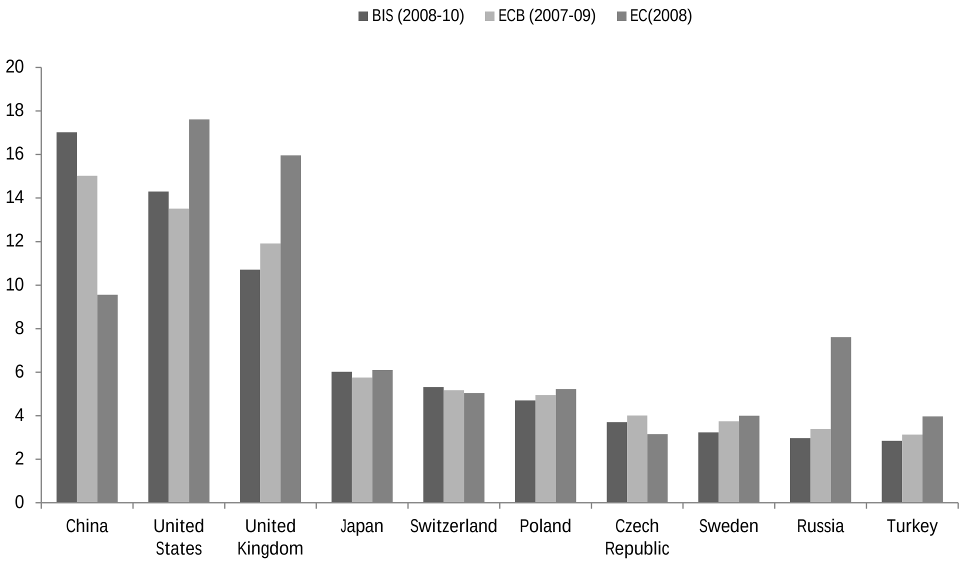
Data shown in Chart 2 refer to the larger groups of trading partners for the euro area. To account also for smaller partners (in terms of trade) the BIS calculates the EERs of the euro area vis-à-vis a group of 42 partner countries (subtracting the euro area Member States from the group of 61 partners), while the ECB calculates EERs for the euro area vis-à-vis 40 partner countries. Finally, the EC includes 24 partner countries in its broad indicator for the euro area.

China is ranked to be the biggest competitor for the euro area according to the ECB and BIS. In the EC indicator, China only is the third largest competitor following the United States and United Kingdom, as the EC indicator does not reflect import trade weights. Moreover, it is striking that Russia is the fourth largest trading partner according to the EC, while it has the ninth position in the BIS and ECB indices.

Chart 2

Top 10 trading partners of the euro area in the broad EER groups

(percentages)



Note:

BIS (2008-2010) are trade weights in the period indicated referring to a group of 42 trading partners.

ECB (2007-2009) are trade weights in the period indicated referring to a group of 40 trading partners.

EC (2008) are trade weights of the European Commission in 2008 referring to a group of 24 trading partners.

2.3 Weighting method

Generally, EER indicators based on Turner and Van't dack (1993) gauge three types of competition between a domestic country *i* and a foreign country *j*:

- The import competition between countries *i* and *j* in market *i*;
- The export competition between countries *i* and *j* in market *j*;
- The competition of countries *i* and *j* in all other markets.

The overall weight of a partner country considered in a group of trading partners is obtained by summing up the weighted average of import and export weights. Calculating the weight for imports is straightforward, as it consists of the simple weight of a partner relative to all partners' imports.

It is different for the export weights, because the method generally applied includes the competition arising from a partner's domestic production and third market effects. Accounting for third market effect is important, as is for instance demonstrated by the development of the euro area's trade with China (see Schmitz et al., 2012). In the ECB indices, China is the largest trading partner of the euro area in the period 2007-09, also because of the competition between the euro area and China in all other markets. Hence, on the one hand, the euro area faces competition from Chinese manufacturers on the Chinese market; while on the other hand, competition between euro area and Chinese exporters takes place on third markets.

The third market effect is taken into account in all EERs discussed in this paper. However, import competition between two countries in the domestic market is not considered in the EC's EERs.

2.4 Updates of trade weights

Both the ECB and BIS use three-year non-overlapping averages of trade data which are updated every three years, while the European Commission updates the weights on an annual basis using yearly data, with the latest weights available up to 2008. Finally, the IMF does not update the weights at a regular frequency, but at infrequent intervals.

In particular for the ECB, updates of trade weights for the euro area occur in two instances. One is the enlargement of the euro area to new member countries, which involves the enlargement of the basket of currencies in the narrow and larger groups; the second case is the regular updating of the underlying trade weights.

In the first case, new codes are assigned to the narrow and broad groups of trading partners, which are revised backwards, with the exception of series accounting for the historical development of the euro area;[8] for the Harmonised Competitiveness Indicators (HCIs) calculated for single euro area countries, the composition of the groups remain stable, as the basket includes all euro area member states separately. Therefore, the composition of the narrow group of the HCI counts 37 countries (57 countries for the broad group), whether or not a new country joins the euro area.[9] In the case of regular updates of manufacturing trade data, however, the time series changes over the entire period due to data revisions and chain-linking.

2.5 Deflators

The deflators used for the calculation of the real effective exchange rates as shown in Table 3, widen the scope of the indicators to measure countries' price and cost competitiveness. Both the European Commission and ECB calculate real effective exchange rates, based on:

(1) Consumer price (CPI and HICP where available);

(2) the GDP deflator (PGDP);

(3) Unit Labour Costs in the total economy (ULCE or ULCT); and

(4) Unit Labour Costs in the manufacturing sector (ULCM).

The main feature of these deflators is the underlying harmonisation of concepts. For example, for all European Union country data the Harmonised Index of Consumer Prices is used, while similar national consumer price indices are employed for all other trading partners. GDP deflators are derived from quarterly national accounts. Unit labour costs are calculated as the ratio of the compensation per employee and labour productivity, with labour productivity measured as GDP at constant prices divided by the total number of employees. The European Commission also provides data based on price deflator of exports of goods and services (PX), while Producer prices-based (PPI) EERs are available for the ECB indicators of the narrow-group. BIS indicators are based on CPI deflators, while the IMF calculates CPI deflated EERs for a broad group and ULC-deflated EERs for a narrow set of industrial countries.

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8 These series change only from the date of the enlargement and are not revised backwards due to the changed composition.

9 Currently, the narrow group for the HCI includes 17 euro area member states and 20 non euro area trading partners. The broad group for the HCI extends the number of countries to 40 non-euro area partners.

Table 3

Overview of deflators

Institution	ECB/European Commission		BIS	IMF	
	Monthly	Quarterly	Monthly	Monthly	Quarterly
	narrow/broad	narrow/broad	narrow/broad	broad	narrow
Deflators	CPI, PPI*	GDP deflator, ULCM, ULCE/ULCT, PX**	CPI	CPI	ULC

* Only ECB

** Only European Commission

3. Quantitative evidence

In this section, we analyse to what extent there are differences in the effective exchange rate indicators published by different international institutions and which methodological features drive those differences. Given the distinction between groups of trading partners, we perform two separate comparisons of available EERs: for the broad and for the smaller groups of trading partners.

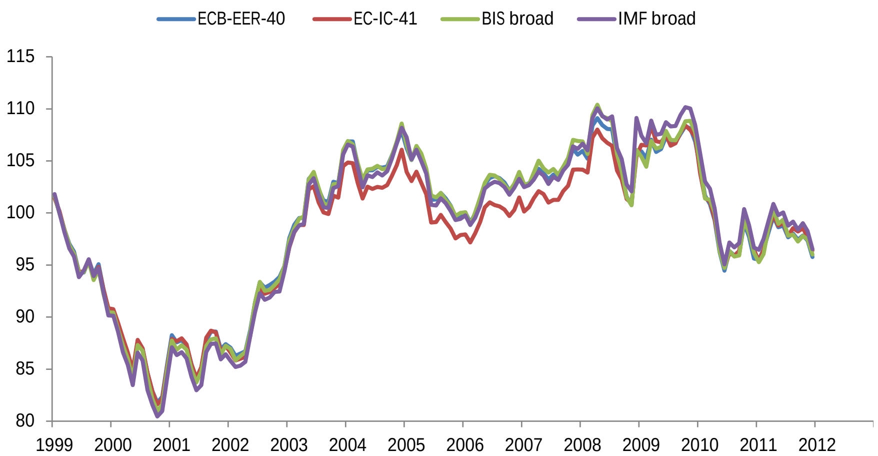
3.1 Euro effective exchange rates

We compare REERs for broad groups of trading partners based on CPI deflators. This analysis is particularly interesting because it allows explaining the differences of methodologies between different data sources. Euro real effective exchange rates deflated by consumer price indices are visible in Chart 3, while the cross-correlations over the period January 1999 until December 2011 are shown in Table 4. In general there is a very high correlation between these indices, the highest being between the ECB and BIS indices, which are also most comparable from a methodological point of view. In the period from 2004 until 2009, one can observe a slightly lower level of the index computed by the European Commission, which most likely arises from the fact that less partner countries are included in this index.

Chart 3

Selected euro real effective exchange rates deflated by CPI

(January 1999–December 2011)



Source: ECB, European Commission, BIS, IMF.

Note: A decline reflects a depreciation of the euro, while a rise shows an appreciation of the euro.

Table 4

Correlation matrix of broad REER-CPI indicators

(January 1999–December 2011)

	ECB-EER-40	IC41	B61	IMF broad
ECB-EER-40	100.00%			
IC41	99.08%	100.00%		
B61	99.74%	98.99%	100.00%	
IMF broad	99.49%	99.65%	99.22%	100.00%

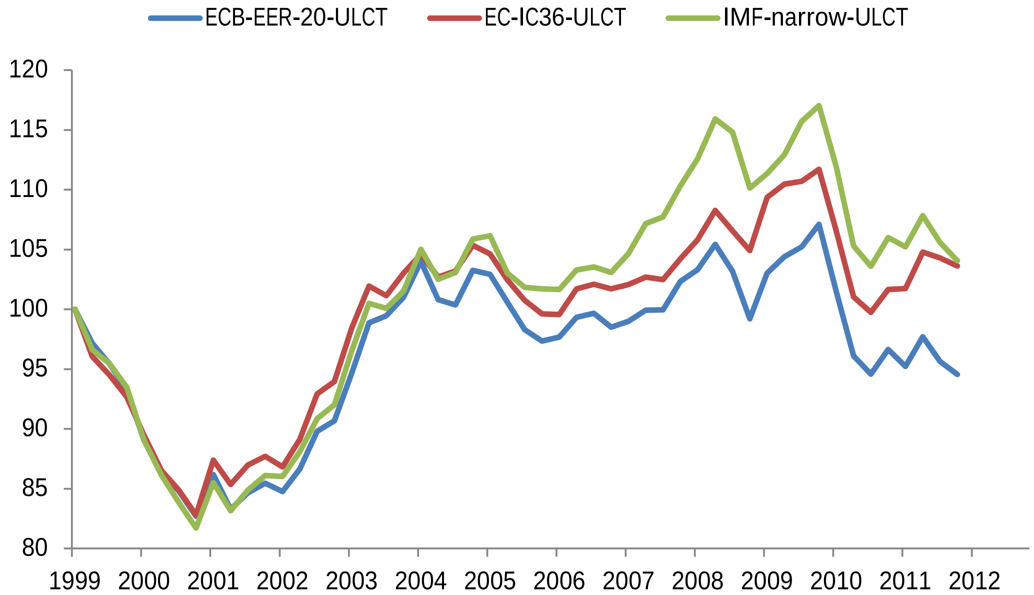
Source: BIS, ECB, European Commission, IMF.

More heterogeneity is noticeable among REERs for smaller groups of trading partners, where unit labour costs (ULCT) in the total economy are used as the deflator (Chart 4). In fact, over the period January 1999 to December 2011, a divergence of the indices is visible from 2004 onwards. In December 2011 the ECB index reaches the lowest value among the three indices considered, thus indicating a real depreciation of the euro since 1999, while the other two indices point to a real appreciation of the euro. Again, the explanation lies in the trading partners considered in this group of countries, since the ECB index also includes emerging market economies where unit labour costs tend to rise faster than in advanced economies.

Chart 4

Selected euro real effective exchange rates deflated by ULCT

(January 1999–December 2011)



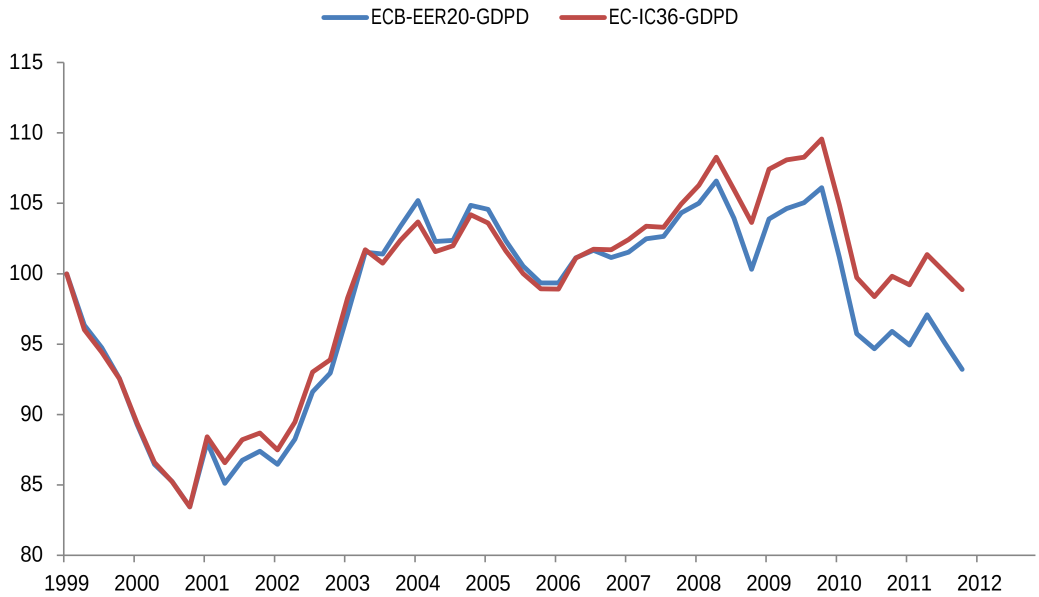
Sources: ECB, European Commission, IMF.

Note: A decline reflects a depreciation of the euro, while a rise shows an appreciation of the euro.

Chart 5

Selected euro real effective exchange rates deflated by GDP deflator

(January 1999–December 2011)



Sources: ECB, European Commission.

Note: A decline reflects a depreciation of the euro, while a rise shows an appreciation of the euro.

A similar pattern emerges when comparing euro real effective exchanges rates deflated by GDP deflators as computed by the ECB and European Commission (Chart 5) and when unit labour costs of the manufacturing sector are used as deflators (not shown in a chart).

3.2 Scoreboard indicators for euro area member states

In this section, we follow the approach of the European Commission when calculating the scoreboard of the EU's Macroeconomic Imbalance Procedure (see European Commission, 2012). In the scoreboard, percentage changes in the real effective exchange rates (deflated by CPI) of EU countries over a three year period are reported. The latest version of the scoreboard in the European Commission's Alert Mechanism Report (2012) covers the period 2007 until 2010, while in Table 5 we focus on the most recent period 2008 to 2011. The benchmark used in the scoreboard is the European Commission's IC36 index (in the first column of Table 5), which is the smaller of the EC's trading partner groups. We compare this indicator with various CPI deflated REERs for the euro area Member States (Table 5).

Looking at Table 5, a few regularities emerge: the three-year percentage change based on the IC36 indicator shows – for the majority of countries considered – the lowest values (if negative) and the highest values (if positive) across all indicators displayed. Moving to a wider group of trading partners (e.g. the IC41) reveals more negative or less positive numbers, respectively. The same pattern also emerges when moving from the ECB's smaller to the larger group of trading partners. For instance, Germany shows a value of minus 3.8% based on the IC36 index, whereas it exceeds minus 5% in the ECB-40 and BIS (broad) indices. The positive value for the Slovak Republic is highest in IC36, and it is also higher in the EER-20 than in EER-40. This implies that differences in the composition of trading partner groups have a consistent impact on the resulting indicators.

Table 5

Scoreboard indicators for euro area Member States, 2008-11

(percentages)

	IC36	ECB-20	ECB-40	IC41	BIS broad	IMF
Austria	-1.1	-1.6	-2.1	-1.9	-2.4	-1.6
Cyprus	-0.7	-1.9	-2.5	-1.7	-2.8	-1.7
Estonia	0.8	0.7	0.0	-0.6	-0.6	NA
Finland	-1.2	-2.0	-2.9	-2.8	-5.1	-4.4
France	-3.3	-3.6	-4.3	-4.1	-5.0	-3.5
Germany	-3.8	-4.8	-5.5	-4.6	-6.0	-4.7
Greece	2.9	1.2	0.8	1.9	1.1	1.9
Ireland	-9.1	-10.0	-10.5	-9.7	-11.5	-11.1
Italy	-2.1	-2.8	-3.6	-3.1	-3.7	-2.6
Malta	-3.8	-2.8	-3.4	-3.8	-3.8	-3.4
Netherlands	-1.7	-4.2	-4.9	-2.5	-4.5	-2.2
Portugal	-2.2	-2.2	-2.8	-2.9	-2.5	-1.9
Slovak Republic	4.2	3.0	2.5	3.3	2.7	4.0
Slovenia	-0.5	-1.6	-1.9	-1.9	-2.5	NA
Spain	-1.4	-2.3	-2.9	-2.4	-3.3	-1.7

Sources: own calculations based on BIS, ECB, European Commission and IMF.

Note: Scoreboard indicators calculated as percentage change of average REER in year 2011 relative to average REER in year 2008. A negative value reflects a gain in competitiveness, while a positive value shows a loss in competitiveness.

In Table 6, differences in the scoreboard-approach based indicators are highlighted in a more systematic way. We compute scoreboard indicators as in Table 5, but at a yearly frequency starting from 2002 (i.e the three-year change between 1999 and 2002). Subsequently, we determine differences (in absolute value terms) between various indicators and report the average difference for each country and overall.

The difference between ECB and EC EERs for the smaller group amounts to, on average, 0.9 percentage points (ECB-20 vis-à-vis IC36). A similar result is obtained when comparing the smaller with the larger group of partners for the indicators of the European Commission (IC36 vis-à-vis IC41). In contrast, the difference between the two ECB indicators (ECB-20 and ECB-40), as well as the difference between the ECB-40 and the BIS-B61 – which both follow a very similar methodology – reach a value of 0.6. This suggests that the inclusion of the most important trading partners for the euro area such as China (which is not considered in the IC36 index) has a sizeable impact on the indicators. The largest difference with the other indicators is visible for the IMF (1.2 percentage points in comparison to the ECB-40) which might be driven by the fact that the IMF updates its trade weights less frequently and considers a broader trade basis and set of partner countries.

Table 6

Differences in scoreboard indicators 2002-2011

(averages, absolute value)

	ECB-20 vs IC36	EC36 vs IC41	ECB-20 vs ECB-40	ECB-40 vs BIS broad	ECB-40 vs IMF
Austria	0.5	0.7	0.4	0.5	1.0
Cyprus	1.1	1.1	0.5	0.9	2.0
Estonia	1.0	1.7	1.0	0.5	NA
Finland	0.5	1.6	1.1	0.9	1.2
France	0.6	0.8	0.6	0.4	0.8
Germany	0.9	0.9	0.7	0.4	0.6
Greece	1.1	1.0	0.6	0.4	0.7
Ireland	1.0	0.6	0.6	1.5	1.8
Italy	0.7	0.9	0.7	0.3	0.6
Malta	1.1	0.8	0.6	0.9	1.5
Netherlands	1.9	0.6	0.7	0.6	1.8
Portugal	0.7	0.6	0.5	0.2	0.9
Slovak Republic	1.0	0.7	0.4	1.1	1.7
Slovenia	0.5	1.4	0.7	0.5	NA
Spain	0.7	0.8	0.7	0.3	1.1
Overall	0.89	0.94	0.64	0.63	1.22

Sources: own calculations based on BIS, ECB, European Commission and IMF.

Note: Scoreboard indicators calculated as percentage change of average REER in year t relative to average REER in year t minus 3

Equivalent results (however with larger differences due to more sizeable fluctuations in the indices) are found if we consider indices deflated by ULCT or GDP deflators (not presented in a table). All in all, Table 6 reveals that there are rather persistent differences between various indicators. While these appear to be small in general, it would still be desirable to follow the same methodology in constructing these indicators – in particular as regards the composition of trading partners groups.

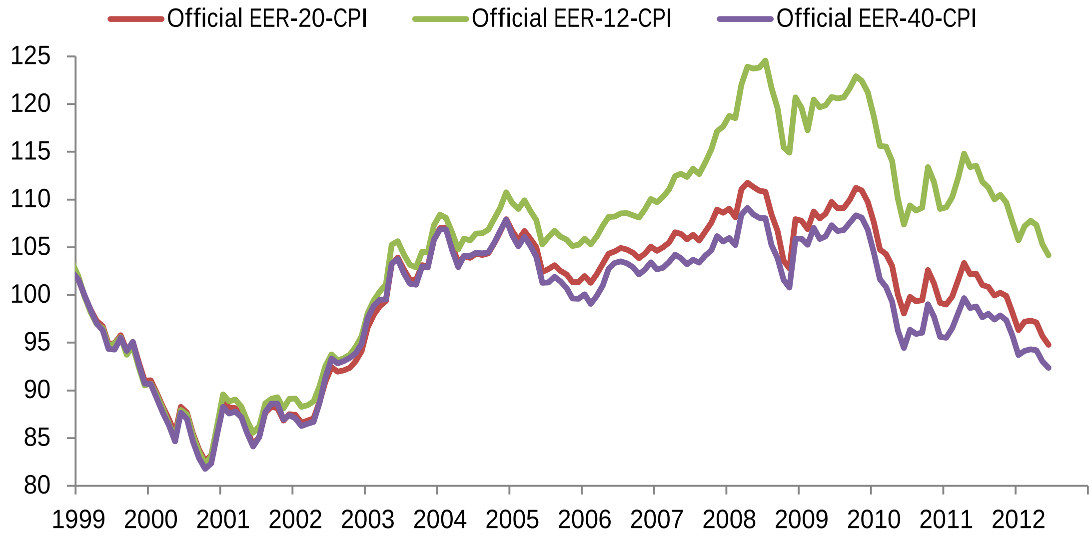
3.3 Effective exchange rates simulations

To help identifying sources of divergences between different indices, we simulate effective exchange rates with different sets of underlying trade weights based on ECB methodologies and calculations. Chart 6 reveals that the number of trading partners matters. In particular, moving from 12 trading partners to 20 trading partners (thus including more emerging market economies, most noticeable China) leads to substantial changes in the indices. As a large proportion of euro area trade is already covered by the EER-20 group (about 80%), a further move to the EER-40 groups does not have a major impact on the indices.

Chart 6

ECB euro real effective exchange rates deflated by CPI

(January 1999–May 2012)



Source: ECB.

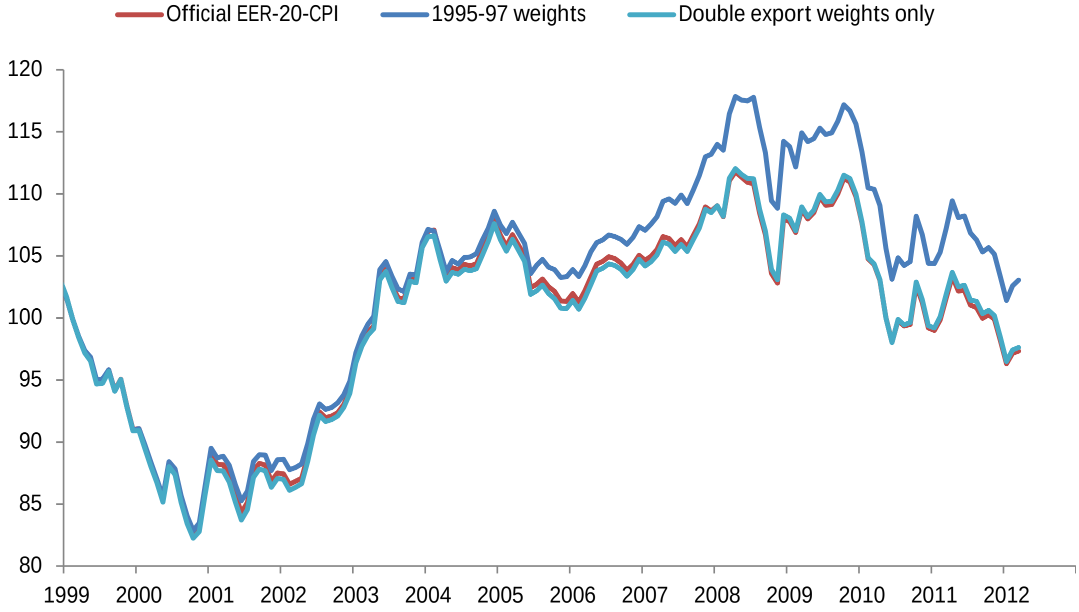
In Chart 7, we isolate changes in the methodology regarding trade weights. For the EER-20 indicators deflated by CPI, we first exclude import weights (hence we only consider double export weights, following the European Commission's methodology). We observe that this has only a very marginal impact on the REER index, as in general those countries that are the main export competitors for the euro area also are important sources of imports (Schmitz et al., 2012).

Second, we present evidence on the importance of updating trade weights regularly. To this end, we construct an index that is based over the entire time horizon on the trade weights of the period 1995-97. Chart 7 shows a considerable divergence of this index from the official ECB EER-20 index since 2005. The deviation seems to be driven by the shift in trade weights towards emerging market economies and non-euro area EU Member States (most prominently, the rise of China, as shown in Schmitz et al., 2012).

Chart 7

ECB euro real effective exchange rates (EER-20) deflated by CPI, various trade weights

(January 1999–March 2012)

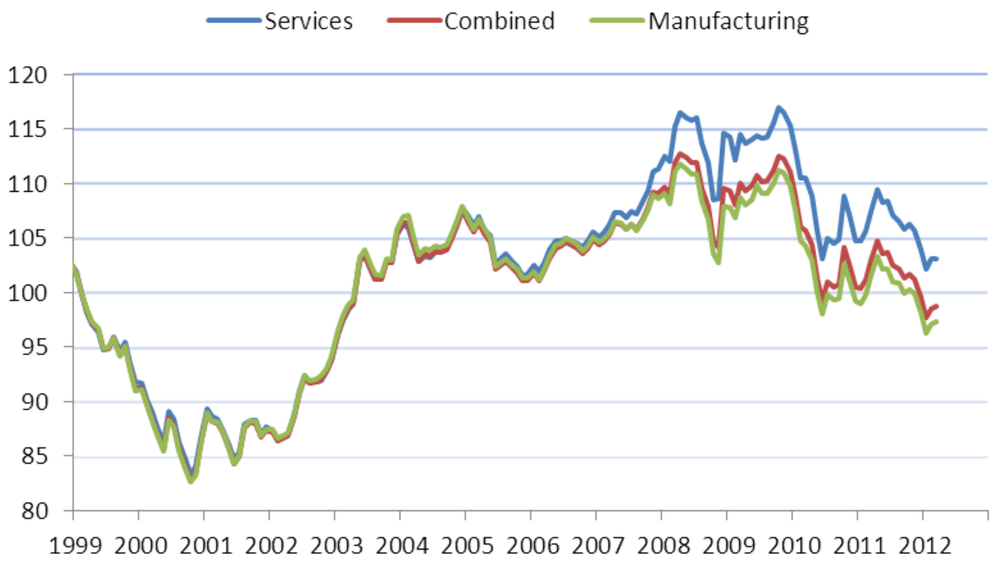


Source: ECB and own calculations.

Chart 8

Real euro EERs deflated by consumer price indices, different trade weights

(January 1999-March 2012)



Source: ECB and Schmitz (2012).

Note: A downward movement reflects a depreciation of the euro, while an upward movement indicates an appreciation.

Chart 8 contains three euro real effective exchange rates deflated by CPI: the official REER-20 (based on manufacturing trade weights) is compared to the same indicator based on trade in services and to an index combing both sets of trade weights.[10] In the period since January 1999, the services based REER indicates a loss in price competitiveness of about 3%, while the manufacturing (official) ECB index indicates a competitiveness gain of 2.7%. The combined index indicates a slight improvement in competitiveness by 1.3%.

Including trade in services in the weighting scheme leads to difference in the trade weights (see Schmitz, 2012). For example, the United States and United Kingdom have a much higher weight in services compared to manufacturing trade, while the opposite is true for China. These patterns have an impact on the developments of real effective exchange rate indicators. This is in particular true at the individual Member State level where services trade make up a dominant share of total trade for some countries.

4. Conclusion

This paper highlights different methodological approaches to calculating REERs. In general, there is a broad consensus on how to construct these indicators. However, there are observable differences in the REER indicators due to their underlying methodologies. In particular, the choice of partner countries is heterogeneous among indicators published for the euro area. As a consequence, certain events, such as the latest developments of trade with China, taking into account the competition on third markets and China's important role as an exporter to the euro area, is not reflected in all available indicators. Furthermore, trade data used in the weighting schemes are not harmonised across different institutions. Finally, the development of countries' competitiveness may not reflect the most up-to data due to different updating schedules.

Consequently, exchange rate-based competitiveness indicators as computed by different institutions may not always deliver the same policy messages. Our analysis supports a further move towards harmonisation of methodologies, in particular as regards the composition of trading partners groups. We advocate the inclusion of those countries in the indices that represent the major trading partners of the euro area according to the most updated data.

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[10] These are based on Schmitz (2012).

Weighted Average Relative Price (WARP)

A Supplement to Standard Real Effective Exchange Rates (REERs)[1]

Charles Thomas and Jaime Marquez[2]

1. Introduction and summary

This paper describes our weighted average relative price (WARP).[3] The staff in the International Finance Division of the Federal Reserve Board has found it to be a useful supplement to the Board's standard real effective exchange rate (REER) measures. The idea behind the WARP is very simple: It attempts to measure the level of US prices relative to the prices of those countries that either trade directly with the United States or compete against US exporters in third markets.[4] Later we describe in detail how this measure differs from standard real effective exchange rates (REERs), but first a little motivation is useful.

As shown in Figure 1, between 1970 and 1985, the share of US trade that was with emerging market economies (EMEs) stayed fairly steady at about 25 per cent. Starting in the mid-eighties, as these economies became more integrated in the global trade network, their share in US trade started to grow to where it is now over 50 per cent.

Since many EMEs had lower cost structures than the developed economies, this meant that a larger share of US and world trade was with relatively low-cost producers. We could see the effects of this on import prices and the pattern of trade, and it clearly had implications for US external balances and employment. However, the standard REERs, were not signalling any secular change in real exchange rates. There was no signal because the REERs are not designed to pick up this kind of secular change. The world was seeing a shift in the location of productive capacity. As a first order event, this was a change in quantities, not prices, and the REERs are designed to pick up only price changes. The point of the WARP is to capture the way shifting quantities (or productive capacities) interact with established differences in price levels to affect competitiveness.

In the next section we review how REERs are constructed and contrast them with the WARP. Since the WARP uses the purchasing power parity (PPP) exchange rates computed by the World Bank's International Comparison Project (ICP), this requires a bit of a detour into how PPPs are put together. We then compare the WARP to standard REERs and show that indeed it has a secular trend that the REERs do not. The note closes with a few examples of where we have used the WARP and discusses how it relates to notions of competitiveness.

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2 Federal Reserve Board of Governors.

3 See Thomas et al. (2008).

4 We are by no means the first to think of this or to implement it. Early and excellent work on this was done at the BIS by Turner and Van't dack (1993).

2. REERs vs. WARP: Their construction

2.1 REERs

All REERs for the United States start with a set of bilateral market exchange rates against the dollar E(j/$,t). As given in equation (1), these are then adjusted for relative price movements in the two economies, typically using the ratio of a US price index to a price index for country *j*:

(1) $$q_{j,t} = \frac{PI_{us,t}}{PI_{j,t}} \cdot E_{\frac{j}{\$},t}$$

These $q_{j,t}$ are bilateral real exchange rates against the dollar and an increase represents a real appreciation of the US dollar.

Of course, the price indexes (the PIs) are just that, price indexes, so their ratio in a given time period has no intrinsic meaning. The information content in the ratio is in how it moves over time.

From these bilateral measures, the REER is usually constructed as a chain index with time-varying trade weights, as follows:

(2) $$\frac{Q_t^{CR}}{Q_{t-1}^{CR}} = \prod_{j=1}^{J} \left(\frac{q_{j,t}}{q_{j,t-1}}\right)^{\omega_{j,t}}$$

where $\omega_{j,t}$ is a simple trade weight or some other measure of the relative importance of country *j* in our trade at time *t* and *J* is the number of countries. The level of Q_t^{CR} is set equal to 100 in some arbitrary period and the other periods are solved for recursively.

By using period-to-period ratio changes in the $q_{j,t}$, we get around the fact that the levels of the price indexes, and hence the *q*'s, have no intrinsic meaning. We only use the information content in their changes over a given period—say a month or a quarter. Of course there are many price indexes one can choose from—CPIs, PPIs, unit labour costs, etc., and there are many ways to construct the trade weights. Given these choices there are many ways to construct chained REERs.

One can also construct a REER by aggregating levels, that is, without chaining. For example, we could set all price indexes, $PI_{j,t}$, including those for the United States, to equal one in some base period, call it *z*; index the exchange rates to one in the same period; and then construct the REER as an arithmetic or geometric average of the ratios of the normalized US index to the normalized foreign indexes. The geometric one is more common and is constructed via (3)-(5):

(3) $$PI'_{j,t} = \frac{PI_{j,t}}{PI_{j,z}}, \qquad E'_{\frac{j}{\$},t} = \frac{E_{\frac{j}{\$},t}}{E_{\frac{j}{\$},z}}$$

(4) $$q'_{j,t} = \frac{PI'_{US,t}}{PI'_{j,z}} \cdot E'_{\frac{j}{\$},t}$$

(5) $$Q_t^{LR} = \prod_{j=1}^{J} \left(q'_{j,t}\right)^{\omega_{j,t}}$$

These measures give the weighted change in the bilateral real rates since the base period.

There are two problems with these: First, the value of Q_t^{LR} depends on what base period, *z*, you choose. So you need a good reason to pick one base period over another. Second, it still does not fully capture the quantity effects discussed earlier, unless the low-cost producers became low-cost sometime after the base period.

To see why none of these REERs address the quantity effect, we run the following thought experiment: Suppose the United States trades with many countries, some with relatively high prices and some with relatively low prices. To keep things simple we suppose inflation rates are the same everywhere and nominal exchange rates are fixed. So all the $q_{j,t}$ are constant during our experiment. Now, as happened in the 1980s, we suppose the low-price economies grow faster than the rest, greatly expand their productive capacities, and start producing more goods for international trade.

What happens to the REERs? The chained REERs do not move. The weights change, but because there is no period-to-period change in the bilateral price ratios, the aggregate measure does not change. What about the REERs constructed in levels via equations (3)-(5)? These aggregates may move as the weights move because the ratios that we are aggregating need not all be equal to one over this period. But the amount and direction by which the aggregates move will depend entirely on what happened between the base period, *z*, (when all the $q'_{j,t}$ ratios were set to one) and the starting date of our thought experiment.

2.2 WARP

As do the REERs, the WARP starts with market exchange rates and measures of US prices and foreign prices. The difference in the WARP is that it uses measures of the US price *level* relative to the foreign price *level* and not relative price *indexes*. These measures of relative price levels come from the purchasing power parity (PPP) exchange rates constructed by the International Comparison Project (ICP). Most economists have some familiarity with PPPs, but given the central role they play in WARP, we take a detour here to describe how they are constructed.

How the PPPs are constructed

The ICP first collects spending and price data for a large set of goods and services that are as comparable as possible across countries. In greatly simplified terms, it then sets up a large set of simultaneous equations.[5]

For every product *n* that it collects data on, it posits that there is an average "world price," π_n. This world price is in terms of a fictional currency called the "international dollar." The world price is an average of individual countries' prices for good *n*, where the weight given to each country is its share in the world's consumption of that good. If there are N goods in the world, then there N equations that look like this:

(6) $$\pi_n = \sum_{j=1}^{J}\left(\frac{P_{n,j}}{PPP_j}\right)\cdot\left(\frac{Y_{n,j}}{\sum_j^J(Y_{n,j})}\right) \quad n=1\ldots N$$

Of course to do this we needed an exchange rate to convert country *j*'s local currency into international dollars. These are the PPP exchange rates. Where do these PPPs come from? For each country *j*, its PPP exchange rate is such that if one takes the nominal income of that country in its local currency and converts that income into international dollars at the PPP, then the value of that income in international dollars would be just sufficient to buy the country's expenditure basket at world prices. That is:

(7) $$\sum_{n=1}^{N}\frac{P_{n,j}\cdot Y_{n,j}}{PPP_j} = \sum_{n=1}^{N}\left(\pi_n \cdot Y_{n,j}\right)$$ and if we rearrange this, we have

(8) $$PPP_j = \frac{\sum_{n=1}^{N}\left(P_{n,j}\cdot Y_{n,j}\right)}{\sum_{n=1}^{N}\left(\pi_n\cdot Y_{n,j}\right)} \quad j=1\ldots J$$

[5] Our presentation follows closely that of Gulde and Schulze-Ghattas (1993); see Kravis, Heston, Summers (1978, 1982) for additional details.

Thus the PPP is a weighted average of local currency prices divided by a weighted average of world prices (in international dollars) where the weights are country *j*'s expenditure shares.

This system has J+N equations and just as many unknowns. However, only J+N-1 of them are independent.[6] To remove this indeterminacy, the ICP sets the exchange rate between the US dollar and the international dollar to one.[7] This means the PPP for the United States is one and we have

$$(9) \qquad 1 = \frac{\sum_{n=1}^{N}(P_{n,US} \cdot Y_{n,US})}{\sum_{n=1}^{N}(\pi_n \cdot Y_{n,US})}.$$

If we divide (9) by (8) and multiply both sides by country j's market exchange rate against the US dollar we have

$$(10) \qquad \frac{E_{\frac{j}{\$}}}{PPP_j} = \frac{\left(\frac{\sum_{n=1}^{N}(P_{n,US} \cdot Y_{n,US})}{\sum_{n=1}^{N}(\pi_n \cdot Y_{n,US})}\right)}{\left(\frac{\sum_{n=1}^{N}(P_{n,j} \cdot Y_{n,j})\left(\frac{1}{E_{\frac{j}{\$}}}\right)}{\sum_{n=1}^{N}(\pi_n \cdot Y_{n,j})}\right)}$$

Focusing on the right hand side of (10), we see the numerator is the ratio of US prices in dollars to world prices in international dollars. The denominator is the ratio of foreign prices—converted to dollars using the market exchange rate—to world prices in international dollars. This leaves us with the ratio of US prices to foreign prices when both are expressed in a common currency using market exchange rates.

Aggregating the relative price levels to WARP:

Given that we now have bilateral measures that capture the level of US prices relative to the level of foreign prices when both are expressed in a common currency (the left hand side of (10)), we just need to aggregate them to a measure of US prices relative to our trading partners' prices. For this, we use geometric aggregation as follows:

$$(11) \qquad q''_{\mathrm{j,t}} = \frac{1}{PPP_{j,t}} \cdot E_{\frac{j}{\$},t},$$

$$(12) \qquad Q_t^W = \prod_{j=1}^{J}\left(\mathrm{q}''_{\mathrm{j,t}}\right)^{\omega_{j,t}}$$

We note that the level of Q_t^W has a very natural interpretation as the ratio of US prices to foreign prices. Thus a value of 1.5 implies that US prices are 50 per cent higher than the average of our trading partners' prices.

3. REERs vs. WARP: Their behaviour over time

This section compares the movement of the WARP to several REERs over the past several decades. Before comparing the measures, it is useful to look at the movements of what goes into them. As noted earlier, and shown in Figure 1, the share of US trade done with emerging

[6] To see this we note that for any solution we can multiply all the international prices by an arbitrary constant and divide the PPPs by that same constant and still have a solution for all the equations in (6) and (8).

[7] That the ICP chooses to eliminate the world price/exchange rate indeterminacy by setting the PPP for the US to one is convenient, but it in no way affects derived measures of relative prices or income.

market economies (EMEs) has increased dramatically since the early 1980s.[8] This is one key requirement for there to be a difference between the WARP and the REERs. The other key requirement is that there be a significant difference in the price levels across our trading partners. Figure 2 illustrates that this second requirement is also fulfilled. The dashed blue line plots the ratio of US prices to the prices of our advanced foreign economy (AFE) trading partners. This ratio was near 1.3 in early 1985 when the dollar was at its peak, but has since been in the range of 1.1 to 0.9. That is, by this measure US prices were roughly 30 percent above our AFE trading partners' prices in 1985, but have since been roughly equal to theirs plus or minus 10 per cent. The solid green line shows the ratio of US prices to those of our emerging market economy (EME) trading partners. It has also moved with the large swings in the dollar, but it has generally been in the neighbourhood of 1.7, implying that US prices have been roughly 70 per cent higher than EME prices.

Figure 3 shows what happens when we put these pieces together. The solid green line is the WARP when it includes the prices of all our major trading partners. The other lines plot three standard REERs—the Federal Reserve Board's Broad Real Dollar (solid black), the IMF's REER for the US dollar (dashed red) and the BIS's REER for the dollar (boxed blue). The three REERs have been re-indexed so they all equal the value of the WARP in 1994Q1—the first quarter for which we have an observation for the BIS measure.

There are two points to take away from this figure. The first is how closely the three REERs track each other over the period. Compared to the FRB's REER, the IMF's measure shows somewhat more appreciation of the dollar in the early 1980s, but since 1985 these two REERs have moved nearly in lock step. The same is true for the BIS measure. Since its start in 1994, it has moved almost exactly with other two REERs.

The second point, and the reason for writing this note, is that the WARP does not follow the other measures over the whole period. The WARP tracks the REERs fairly closely between 1986 and 1998, but starting in the late 1990s, the WARP shows much more real dollar appreciation. In fact, if we compare the latest value for the WARP with its value in the early 1990s, it shows a noticeable real appreciation. In contrast, the REERs show a noticeable depreciation over the same period.

We do not take the stand that the WARP is telling the 'true' story and the REERs are not. There is no reason to. Researchers have many measures to choose among and the choice of which one measure, or set of measures, to use will be determined by what is most useful for the question at hand. The WARP is designed to pick up a feature of the trade landscape that the REERs cannot, and it seems to do that. As such, at a minimum, we consider it a useful supplement to the REERs.

4. Applications

This section reports on some applications of the WARP. Since few others have been using the WARP, the section is embarrassingly self-referential. As noted above the idea of using PPPs to get at level price differences is not new to us; Turner and Van't dack (1993) discuss the idea. More recently Nickell (2005) uses a similar construct to investigate why UK inflation was so low in the early 2000's.

Our first applications focused on the implications of using WARP for modelling US international trade with an emphasis on the responsiveness of US trade to economic activity

[8] The trade weights used throughout this paper are those constructed at the Federal Reserve Board for its Broad Real Exchange Rate Index and related measures. Their construction is described in Leahy (1998).

(see Thomas et al. 2008 and 2009a) and the response of import prices to changes in exchange rates (Thomas et al. 2009a). We found that using WARP confers a distinct advantage in terms of coefficient magnitudes and out-of-sample forecasts relative to the conventionally measured REER. For most work at the Federal Reserve Board the WARP has not displaced the standard REERs, but is being used alongside of them. This is the same approach taken by the IMF when it included the WARP in its 2012 Article IV consultation for the United States (IMF, 2012).

While it is clear that the REER and WARP are quite different for the United States, it is natural to ask if there is such a large difference for other countries. In a forthcoming volume from the World Bank (Thomas et al. 2011), we compute WARPs for many countries, compare them to their REERs, and then decompose the differences into the contributions from price level differences and changes in trade shares.

That study also uses disaggregate PPP data provided by the ICP to examine how sensitive such measures are to the inclusion of non-tradable goods and services. For 2005, when all goods and services prices are considered, the US WARP shows US prices to be more than 20 per cent above those of its trading partners. However, when we restrict ourselves to looking only at goods and services that are generally traded internationally, there is little difference between US prices and those of its trading partners. As discussed below, we do not view this as an argument for excluding non-tradables. Because we expect international trade to eliminate large differences in traded goods prices, we expect the fundamental drivers of competitiveness and trade to be largely determined by the prices of non-tradables.

Finally, recognizing the spectacular increase in China's participation in world trade, we looked at the behaviour of China's WARP in Thomas et al. (2009b, 2009c). As expected, we find that China's prices are indeed well below the average of its trading partners. However, we also find that China's WARP has been rising over the same time that China's growing participation in world trade has meant that it has been pushing up its trading partners' WARPs.

This China example illustrates an important difference between the WARPs and the REERs. With the REERs, as with bilateral exchange rates, if some currencies show an appreciation, some others must be showing a depreciation. The WARPs, do not have this property. As a developing country grows quickly its prices may rise faster than its trading partners', imparting an upward drift to the developing country's WARP. Yet, if the developing country's prices remain at a level below its trading partners', and the developing country's share in world trade increases, increased trade with this country can impart an upward drift to the WARPs of its trading partners. Thus it is possible for all WARPs to move in the same direction at once.

5. On competitiveness and final thoughts

This brings us to our last question regarding the WARPs: How do they relate to competitiveness? The point made just above argues for some caution in relating WARPs to competitiveness. Since all the WARPs could move up at once, we would be hard pressed to then say that everyone is becoming less competitive at the same time.

Aside from this possible anomaly, there are two more fundamental difficulties in relating WARPs to competitiveness. The first is finding a reasonable working definition of competitiveness. As Keynes (1925) noted almost a century ago, one cannot think of competitiveness in terms of the differences in traded goods prices (prices of "unsheltered" goods in his words) because trade by its nature tends to eliminate such differences. Max Cordon concluded a reasonable definition is in terms of the profitability of firms in the traded sectors (Corden, 1994).

Working with Corden's notion of competitiveness as profitability, we are then left with trying to map cross-country differences in general price structures (possibly for just non-traded goods and services) into cross-country differences in the cost structures for traded goods and services. Such a mapping requires measures of relative labour and capital productivity in the traded sectors. The WARPs do not include such productivity measures. Put differently, the WARPs provide a summary measure of relative price structures across countries. To read them directly in terms of competitiveness or relative cost structures one would have to assume that labour and capital productivity are equalized across countries. This is clearly not the case, so the WARPs cannot capture all that is needed to measure competitiveness.

So where does that leave us? The discussion relating WARP to competitiveness is meant to be cautionary. The WARP seems to be related to competitiveness, but we caution against using it, or any single simple measure, to quantify such a complex aspect of the economy. On a more positive note, the WARP does capture some important phenomena that are not well reflected in other measures and we have found it to be helpful in explaining some important macroeconomic phenomena. As such we consider WARP to be a useful addition, or supplement, to the more standard, widely used, REERs.

Figure 1
Trade Shares

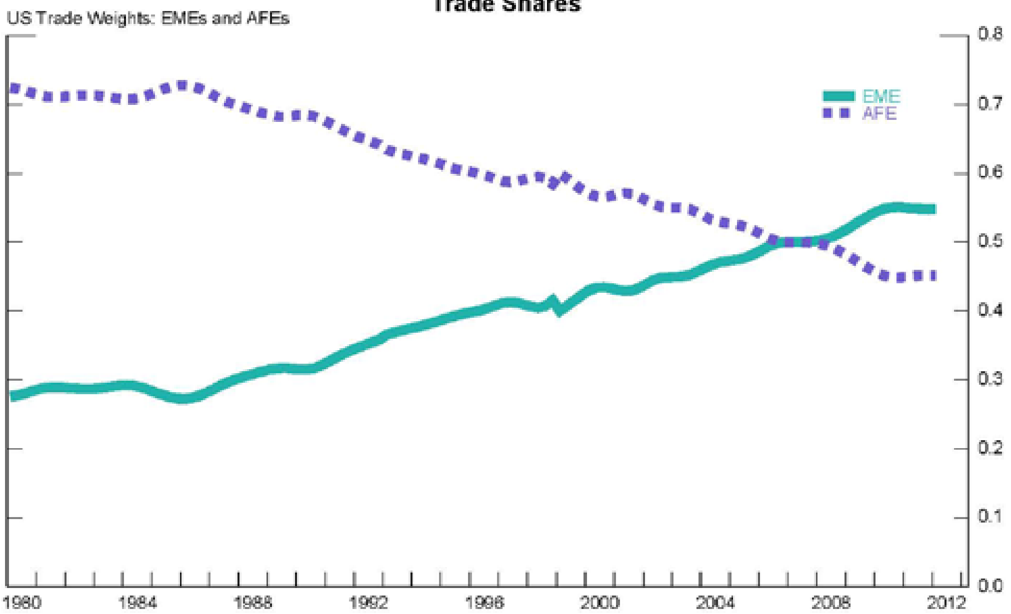


Figure 2
Relative Prices

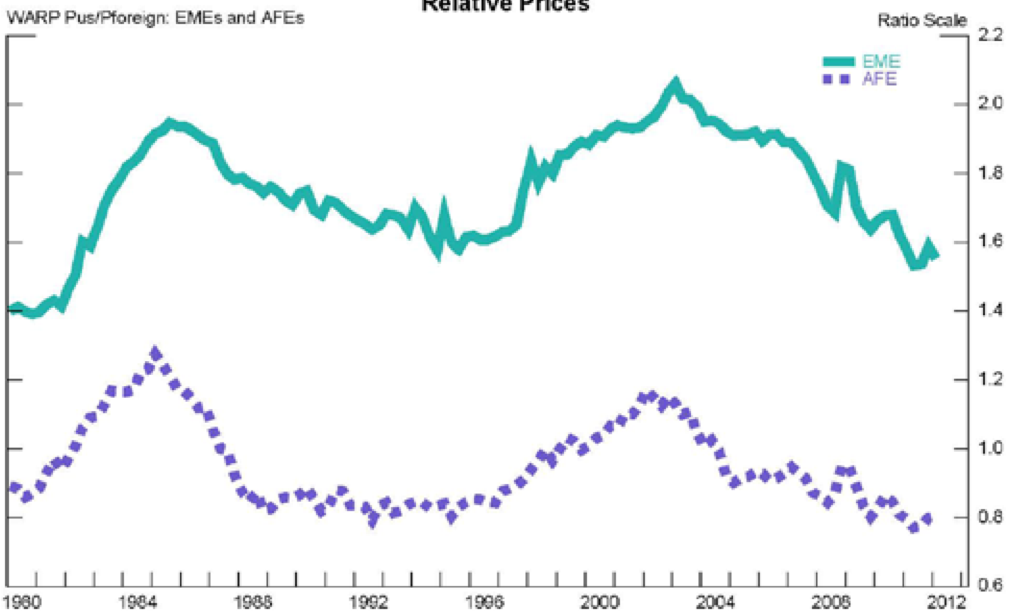
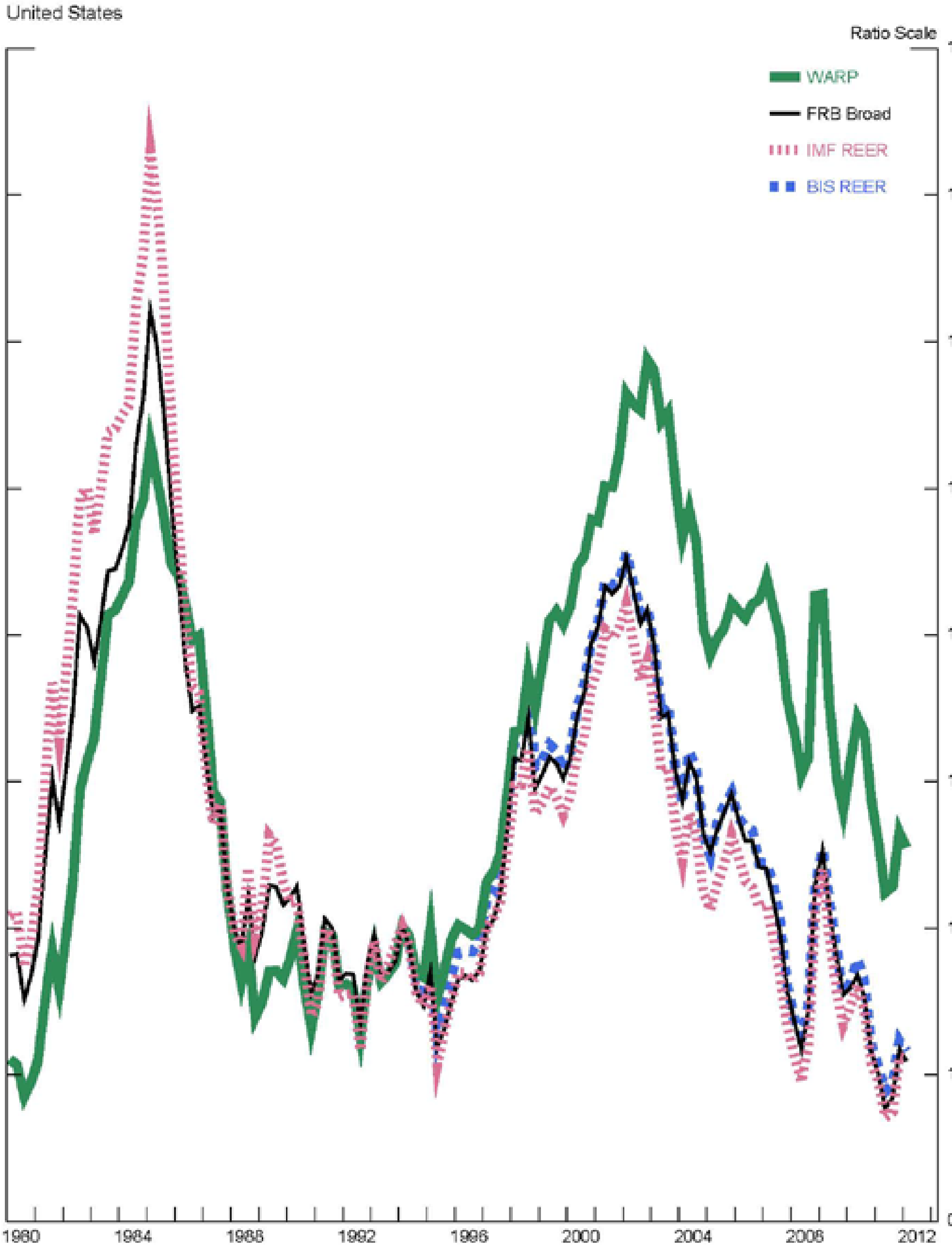


Figure 3
International Relative Prices: WARP and REERs



BIS and IMF REERs and FRB Broad Index are renormalized to equal the value of WARP in 1994:Q1 -the first date for which the BIS series is available.

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The story told by debt indicators and the hidden truth

Weaknesses of the most commonly used debt indicators and the way forward

Agnes Tardos

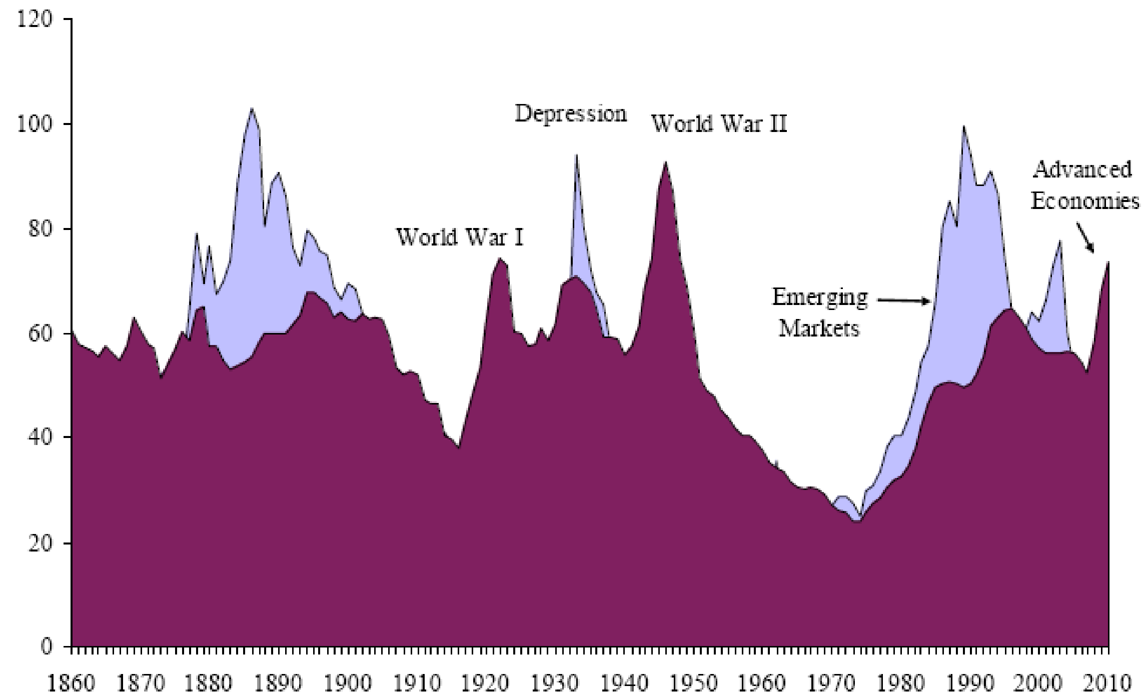
Introduction

Debt indicators are in the heart of the current economic debate on the recent financial crises. The crises started with the boom of housing loans and the excessive indebtedness of households in the US. It spread throughout the world by using innovative financial structures and ultimately infected the public sector. The crises started in the first decade of the 21st century and today in 2012 we are still not sure when and how the story will end.

Please find below a chart from the paper of Reinhardt and Rogoff: A Decade of Debt, 2011 that illustrate their statement: "During peacetime, a leading factor behind rapid surges in public debt has been severe or systemic financial crises."

Table 1

Gross central government debt as a percentage of GDP: advances and emerging market economies, 1860–2010



Source: Reinhardt and Rogoff: A Decade of Debt, 2011

Instead of reviewing the most common debt indicators this paper makes an effort to identify and analyze some of the theoretical and practical problems surrounding the measurement of indebtedness.

The definition of debt – Does it matter? Differences in the use of micro and macro indicators

Macro statisticians and business reporting experts use different definition for debt and financial liabilities, while statistician include equity instrument in the category of financial liabilities, business accountants treat equity as distinct category, thus in business accounting financial liabilities do not include equity instruments. This diversity of definitions could confuse some of the users.

According European System of Accounts 2010 (ESA 2010) para 5.06 – a handbook used by European macro statisticians "Liabilities are established when the debtor is obliged to provide a payment or a series of payments to the creditor." Please note that the ESA liability definition is identical with the System of National Accounts (SNA) 2008 definition, the handbook issued by the United Nations.

The financial reporting definition according to International Financial Reporting Standards – the standard that provide the basis for business reporting of individual firms throughout the world – is broadly in line with the above statistical concept, however provides much more detailed guidance. According to International Accounting Standard 32 (IAS32) para 11 on "Financial Instruments: Presentation" financial liability is defined as follows:

A *financial liability* is any liability that is:

- a contractual obligation:
  - to deliver cash or another financial asset to another entity; or
  - to exchange financial assets or financial liabilities with another entity under conditions that are potentially unfavorable to the entity; or
- a contract that will or may be settled in the entity's own equity instruments and is:
  - a non-derivative for which the entity is or may be obliged to deliver a variable number of the entity's own equity instruments; or
  - a derivative that will or may be settled other than by the exchange of a fixed amount of cash or another financial asset for a fixed number of the entity's own equity instruments. For this purpose the entity's own equity instruments do not include instruments that are themselves contracts for the future receipt or delivery of the entity's own equity instruments.

The main difference between the two concepts cannot be derived from the definitions itself. The difference arising from the fact that the statistical definition is applied with the following exception: "Equity and investment fund share units (AF.5) is treated as a financial asset with a corresponding liability even though the claim of the holder on the corporation is not a fixed amount." (ESA 2010 para 5.05)

While accountants spend a lot of time in trying to define and redefine the boundaries between liabilities and equity, statisticians treat equity instruments issued as part of liabilities. Statisticians also understand the distinction between debt and equity, however debt is not clearly defined as part of the main statistical frameworks and thus users can freely define the list of instruments included in a debt indicator.[1] One recent example of the problems caused is the difference in the debt definition used in the dashboard created by ESRB and the scoreboard created by the Eurostat on the indebtedness of non financial corporation.

Debt versus equity classification in the business reporting

In business reporting the difference between debt and equity seem to have critical importance. On micro level it makes a tremendous difference whether the issuer of the liability is obliged to pay to the creditor (liability in accounting term or debt (and other payables) in statistical terms) or the holder of the equity instrument has only right to the residual interest in net assets (assets minus all liabilities excluding own equity) of the company.

Difference between debt and equity – illustrative example

The recent crises started with the boom of housing loans and the excessive indebtedness of households in the US. The households with mortgage loans have a clear obligation to pay cash based on the mortgage loan contract signed between the bank and the members of the household. There is no difference between accounting and statistical loan obligation of indebted households

The same applies for a bank borrowing of a corporation. Households with mortgage loans and indebted corporations could face bankruptcy procedures or other legal consequences if they do not meet there payment obligation in time. The creditor of a mortgage loan to a household or a commercial loan to a corporation – traditionally a bank – is legally entitled to receive cash.

The situation is fundamentally different for the issuers and holders of equity instruments. The company who issued equity instruments does not have any contractual obligation to pay cash. Individual holders of the shares are not entitled to put back their shares to the company and ask for cash or cash equivalent. In many instances majority of the owners can vote for dividend payment or could decrease the share capital of the entity and deliver financial or not financial assets to the shareholders, however the ability of any individual shareholder to do so is dependent from the decision of other shareholders. In most jurisdiction several legal constrains ensure that the right of creditors are observed before shareholders can withdraw financial instrument from the company they own.

Financial innovations during the early years of 2000 made it more and more difficult to determine whether an instrument or a portion of instrument should be classified as debt or equity. Difficulties have arisen during the evaluation process and also in the interpretation of the results. International Accounting Standard Board (IASB) is currently in the process of rethinking the boundaries currently applied.

Does the debt-equity distinction matter on the macro statistical level?

Financial macro statistics provide overview on the flow and stock of external financing of a country or region (Balance of payment and International Investment Position) or the financing stock and flow of a given economy and its sectors (Financial Accounts). Although both statistics provide certain information on the debt and equity feature of the financial instruments involved, this distinction is not the primary focus of their categorization. Balance of Payment statistics focus on the purpose of the investment while financial accounts presents instrument in the order of their liquidity.

[1] The most commonly used guidance including the debt definition is the IMF manual on *External Debt Statistics: Guide for compilers and users* and the *Manual on Government Deficit and Debt* issued by Eurostat.

Further complications arise from the fact that statisticians do not have the time and resources to investigate borderline cases between debt and equity instrument. Statistical data collection often relies on widely different national business accounting principles applied in individual countries.

Debt indicators can be compiled in various different ways and can be used for many purposes. The most common use of debt indicator is the assessment of the vulnerability and the financial stability of the indebted entity. Some of the common questions asked in respect of debt indicators:

- Will the entity be able to repay its obligation (solvency and liquidity)?
- Is the level of indebtedness sustainable?
- Did the entity get sufficient financing in order to achieve its economic goals?
- What is the impact of indebtedness on the vulnerability?

While the first two questions can be asked only for debt instruments the last two issues can also be interpreted in a broader sense where the debt or equity nature of the instrument is not relevant.

Please also note that some of the questions asked above cannot be answered from the statistical aggregates traditionally compiled from macro statistics. In order to understand why, we should analyze the following question.

Whose indebtedness are we interested in? Limitations of the reflection of cross border exposure in the current statistics and the need for micro data

The main purpose of the business accounts is to provide information on the economic entity's performance for investors, creditors and other external parties. The information is provided on the level of the consolidated group. (In accounting term consolidation means that group of entities under the control of the same parent are presented as on single entity. Members of the group can be involved in widely different main economic activity and often be resident in different countries and regions.)

The main purpose of macro financial statistics is to provide information on the performance of the economy of a country, sector or region. The level of aggregation is dependent on the interest of the users. Macro statistics are most often compiled on country and regional and sectoral level on a residency basis. Information is collected (and aggregated) from entities resident in a given country or region. Statistics compiled on residency basis can provide adequate information on the economic activity and performance of a country, however are not sufficient to provide full picture of stability, vulnerability and inter-linkages.

These latter issues are now in the focus of the interest as one of consequences of the latest financial turmoil. In order to be able to answer the new questions, traditional residency based statistics should be supplemented by cross border statistics. Please find below some example of the limitations of residency based information.

Residency based statistics include information on special purpose entities (SPE) whose economic activities are not truly linked to the economic activity, performance of the country or region and thus their financial position might hugely distort national and regional aggregates.

In our globalized economy most of the major corporate and financial institutions have cross border operation. Stability and vulnerability of a country and a region is dependent on the stability and vulnerability of the entities operating in the territory. Residency based statistics on its own cannot provide information on the nature on the economic and financial inter-linkages and risks involved.

One example of the above is the significant Austrian presence in the Hungarian Banking sector. The stability of the Hungarian banking sector depends on the stability of the Austrian banking sector. To make the story even more complex, the Austrian banks have extensive presence in Central and East Europe (CEE). As a consequence the Hungarian financial stability is directly influenced by the financial stability of other CEE – through the Austrian banks.

Another example could be a major Hungarian bank with major subsidiaries outside of Hungary. The performance, stability and vulnerability of the bank is greatly determined by the performance of its subsidiaries.

Micro level information is also needed in order to better understand full story hidden in the macro aggregates. One example might be that for the full evaluation of the indebtedness of households it is not sufficient to analyze aggregates of the household sector but we should know more on the income distribution of indebted households.

Sector classification

Classification of institutional units have significant impact on sectoral debt indicators. The financial crisis highlighted the importance of classification issues. In the following some examples are provided in order to illustrate how difficult to interpret the data without understanding the full story behind the numbers.

The classification of bank rescue units in European countries

Albert Braakmann and Thomas Foster in their Paper: "Challenges in improving the measurement of the government financial position and the classification of units as public and private" Dublin August 2011 analyzed four different rescue units and presented their classification and their impact on Government debt.

Table 2

Impact of rescue unit classification on government debt

2010	Gross Government Debt / GDP	Debt of the rescue unit classified w ithin the government sector / GDP	Debt of the rescue unit classified outside the government sector / GDP
	%	%	%
Germany (Erste Abw icklungsansalt (EAA) and FMS Wertmanagement (FMS-W)	83,2	10,2	-
France (Societe de financement de'economie francaise (SFEF)	78,3	-	4.0
Ireland (National Asset Management Agnecy (NAMA) Master SPV)	96,2		18,6

Source: Albert Braakmann and Thomas Foster: "Challenges in improving the measurement of the government financial position and the classification of units as public and private" Dublin August 2011.[2]

2 The initial zero impact on government financing of the Irish Nama solution was to a large extent reduced by the substantial capital injections performed by the government and other payments to the troubled banking sector and to NAMA Master SPV.

It is worthwhile to quote one of the conclusions of the authors:

> "As a consequence of the sector classification according to the Eurostat decision, differences in the deficit and debt data of general governments occur. The differences have an impact not only on the initial amounts to be included in government deficit and debt, but may also have repercussions on deficit and debt data in later periods. Under certain circumstances, there can be compensating effects."

The European Financial Stability Facility (EFSF) and the European Financial Mechanism (ESM)

Another good illustration of the importance of classification is the different statistical treatment of the recently created European financial intermediaries the EFSF and the ESM. Both entity the European Financial Stability Facility (EFSF) and the European Financial Mechanism (ESM) have been created as part of the new Euro area crisis mechanism. Both units are and will be funded by Euro bond issuance, however their institutional classification is different and thus their borrowing and lending will impact differently the general government indebtedness of Europe.

According to the latest decision of the EU (28–29 June EU summit) the EFSF will have a lending capacity of 440 billion Euro backed by minimal (30 million Euro) subscribed capital and 780 billion Euro guarantees. The total subscribed capital of ESM will be 700 Billion Euro with an effective lending capacity of 500 billion Euro. (87% of the capital will be payable by Germany 27%, France 20%, Italy18%, Spain 12% Netherlands 6% and Belgium 3%). 80 billion of the ESM's Capital is payable up to early 2014 in 3 arrears.

ESFS is not seen as an independent institutional unit and thus any loan provided by EFSF to countries in need are rerouted to the guarantor countries and thus the proportional borrowing and lending to the troubled county will be included in the statistics of the guarantor.

Due to its own capital and different governance structure ESM will be treated a separate European Institutional Unit neither debt incurred by ESM nor the debt of the borrowing country will be rerouted to the Euro Area Member States.[3]

The EFSF is seen as a temporary mechanism and most of its assets and liabilities are expected to be transferred to the ESM whenever it will be established. The transfer could have significant impact on the government debt level of the counties due to the different institutional classification of EFSF and ESM. Due to the change of financial intermediaries potentially 420 billion Euro (500 billion lending capacity minus 80 billion Euro paid in capital) of the ESM will decrease or not increase the gross debt of the Euro Area Member States (4.4% of 2011 GDP).

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[3] Eurostat: "Preliminary view on the recording of the future ESM" as of 11 April 2011 and "The impact of bank recapitalizations on government finance statistics during the financial crisis" as of 18 July 2012.

Table 3

The main features of the ESFM and the ESM system

	EFSF	**ESM**
Time frame	Temporary for 3 years only	Permanent
Legal framework		International organization
Total subscribed capital	30 million Euro	700 billion Euro (80 billion Euro will be paid in by 2014)
Lending capacity	440 billion Euro	500 billion Euro
Governance structure		Similar to International Organizations
Classification of the unit	SPV	European Institutional Unit

A further decision taken on the 28–29 June 2012 EU summit that that will have critical impact on the indebtedness indicators of certain European countries was, that ESM will be able to provide direct capital injections to troubled financial institutions bypassing the sovereign after the implementation of common banking supervision. As a consequence capital injection to the troubled banks will not have direct implication on the gross government indebtedness ratios of countries with need for bank recapitalization. According to Fitch estimate (source J.P Morgan FAQs around the provision of aid to sovereigns by EFSF/ESM 16 July, 2012) the estimated recapitalization need of Spain, Italy, Greece, Ireland, Portugal and Cyprus is 266 billion Euro and their size to GDP per countries varies between 2% to 40% to GDP as of June 2012. It is not yet clear whether governments of banks getting the capital injection will guarantee the capital injections/ loans provided to the troubled banks and if yes then to what extent.

Table 4

Estimated bank recapitalisation need that could bypass government gross debt as a result of the 28–29 June EU summit decision

	Spain	**Italy**	**Greece**	**Ireland a)**	**Portugal**	**Cyprus**	**Total**
Estimated bank recapitalization of Fich billion Euro	100	35	50	63	12	6	266
% of estimated 2012 GDP	9%	2%	25%	40%	7%	33%	8%

a) According to J.P: Morgan information Ireland is looking only 15–20 bn concession from Europe roughly 10–15% of its GDP

Source: J. P. Morgan FAQs around provision of aid to sovereigns by EFSF/ESM

The different statistical treatment of apparently similar instruments and structures highlight the fact that in order to appropriately interpret the information, the users should understand the full story behind numbers.

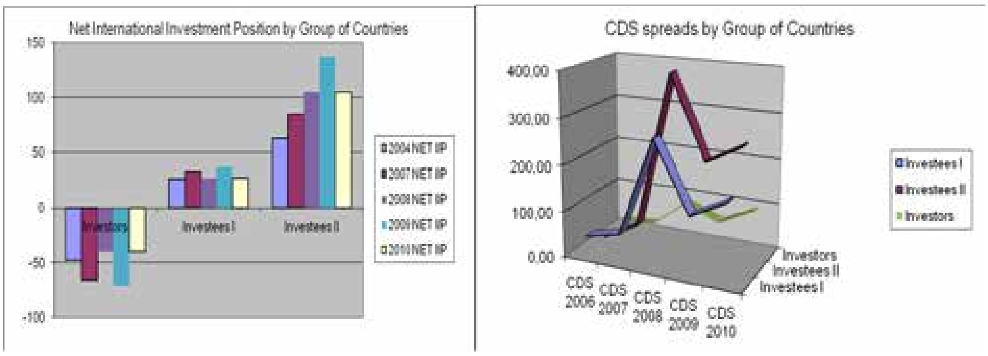
Practical issues – Boundary of the definition of debt

a. Should debt indicators be based on true debt instruments?

Debt indicators should not be limited strictly to debt instruments. Net International Investment Position for example seems to be good indicator of vulnerability. The chart below illustrate that the surge of CDS spreads in the financial crisis was significantly different for the group of countries who have significant net international investment positions in other countries and for the two investee groups with different net investment position.

Table 5 – 6

Net International Investment Positions and CDS spreads by group of countries



Source: IMF, Bloomberg and own calculation. Investors include countries with NET IIP (Foreign Investment position in the country minus investment position in foreign countries) lower than 20% (Switzerland, Norway*, Japan, China, Belgium, Germany and Luxemburg* in 2007). Investees I include countries with NET IIP between 20% and 50% (United Kingdom, Italy, South Africa, Peru, Mexico, Brazil, Czech Republic, Romania, Turkey, Finland*, Ireland, Republic of Korea, Macedonia*, Slovenia) Investees II include countries with NET IIP above 50% (Slovak Republic, Poland, Lithuania, Estonia, Latvia, Spain, Bulgaria, Portugal, Hungary, Croatia, Greek*Iceland*, New Zealand*)

* There were no CDS spread data available for countries marked with *

* * Data of Greece have been left out from the group average

b. How to distinguish between debt and equity, debt and other liability?

Debt and equity

Due to practical consideration statisticians often rely on accounting information in distinguishing debt and equity instrument of corporate entities. We can only hope that with the widespread use of International Financial Accounting Standards throughout the world, the diversity due to the differences in national accounting standards is getting less and less significant.

Further problem is caused by the fact that the primary statistical classification system does not fully support the debt equity differentiation. Please find below some examples of the practical issues in connection with the current classification system.

In the International Investment Position presentation debt and other liabilities to direct investors are classified under the heading to “Direct investment in reporting economy”. It would be possible to split direct investments to equity and other type of liabilities to direct investors. However debt indicators are often constructed excluding all the liabilities to direct investors due to the fact that there are frequent shift between liability instruments to direct investors. Further argument of creating debt indicators excluding liabilities to direct investors is that the stability threat of not paying to direct investor is case of financial difficulty as fare less than a default to third party creditors.

Other practical issue is that within portfolio investment funds in the International Investment Positions are not split whether the fund's own equity has debt of equity feature. The same applies to the investment funds presented within securities in the financial accounts.

Debt and other liabilities

One major confusion is caused by the fact that government debt definition in the Maastricht treaty includes only "traditional debt" instruments in the definition and excludes trade credits, other liabilities and derivative liabilities.[4] Europe is presently considering the rethinking of the definition and the valuation rules of the treaty.

c. Treatment of provisions, guarantees and contingent liabilities

In micro level or stability analyses liabilities arising from provision on contingent events are treated identically with other liabilities. Special care is also taken to contingencies without provision or valuation loss (e.g. guarantees, credit lines, notionals of derivatives). Macro statistics currently do not collect information on these items. This fact seriously threatens the usefulness of traditional macro statistics for stability purposes. This criticism does not apply to the Financial Soundness Indicators developed by the IMF. Unfortunately the latter set of indicators applies only for the banking sector. The statistics underlying the EDP process also contain some information on government guarantees and other contingent items.

d. Impact of the pension obligation of the government – differences in pension systems

Currently the implicit pension obligation of the government is not part of the liabilities of the government. Gross government debt and government deficit figures are hugely influenced by the differences of the pension system in individual countries. From 2014 estimates of the implicit pension obligation will be included in the supplementary tables of the national accounts. Please find below the estimated impact on gross debt figures according to the preliminary research of the University of Freiburg.

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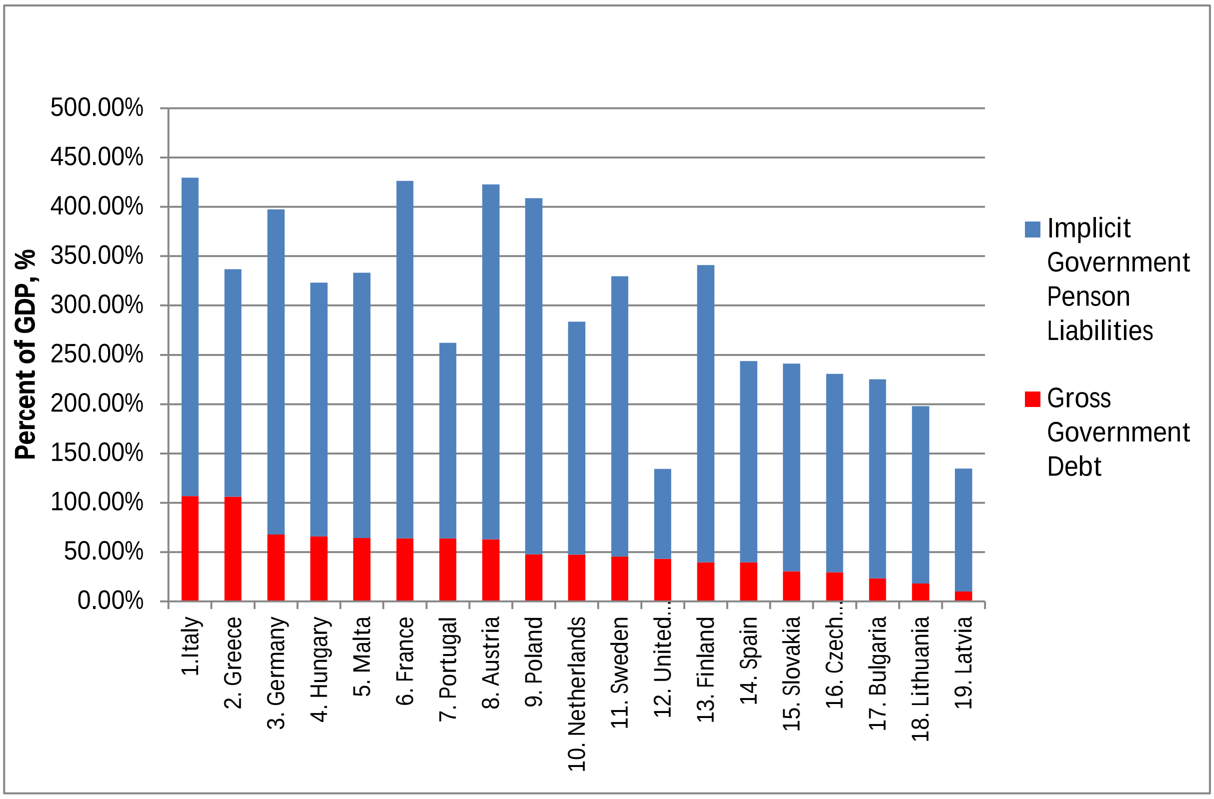
[4] The Maastricht debt reflects the translation difference of certain cross currency interest rate swaps and FRA-as that are closely linked to the debt instruments. All other derivative liability is excluded.

Table 7

Gross government debt including estimated implicit government pension liability by size of direct government debt, 2006

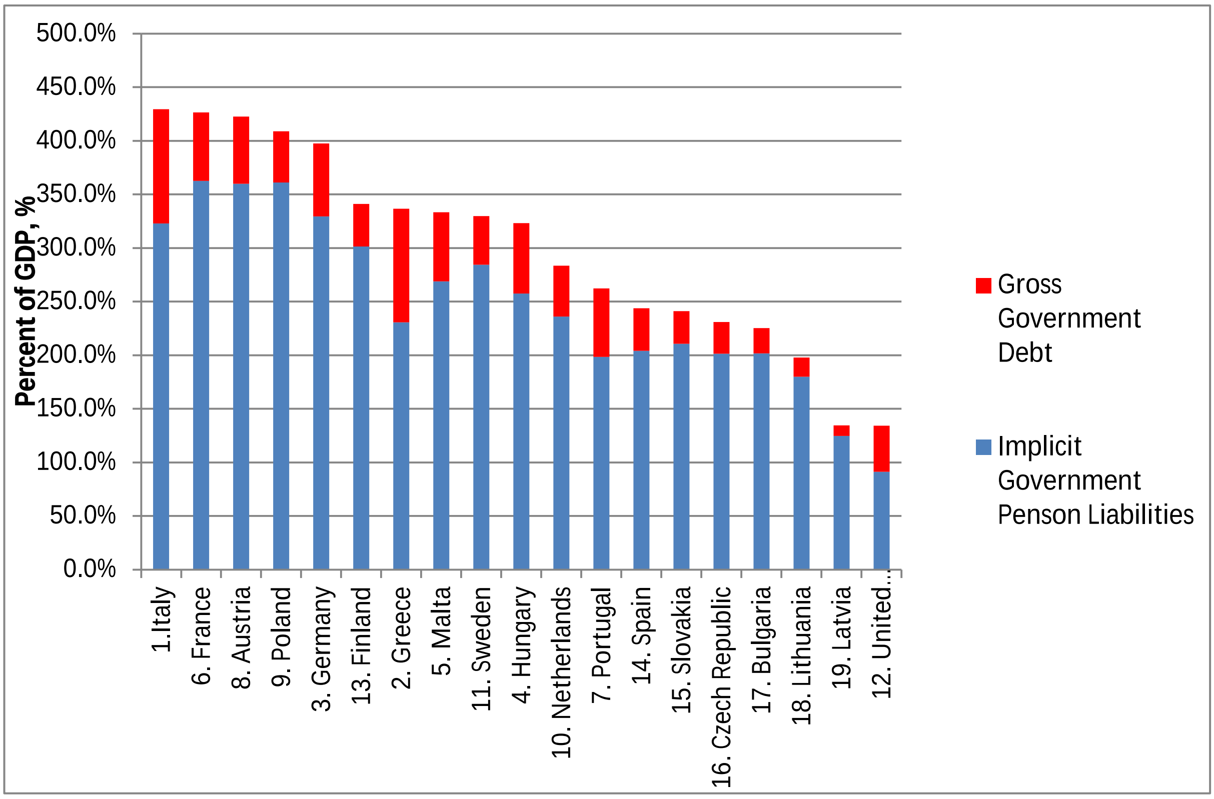


Source: IMF and Pension Obligation of Government Pension Schemes and Social Security Pension Schemes Established in Euro Countries by Christoph Muller, Bernd Raffel Huschen, Olaf Weddige – January 2009 – Research Center For Generation Contracts – Freiburg University

According to the rough first estimate prepared by the Freiburg University Implicit Pension Obligation can be 3 time as high as the gross government debt of the countries. Please also note that the indebtedness ranking of countries dramatically changes in case we consider the total indebtedness of the country including the implicit pension obligation.

Table 8

Gross government debt including estimated implicit government pension liability by size of total estimated government debt, 2006



Source: IMF and Pension Obligation of Government Pension Schemes and Social Security Pension Schemes Established in Euro Countries by Christoph Muller, Bernd Raffel Huschen, Olaf Weddige – January 2009 – Research Center For Generation Contracts – Freiburg University.

European countries are currently working on their pension modeling. There are major uncertainties about the final outcome of this work. The only conclusion so far is that the estimated liability is so significant that sustainability of government financing cannot be assessed without considering the sustainability of pensions.[5]

And lastly it is important to note that the current one sided focus on explicit government debt makes it possible that economic transactions that do not improve the overall position of the government lead to improvement in indebtedness ranking regardless of the true substance of the transaction. One example of the above is the nationalization of the private pension schemes in Hungary (the second pillar from a three pillar pension system) in 2011 when the government took over assets and liabilities from the pension funds worth 9.5% of 2011 GDP. Due to the peculiarity of the current statistical system, the takeover had 9.5% positive impact on the Hungarian government deficit in 2011 and also reduced significantly, the government

[5] This statement might hold despite of the fact that the measurement principles of debt instrument and the implicit government pension obligation is very different.

indebtedness ratio,[6] while the simultaneous growth of the implicit government pension liabilities cannot be seen from the statistics.[7]

Valuation of the debt instruments

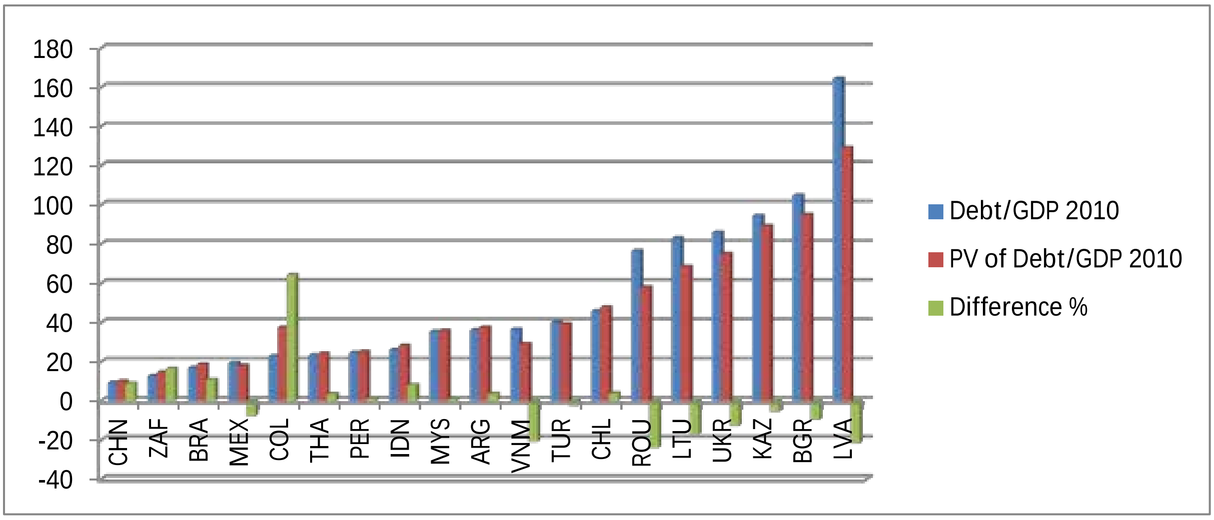
Both SNA and ESA requires the fair valuation of financial instruments. However most of the debt instruments are exempt from the fair valuation requirements as debt instrument (except for securities) should be recorded in the balance-sheet at their nominal amount in the International Investment Position as well as in the Financial Accounts statistics.

The valuation rules have been established many decades ago and have not changed during the past years. When they have been created they were revolutionary compared to the cost less impairment valuation model in business reporting. Since that time accountants have moved to fair valuation of many financial instruments in their balance-sheets and full fair value disclosure is required for all financial instruments in the financial statements prepared according to IFRS.

The differences between fair value and nominal value could be very significant in 2010 for selected countries the difference for some countries exceeded 50% of the debt.

Table 9

Difference between Total External Debt and the present value of Total External Debt of selected countries



Source: The World Bank

Fair valuation of all financial instruments (in addition or beside the current diversity of valuation) would be a big step forward that could significantly increase the usefulness of the statistics for stability and sustainability purposes.[8]

6 The decrease of gross government debt also impact the 2012 government debt figure as the sale of the nationalized assets of the fund are taking time for the state.

7 This issue will be solved by ESA 2010 which will require that from 2014 (or 2015) on estimates of the implicit pension obligation will be included in the supplementary tables of the national accounts.

8 The recent methodological revision of macro statistics already includes voluntary disclosure on fair values.

It should be also noted that debt indicators if instruments are fair valued could also provide misleading messages. Fair value of debt instruments issued by countries who get into financial trouble is decreasing and thus – assuming no other change – due to the decrease of fair values, debt indicators would show improvement at the time of financial distress. This highlights the usefulness of an alternative measure – the nominal value concept.

In business accounting the nominal value concept has been replaced with the amortized cost model, where interest accrual is a non separable element of the financial instrument itself. As statistician heavily rely on business account information in their data collection system it is high time to reconsider the current valuation model.

Another interesting angle of the issue is the current boundary between instruments fair valued and recorded in the statistics at nominal values.

Type of indicators

The type of indicator used always should reflect the intended use of the measure. Instead of providing a classification of debt indicators in the following some pros and contras are mentioned in respect of selected popular indicators.

Gross versus net

Gross debt is useful measure as it fully reflects the known future payment obligation excluding future interest payments. Gross debt could be misleading as it ignores counterbalancing debt receivables.

Please note that in addition of the fair value of debt instruments IFRS 7 requires disclosure of undiscounted future cash-flows including future interest payment by time brackets.

Net debt level could provide more realistic view of the financial position. On the other hand due to the nominal valuation of non security debt instruments the indicator does not present realistic financial position.

Please note that valuation issues could distort both net and gross term measures.

Stock or flow

They complement each other. Stock provides information on the accumulated level of the burden or financing, flow provides good measure on the financing activity throughout the period. Stock measures hide issues connected with interest payment.

Macro debt measures compared to GDP or import export

They are easily comparable internationally. However do not provide adequate information on cross border exposure and on the distribution of income among the indebtedness of entities.

Data quality and comparability

Statistical issues cannot be discussed without evaluating the quality of the information collected and published.

One good example of quality issue is the recent methodology debate between the European Institutions on the proper presentation of derivative liabilities in indebtedness indicator of the non financial sector. Ultimately the institutions agreed to exclude derivative liabilities form the indicator. The decisive factor behind the decision the quality of the information and the lack of comparability of the derivative numbers. Other issues are the lack of comparability of unconsolidated indebtedness data within the nonfinancial sector and national differences in the measurement principles and practices of insurance liabilities.

Do debt indicators really matter? The way forward

This is not an easy question, however experience shows that indicators on indebtedness can have direct impact on the price of the debt. In our globalized world the price of debt is directly impacted by the general belief whether or indebtedness is sustainable or not.

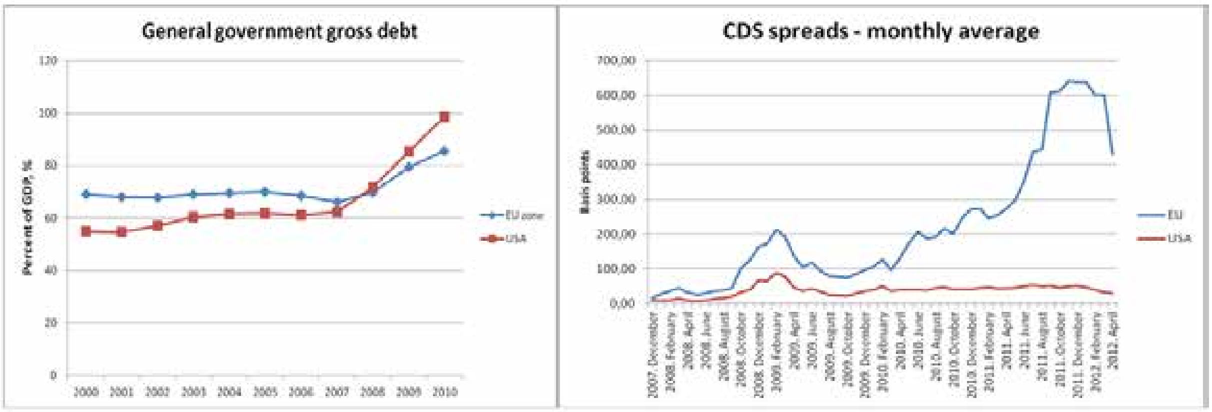
The link between CDS spreads bond yield and indebtedness is a popular topic in the recent economic arena. Close link have been found between debt yields and CDS prices in the Eurozone (Dominic O'Kane: The Link between Eurozone Sovereign Debt and CDS Prices, EDHEC Risk Institute January 2012).

It is less straightforward to demonstrate direct relationship between debt indicators and the CDS spread. Santos, Carlos in his paper on "The euro sovereign debt crisis, determinants of default probabilities and implied rating in the CDS market: an econometric analyses" – Munich personal RePEc Archive – found significant negative relationship between savings and credit spread, however in his model the other two explanatory variables the external and the public debt did not prove to be statistically significant. Another paper on "What is the Risk of European Sovereign Debt Defaults? Fiscal Space, CDS Spreads and Market Pricing of Risk" by Aizemann, Hutchison, Jinjarak – August 2011 – found significant relationship between fiscal space and CDS prices, however could not explain the pricing difference of the Eurozone periphery countries (Greece, Ireland, Italy, Portugal and Spain) with matched 5 middle income countries outside Europe.

It is interesting to note that while according to certain macroeconomic indicators the economic position of Euro zone as a whole seem to be more sustainable than the USA and prices, wages, competitiveness do not differ significantly, markets price Eurozone much more risky. The primary reason for the difference can be explained by the difference in the governance structure of the Euro-zone countries and USA and the market assessment of the ability of the Euro-zone countries to cooperate in case of difficulties.

Table 10-11

Gross Government Debt and CDS spreads of the Euro zone and USA



Source: IMF and Bloomberg

Harmonized definition of debt for statistical purposes

Our globalised economy is getting more and more complex. Analysts are expected to ask different new questions and statisticians will produce growing number of new indicators. This is a natural process. It would be useful to make the effort and try to harmonize debt definitions.

Closer link between accounting and statistical concepts

Accounting regulation developed a lot since the time when the main valuation principles of financial instruments have been established. Statisticians should reconsider valuation principles of debt instruments in the light of the new developments.

There is a need for new data collections on cross border exposures and for micro data

Traditional residency based statistics should be supplemented by new cross border statistics and micro data in order to meet the increased interest on vulnerability and stability. The extended use different consolidation principles might be one way forward.

High priority of harmonization and data quality

And last but not least there is an ever growing need for harmonized good quality information.

Closing remarks

Statistics supposed to be boring. Fortunately it is not. Analyst should use all of their brains in order to try to understand the hidden truth behind the numbers.

On the other hand statisticians should also support the users of the statistics

- by increased transparency on the issues faced during the compilation of the data and
- by increased effort to provide answers to the issues raised by the latest financial crises.

How reliable and comparable are private debt measures: the French case

Franck Sédillot[1]

Introduction

Debt measurement has recently received an increasing attention with notably the publication of the new alert mechanism report by the Commission a first step in implementing the new surveillance procedure for the prevention and the corrections of macro economic imbalances (MIP). In this respect, the scoreboard attached to this report contains five indicators related to external imbalances and four indicators related to domestic imbalances.[2] Among domestic imbalances indicators, the Commission has retained a private sector debt indicator on the ground that excessive leverage implies significant risks for growth and financial stability therefore increasing overall vulnerability of a country. For instance, overleveraged households tend to cut back their consumption spending when hit by a shock that changes their perception of permanent income and wealth. Over indebtedness can also put at risk credit institutions, triggering financial instability and creating pro cyclical effects. Investment can also suffer because companies with debt overhang become less and less willing to take up new projects.

However, there are numerous ways to compile a debt stock according to the financial instruments it might include or exclude. These differences in scope result in levels of debt that can be sizably different. In addition, the inclusion of some instruments may distort the debt level should their recording in financial accounts not adequately reflect the financial debt transactions.

This short paper tries to highlight and to explain the main features but also some of the difficulties linked to the private debt measurement.[3] The first section will describe how indebtedness is measured: instruments and sources. The second and the third section will illustrate some weaknesses of the Commission definition. The last section will conclude.

Private debt: measure and sources

Debt measurements are derived from the national financial accounts (balance sheets). The private sector is defined as Non Financial Corporations (S11), households and non-profit institutions serving households (S14+S15). NFC include both private and public sector companies, as well as domestic and foreign-owned companies (directly and indirectly) located and operating in the country. The European Commission defines the private sector

[1] Banque de France, 43-1421 DGS-DSMF-SESOF 75049 Paris CEDEX 01 France. E-mail: franck.sedillot@banque-france.fr. I am grateful to J. Fournier, D. Nivat, B. Terrien and participants at the Sixth IFC Conference on "Statistical Issues and Activities in a Changing Environment" (BIS Basel, 28–29 August 2012) for helpful discussions. All errors and omissions are my own.

[2] For a detailed presentation of the procedure and the scoreboard see: http://ec.europa.eu/economy_finance/economic_governance/macroeconomic_imbalance_procedure/index_en.htm

[3] See also for a similar discussion in the case of Sweden G. Blomberg, J. Hokkanen and S. KåhreTax "Planning may have contributed to high indebtedness among Swedish companies", Economic Commentary, 2012(3), Sveriges Riksbank.

debt ratio as the (country's) total of outstanding loans (F4) and outstanding securities liabilities (other than shares, F3) held by non-financial corporations and households divided by the (country's) GDP. Similarly to the Excessive Deficit Procedure, when the debt ratio in a country's private sector exceeds an indicative threshold, the country shall be subjected to an in-depth analysis. This threshold, determined on the basis of the upper quartile in the statistical breakdown of historical values for the debt ratios in the EU member states during the period 1995–2007, is the same for all countries with a value of 160% as a percentage of the country's GDP. Debt measures can encompass a variety of financial instruments as can be seen from the table 1 below.

Table 1

Private sector debt: instruments and sources

	Sector	Source	Frequency	Reliability
Loans (F4)				
Banking loans	S11+ S1415	Balance Sheet Items (BSI) statistics	Monthly	Reliable, no revisions
Inter-company loans	S11	ESANE[1]	Annual	Final data 2009, provisional data 2010, estimation 2011
Inward FDI (loans and deposits sub-category)	S11	Balance of Payments	Quarterly	Final data 2009, provisional data for 2010 and 2011
Securities other than shares[2] (F3)	S11	Securities issues (SEC) statistics	Monthly	Reliable, no revisions
Trade credits (F71)	S11	ESANE	Annual	Final data 2009, provisional data 2010, estimation 2011

1 Elaboration des Statistiques ANnuelles d'Entreprises, annual data covering all the balance sheet items of all French non financial corporations. Individual data are provided by the National Statistical Institute. Inter-company loans are measured using item B508 ("groups and associates") from tax reports and accounting statements 2057. Trade credits are compiled using item B342 ("trade payables and attached accounts") from tax reports and accounting statements 2050. 2 Financial derivatives are part of this financial instrument. For French NFC their reported amount is negligible.

Some tentative comments and question marks:

Banking loans: loans from monetary and financial institutions. These are highly reliable statistics compiled from monthly reports. The respondents have a banking license therefore under the supervision of the prudential authorities. These statistics are also part of M3 compilation.

Securities other than shares: monthly statistics and highly reliable covering issuances of non financial corporations.

Trade payables: by analogy with private accounting, the Commission excludes trade payables (under the form of payment delays) which are captured in financial accounts by the operation F71 (trade credits and advances).

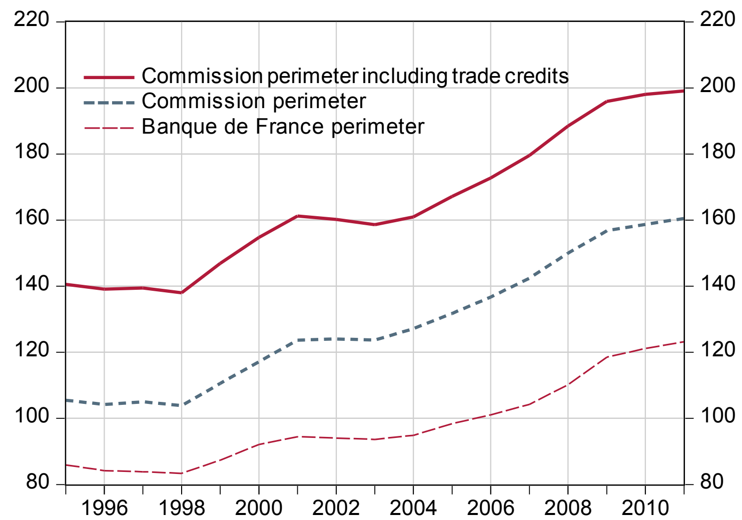
The Banque de France has been compiling and publishing since 2004 debt indicators covering households, non financial corporations and the general government.[4] These ratios derived from quarterly financial accounts are published about 120 days after the end of the quarter. The debt instrument coverage is very similar to a Maastricht type of compilation and therefore differs in this respect from the approach followed by the Commission. Notably the Banque de France measure only keeps credits granted by monetary and financial institutions whereas the Commission's measure includes all credits on the liability side of private agents. All these three definitions lead to sizable differences in the level of indebtedness as displayed in Figure 1 below, the level ranging in 2011 from 120% of GDP to 200% of GDP. The French debt level contained in the scoreboard stands at 160% in 2011.

Although the inclusion or not of trade credit can be a matter of discussion, it is worth highlighting that the Commission's measure refers to the non-consolidated liabilities in the respective sectors. In other words, the debt measure includes the total of all individual companies' and households' loan liabilities, regardless of the counterpart sector. Therefore it includes not only loans from banks, securities markets or lenders in other sectors but also loans from lenders in the same sector. If for households both measures do not differ (at least for France) this is not the case for NFC. Indeed, the total loans granted to non financial corporations in the financial accounts not only cover loans granted by resident and non-resident credit institutions but other loans. This latter subcategory refers to loans between resident affiliated companies (inter-company loans) but also covers a part of foreign direct investment, namely "other capital" that is loans (and deposits) between resident entities and their non-resident affiliates (parent companies, directly and indirectly owned subsidiaries and fellow companies meaning enterprises with no direct ownership links between them or where one owns less than 10% of the equity capital in the other.[5]

Figure 1

French private debt levels as % of GDP

(Source: Banque de France, financial accounts)



[4] For more details see http://www.banque-france.fr/en/economics-statistics/securities-loans-and-deposits/debt-and-securities/debt-ratios-of-the-non-financial-sector/debt-ratios-of-the-non-financial-sector.html.

[5] See ESA 1995 §5.81: "Category AF4 includes: a) balances on current accounts, for example intra-group balances between non financial corporations and their non-resident subsidiaries…."

Issue 1: inter-company loans

To take or not into account inter-company loans is an interesting issue for reflection. In favor of taking them into account is the idea of simplicity and “over compassing” approach. At the same time, this could obviously be conducing to double counting: if a company takes out a bank loan and then lends this money to, for instance, its subsidiary in the same country, these loans are included in both stages and thus taken up twice in the debt measure. On the contrary, if the subsidiary itself chooses to take out a corresponding bank loan, this loan is only counted once. The debt level in the corporate sector is thus lower according to this measure, despite the debt level actually remaining the same. The simple T account example below will illustrate this point very simply.

Let consider a company A which raises equities for an amount of 100 and get a banking credit for an amount of 80. The balance sheet of A is:

Company A

Assets	Liabilities
180 (cash)	100 (equities)
	80 (banking loan)

Two scenarios can be envisaged. In scenario 1, company A acquires with its cash non financial assets (productive capital) allowing it to produce goods:

Company A

Assets	Liabilities
180 (non financial assets)	100 (equities)
	80 (banking loan)

In scenario 2, for any management reasons, the company A sets up two 100% controlled subsidiaries B and C which buy the non financial assets. For this purpose the parent company A grants credits to its two affiliates:

Parent company A

Assets	Liabilities
20 (participations)	100 (equities)
160 (loans to B and C)	80 (banking loan)

Company B		Company C	
Assets	Liabilities	Assets	Liabilities
90 (non financial assets)	10 (equities)	90 (non financial assets)	10 (equities)
	80 (loan from A)		80 (loan from A)

National accounts depict financial operations on a non-consolidated basis. In scenario 1, indebtedness is compounded for 80. In scenario 2, indebtedness is compounded for 240. The internal financial organization of a corporate can impact the compounding of its indebtedness from 1 to 3, except if inter-company loans are not taken into account. It is obvious that alternative scenarios could be possible.

In a scenario 3 for instance, the holding would acquire the assets (as in scenario 1), but lend them to subsidiaries B and C, with a renting fee equal to the interest rates that would have been perceived in scenario 2. While scenarios 2 and 3 are obviously very similar in economic and financial terms, their impact on private indebtedness would fundamentally diverge.

Finally, in a scenario 4, the parent company would become a sheer holding and finance its subsidiaries B and C only via equity. In such a case, as touched upon before, the impact on private indebtedness would be zero…

The Banque de France view is that for reliability and comparability reasons, the internal financial structure of a corporate group should not impact at least significantly the private debt measurement. Its publications are made accordingly. The amounts at stake are not negligible.

For France, inter-company loans represent a sizeable amount of the private debt indicator as shown in Figures 2 and 3 below. In 2011, these loans reach 400 €Bn, that is around 20% of GDP. Overall, these loans should not be assessed in the same way as, for instance, loans from credit institutions. Indeed, often motivated by fiscal reasons they do not reflect the "economic reality" of acquiring money to finance a real investment and therefore do not indicate any excess of leverage but rather do reflect the internal organization of a firm.

Figure 2

French inter-company loans €Bn

(Source: Banque de France, financial accounts)

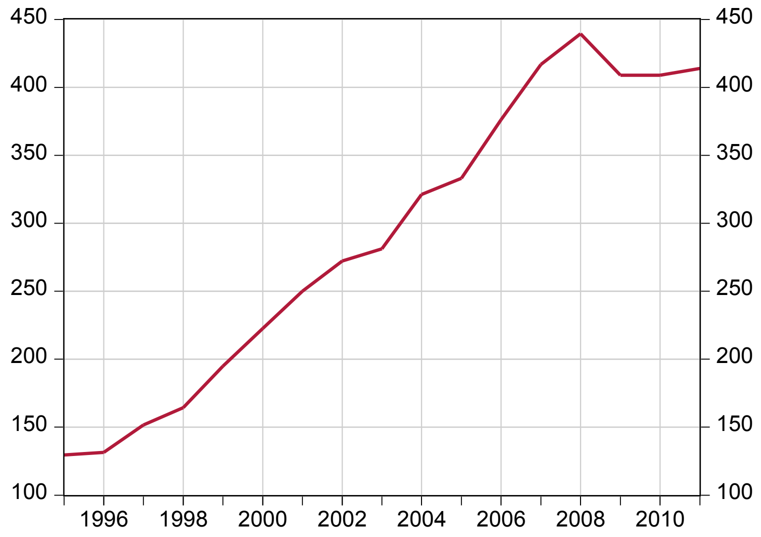
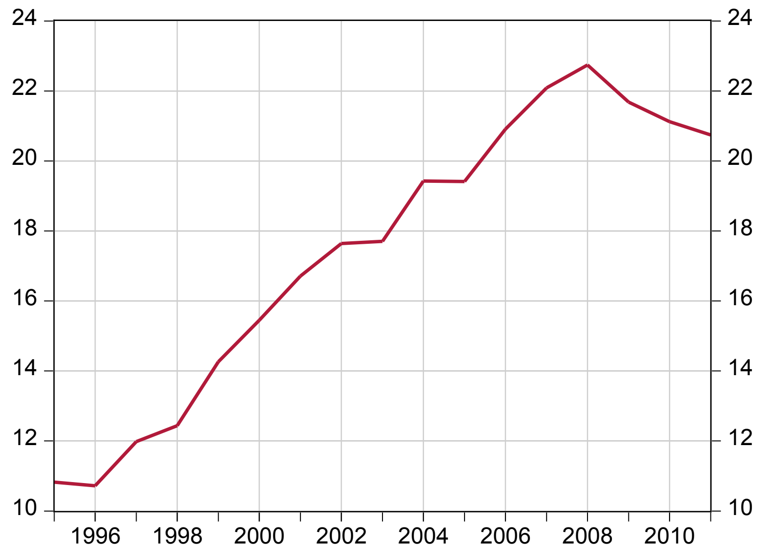


Figure 3

French inter-company loans % of GDP

(Source: Banque de France, financial accounts)



Issue 2: foreign direct investment in other capital

This issue relates to the fact that loans in financial accounts also include part of foreign direct investment operations, more specifically all of the loans and deposits between resident entities and their non-resident affiliates.[6] Direct investment statistics include all of the financial transactions between enterprises deemed to be in a “direct investment relationship” i.e. a relationship where a resident entity in one economy acquires or holds a lasting interest in an entity resident in another economy. According to convention, direct investors are deemed to hold a lasting interest in an entity when they own at least 10% of the equity or the voting rights in an enterprise that is resident in another country. These statistics cover transactions between companies that are indirectly linked, as well as transactions between companies with direct ownership links that meet the 10% criterion. This means that a financial transaction between a company and a subsidiary that is more than 10% owned by majority-owned subsidiary of the first company counts as direct investment, even though there is no direct ownership link between them. Similarly, all of the financial transactions between fellow companies, meaning companies where the same ultimate investor directly or indirectly owns more than 10% of the equity, but that do not have direct ownership links between them, count as direct investment. The remaining of this section is devoted to financial operations between fellow companies.

Until recently, in French BoP statistics (as in many other countries) loans between fellow companies are recorded under the asset/liability principle. Loans made by resident companies to non-resident fellow companies are counted as outward direct investment, while loans from non-resident companies to French fellow companies are counted as inward direct investment. This rule did not raise any particular problems when the current methods for

6 As can be seen below in the text affiliates is a general term covering parent companies, directly and indirectly owned subsidiaries and fellow companies meaning enterprises with no direct ownership links between them or where one owns less than 10% of the equity capital in the other.

compiling and recording balance of payments flows and international investment position stocks were first defined, but, today, it inflates direct investment notably because of the creation and growth of special purpose entities (SPEs). Some of these entities were created by international groups to provide the necessary financing to the other companies belonging to the group by issuing securities on international markets or by obtaining bank loans. These structures are usually not located in the country where the ultimate investment is made. In this case, the funds are transferred from the countries where they have been raised to countries where they will be used, with a possible detour via the group's home country or a third country. Each transfer of funds corresponds to an inter-company loan that is recorded as direct investment in BoP statistics and loans in national accounts. SPEs may also be given the task of centralising the group's disposable cash. In this case, they receive funds from companies with cash surpluses and distribute them to companies with borrowing needs. All such transactions are recorded as direct investment transactions. SPEs also affect direct investment through payment transactions, as in the case of an acquisition by one country in another country that gives rise to payments made to or from cash management centers located in a third country. Ultimately, SPEs' impact on the financing and payment flows for FDI transactions makes the circulation of funds between affiliates increasingly complex. Two phenomena are growing in importance:

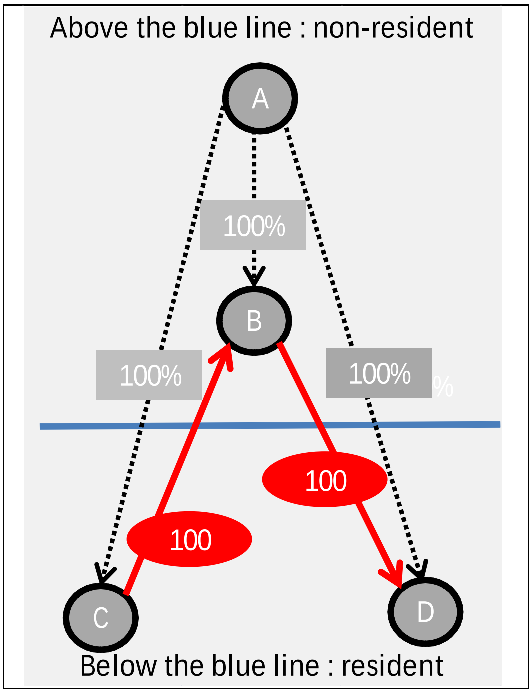
- "capital in transit" (or pass-through capital), which refers to funds channeled from one affiliate to another through one or more other affiliates. The entities in the middle of the chain merely channel the funds that they receive to other affiliates. Cash pooling facilities are one example of such intermediate entities, since they channel funds from affiliates with cash surpluses to affiliates with cash needs;
- "round-tripping", which refers to capital that is transferred from one affiliate to another, non-resident, affiliate and then returned, in part or in whole, directly or indirectly, to the original entity.

A clear effect of these entities in statistics is to artificially inflate direct investment flows and stocks by multiplying the loans between companies belonging to the same group and located in different countries. Increasing share of recorded FDI transactions are no longer related to actual investments (in the traditional sense), but to various types of pass-through transactions where multinational enterprises channel funds through their affiliates in one country to those in other countries for the purpose of facilitating group financing or gaining administrative, tax, regulatory or other such advantages. This disconnection of real transactions from payment flows is all the more pronounced as the degree of regional economic and financial integration increases.

A simple example will illustrate this point (see Figure 4 below). A company A fully owns three companies B, C and D. C and D are residents whilst B is non-resident (controlling arrow in black). For the time being the location of the ultimate parent company is not important. B, C and D are therefore fellow enterprises i.e. enterprises with no direct ownership link involving more than 10% of equity capital. C lends 100 to B which in turn lends 100 to D (red arrows). Under the asset/liability principles, the operation from C to B is recorded as an outward direct investment for the resident country and the operation from B to D as an inward foreign direct investment for the resident country. In the financial accounts they are recorded on both the asset and the liability side of the NFC sector under the F4 operation (loans). Therefore, this increases the indebtedness in the national accounts by 100 whereas this is only a transit of money without any real operation behind. In BoP statistics of the resident country both assets and liabilities have also increased by the same amount.

Figure 4

Capital in transit example



The OECD and the IMF defined a new method called “extended directional principle,” which is set out in the OECD Benchmark Definition of Direct Investment, 4th edition (2008) and in the IMF Balance of Payments Manual, 6th edition (2008). In the case of the “round-tripping” and funds in transit transactions described above, which mainly concern fellow enterprises, all of the flows for the entities in a given group would be reclassified in the same category, either inward or outward FDI. This means that when a resident entity sends funds to a non-resident fellow enterprise that then lends the funds to another resident fellow company, the two transactions are no longer classified respectively as outward and inward FDI; instead, they are classified as outward FDI, in the case of a resident group, or as inward FDI, in the case of a non-resident group. Lending and borrowing between fellow enterprises thus offset each other, either completely or partially, instead of artificially inflating outward and inward FDI flows. In our simple example, if the ultimate controlling parent enterprise A is non-resident then the flow between C and D is recorded as a positive inward direct investment whilst the flow between B and C is recorded a negative inward investment flow. Conversely if the UCP is resident then the flow between B and C is a positive outward investment and the transaction between C and D a negative outward investment. Overall this amounts to net out the two operations recorded under the asset liability principle.[7]

For France the amounts at stake are not negligible as show in the figures 5 and 6 below. In these figures both inward and outward FDI for loan and deposits operations compiled according the asset liability principle are displayed in value or in GDP percentage points. As already mentioned these BoP amounts are taken at their face value in the national financial accounts and classified as loans on the asset side of the non financial corporate sector for

[7] For a detailed approach on the implementation of this new principle see for instance D. Nivat and B. Terrien “French outward and inward foreign direct investment in 2009: new presentation”, Quarterly Selection of Articles (20), Winter 2010-2011 and B. Terrien “A new standard for compiling and disseminating foreign direct investment statistics”, Quarterly Selection of Articles (16), Winter 2009–2010.

outward FDI and loans on the liability side for inward investment. Between 1995 and 2011, FDI amounts have been multiplied by almost 6; outward FDI increased from 50 €Bn to 325€Bn. The evolution of inward FDI is roughly similar to that of outward FDI, its stock level reaching 270 €Bn in 2011 after 40 €Bn in 1995. Their respective shares in GDP percentage points are now substantial. In 2011, the mount of private indebtedness imputable to inward FDI is 14 points of GDP. Figures 7 and 8 present outward and inward FDI for loans and deposits complied according both principles. The compilation of loans and deposits operations between fellow companies according to the extended directional principle rule leads to sharp and simultaneous decreases in the stocks of French inward and outward inter-company loans. For instance in 2011, the stock of inward FDI is divided by 10 from 275 €Bn to 30 €Bn. Overall, taking one figure or the other significantly impact the private debt ratio.

Figure 5

French FDI loans and deposits sub category, €Bn

(Source: Banque de France, BoP and financial accounts)

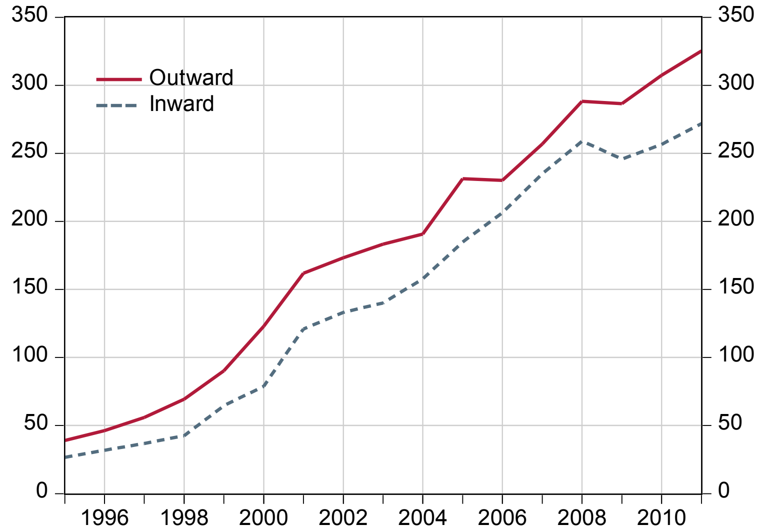


Figure 6

FDI loans and deposits sub category, % of GDP

(Source: Banque de France, BoP and financial accounts)

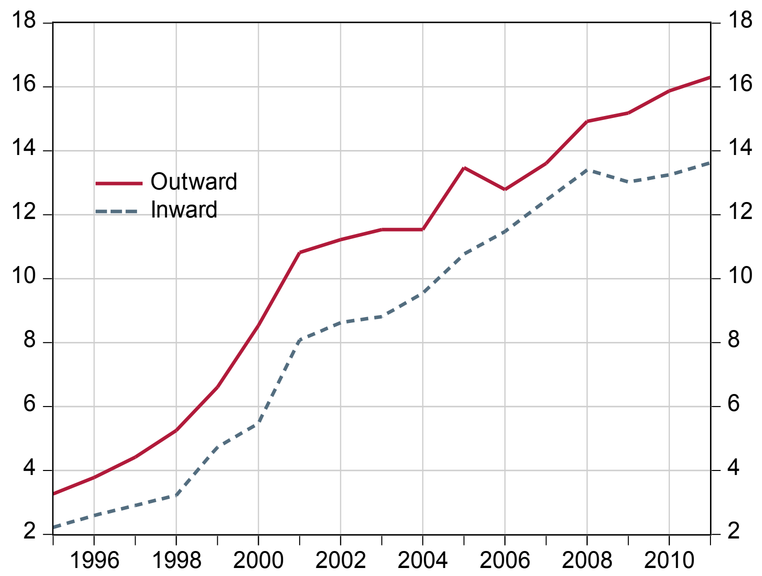


Figure 7

outward FDI loans and deposits sub category, €Bn

(Source: Banque de France, BoP and financial accounts)

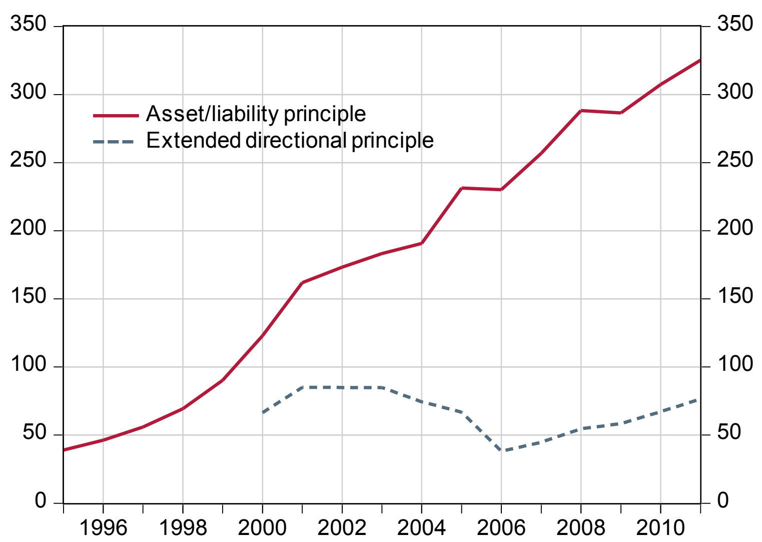
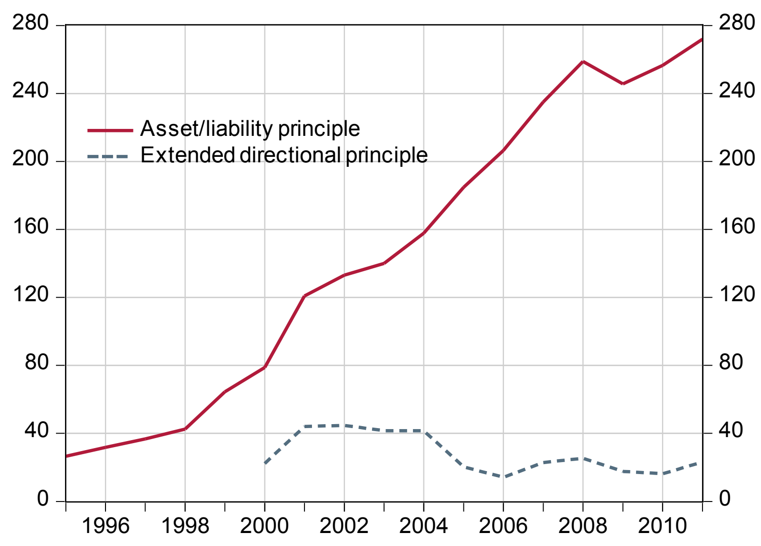


Figure 8

inward FDI loans and deposits sub category, €Bn

(Source: Banque de France, BoP and financial accounts)



Conclusion

This paper has raised number of issues in the view of illustrating the possible major impact of choices that appear technical on the private indebtedness ratios, hence on the macro-economic assessment at the country level.

A few more general conclusions could be tentatively outlined:

- “the devil is in the details” applies also for statistical measurement,
- therefore, apparently simple, “blind”, solutions can be misleading…
- further work seems both necessary and urgent at the international level in the field of private debt measurement.

Tax planning may have contributed to high indebtedness among Swedish companies

Gunnar Blomberg, Jyry Hokkanen and Sofia Kåhre

The European Commission has identified in a survey of potential imbalances within the EU a number of European countries that are assessed as having excessive leverage. One of these countries is Sweden, which is alleged to have a high burden of debt in the private sector, which could make the economy vulnerable and entail risks to growth and financial stability. The Commission uses private sector debt as a percentage of GDP as an indicator of potential imbalances. However, this measure can to some extent exaggerate the risks as far as Sweden is concerned. This is because loans in the same corporate group, which are included in the European Commission's measures, comprise a large part of the total debt in the Swedish corporate sector. In this commentary we show that group loans should not be assessed in the same way as, for instance, loans from credit institutions, as the relationship between the lender and the borrower are different for these loans and they are often motivated by an endeavour to keep taxes as low as possible. We also discuss why non-financial companies' debts have increased substantially over the past 15 years. Our conclusion is that the adjustment to the tax regulations may have contributed to Swedish companies having a relatively high level of indebtedness, seen from a European perspective. Moreover, we show that the Swedish companies' level of indebtedness, in terms of debts in relation to equity, have fallen during the first decade of the 2000s, which would contradict the claim that company debt levels are a problem.

The private sector's debt ratio in Sweden is among the highest in the EU

During the spring, the European Commission published a report containing a survey of areas with potential imbalances among EU member states.[1] The size of the debts in the private sector was one of the areas examined by the Commission. The report is the first step in an annual procedure to identify and rectify imbalances among member states at an early stage. The Commission points to areas where a more in-depth analysis is required. Only after this type of analysis has been made can the Commission issue policy recommendations to rectify problems in cases where imbalances are assessed to be profound and persistent.

With regard to indebtedness in a country's private sector, the European Commission has set an indicative threshold of 160 per cent for private sector debt as a percentage of the country's GDP. This indicative threshold has been determined on the basis of the upper quartile in the statistical breakdown of historical values for the debt ratios in the EU member states during the period 1995–2007. If the debt ratio in a country's private sector exceeds the indicative threshold, the country shall be subjected to an in-depth analysis.

The Commission defines the private sector as *non-financial corporations, households* and *non-profit institutions serving households*. The non-financial corporations include both private and public sector companies, as well as domestic and foreign-owned companies with activities in the country.

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[1] European Commission, Alert Mechanism Report, 14 February 2012.

The private sector debt ratio is thus expressed as a percentage of the country's GDP and is a stock variable that consists of the total of all outstanding loans and outstanding securities liabilities (other than shares) held by non-financial corporations and households. The definition of liabilities does not include trade credits or the item known as "other liabilities". The data are reported by the respective country's financial accounts, which are part of the national accounts reporting system.

The Commission's measure refers to the *non-consolidated liabilities* in the respective sectors. This means that the debt measure includes the total of all individual companies' and households' loan liabilities, regardless of where the loans have been taken. This means that it includes not only loans from banks, securities markets or lenders in other sectors; loans from lenders in the same sector are also included in this concept. As we will show further on in this commentary, loans in the same sector have great significance for non-financial corporations, as lending within groups is very common. However, this does not apply to the household sector, as loans between households rarely occur and are not included in the statistics.

Figure 1 shows that the private sector debt ratio in Sweden is one of the highest in Europe. The private sector's non-consolidated gross debt amounted to 237 per cent of GDP in 2010. This puts Sweden in sixth place within the EU and is far above the indicative threshold of 160 per cent of GDP. It is primarily the non-financial companies that account for the large burden of debt, while household debt is not as large in a European comparison. Swedish household debt is nevertheless above the average relative to the other countries in Europe. What this entails for the Swedish economy has been analysed in various contexts, by the Riksbank among others.[2] We will therefore now focus mainly on corporate debt levels.

Measures of debt should be consolidated within each sector

The main advantage of the debt measure used by the European Commission is that it is based on comparable data what are available to all European countries. This enables an easy comparison of the EU countries' debt levels.

However, there is a substantial disadvantage with the European Commission's debt measure, and this disadvantage becomes clear with regard to inter-company loans. If a company takes out a bank loan and then lends this money to, for instance, its own subsidiary in the same country, these loans are included in both stages and thus taken up twice in the debt measure. However, if the subsidiary itself chooses to take out a corresponding bank loan, this loan is only counted once. The debt level in the corporate sector is thus lower according to this measure, despite the debt level actually remaining the same. The debt measure used by the Commission thus gives an exaggerated picture of the level of debt in the private sector in countries where inter-company loans within the country are common.

In an alternative measure that the Commission has also chosen to report, the debts between companies in the same country have been disregarded. This debt measure, the *private sector's consolidated gross debt*, shows the non-financial corporations' and households' loan liabilities towards other sectors in the same country and abroad.

However, this consolidated debt measure is not used for all countries within the EU and not is it clear how the consolidated statistics should be defined. Moreover, it is difficult to produce reliable and complete data sources for this measure, which means that different countries

[2] The Riksbank's inquiry into risks in the Swedish housing market. Sveriges Riksbank, April 2011.

have chosen different methods and applications to produce the consolidated value of the gross debt in the private sector.

Despite the fact that there are problems in comparing the data from different European countries, consolidated debt is nevertheless a better measure for analysing the debt level in a particular sector. We therefore base our analysis of indebtedness in the Swedish private section on consolidated data. This consolidation means that we include as non-financial corporations' liabilities all the liabilities the companies have to other sectors, that is, the public sector, financial institutions, households and abroad. Liabilities in their own sector are thus not included. As liabilities abroad are included in this concept of liabilities, we also include here loans from foreign companies within the same corporate group, that is, group loans from abroad. This is necessary to gain an overall picture of the domestic corporate sector's loan funding.[3]

The consolidated debt ratio is also high in Sweden

A consolidation of debts between non-financial corporations means that the Swedish private sector's total debt ratio falls from 237 to 221 per cent for 2010. Following the consolidation, corporate sector debt amounts to 139 per cent of GDP instead of 155 per cent. Household sector debt, which primarily comprises mortgages, is not affected by this, however, and still amounts to 82 per cent of GDP.

Table 1 shows that corporate debt mainly consists of ordinary loans and to a lesser extent securities loans. Inter-company loans within corporate groups (from parts of the group abroad) are common in Sweden, and account for almost one third of the corporate sector's consolidated debt.

The total debts for households and non-financial corporations in Sweden have increased rapidly as a percentage of GDP from the mid-1990s (see Figure 2). From 2005 the debt ratio has been higher than the Commission's indicative threshold of 160 per cent. However, the increase has slowed down and over the past three years the non-financial corporations' debt has declined slightly, while household debt has remained constant.

Inter-company loans have increased very substantially

As shown in Figure 2, corporate sector loans as a percentage of GDP (the blue field) have shown only a modest increase. Between 1995 and 2011 the increase was from 67.6 per cent to 72.2 per cent. This includes loans corporations have taken with financial institutions (banks and so on) abroad and in Sweden. Loans from Swedish banks are predominant.

Securities funding (the yellow field), which accounts for a small percentage of the corporations' total funding, has increased during the same period from 3.8 to 16.3 per cent of GDP. This covers funding through bonds and certificates, issued both in Sweden and abroad, and it is primarily large companies that have had the opportunity to obtain funding in this way. This only includes issues by the Swedish company and not issues made by, for example, foreign subsidiaries.

The part of the corporate sector debt that has increased most is group loans from abroad (the grey field). During the comparison period they have increased from 4.1 per cent of GDP

3 A similar measure of debt – consolidated gross debt – is applied in the EU Stability and Growth Pact to measure public sector debt.

to 46.8 per cent. This strikingly rapid increase means that foreign group companies are now funding more than one third of the Swedish non-financial corporations' debt.

A comparison of a sample of countries with comparable statistics also shows that Sweden is one of the countries in Europe with the largest loan liabilities within corporate groups to other countries in relation to GDP (see Figure 3).

So what lies behind this rapid increase and the high level of group loans from abroad in Sweden?

Foreign direct investment in Sweden an important explanation for the increase in debt

One important factor behind the growing group loan liabilities is that Sweden has had a rapid increase in foreign direct investment over the past 20 years. Direct investment, as measured in the balance of payments statistics, arises when a company buys or in some other way invests in a company abroad. A few years after Sweden abolished its currency regulation in 1989, foreign investment in Sweden accelerated, mainly because an increasing number of Swedish companies were bought up by foreign investors. The stock of foreign direct investment assets thus increased substantially, which is shown in Figure 4.

A common form of foreign acquisition of Swedish companies has been for the foreign investor to establish a holding company in Sweden. The holding company has a relatively small equity capital, but at the same time has a very large loan from the foreign parent company. With the aid of this loan, the holding company can in turn acquire the Swedish company.

In Figure 5 the foreign group loans are divided into loan liabilities in foreign direct investment in Sweden and loan liabilities in Swedish direct investment abroad. The figure shows that around two thirds of the group loan liabilities abroad are to companies abroad who own the Swedish borrower. These loan liabilities have increased at a relatively substantial rate in recent years. Growing foreign investment in Sweden is thus the most important reason for the increase in Swedish corporations' debt in the form of group loans.

Positive net saving and lower debt/equity ratios in Swedish companies

Analysing the indebtedness of the Swedish corporate sector is a complex process. However, it does not appear as though Swedish companies have needed to take on larger liabilities in recent years because their operations have not generated sufficient profits. The corporate sector's financial saving (total income minus total expenditure) has been largely positive for the past ten years.

A common measure of companies' debt levels is the company's debt/equity ratio. This is a key ratio that shows how large the company's debts are in relation to its equity capital and it states the company's financial strength. Figure 6 shows that indebtedness in the Swedish corporate sector has fallen from 2.2 in the year 2000 to 1.7 in the year 2010, when measured in this way. The debt/equity ratio thus shows the opposite development to the development of corporate sector gross debt, which indicates that neither the level of nor developments in corporate sector gross debt appear to cause the companies any problems.

Company taxation and beneficial tax deduction opportunities may contribute to the high level of indebtedness

There may be several motives for foreign owners to draw up their ownership of Swedish companies so that their assets are held in the form of interest-bearing loans to a holding company in Sweden and not in the form of directly-owned shares in the Swedish subsidiary.

One probable motive is Sweden's relatively high company taxation in relation to other EU and OECD countries. This, together with the opportunities for tax deduction for interest and double taxation agreements with several countries make it more beneficial to hold assets in Sweden in the form of interest-bearing loans to wholly-owned holding companies. The reason is that the owner determines the interest cost of these loans and can thus affect, within certain limits, the size of the profits that can be recorded for taxation in Sweden.

An overview of the interest expenditure shows that foreign-owned subsidiaries in Sweden pay an interest rate of on average one percentage point higher on their loans from foreign parent companies than the interest rate they receive on their loans to foreign owners (see Figure 7).

The level of the interest in corporate groups flowing abroad is thus systematically higher than the interest flowing into Sweden from abroad. This is in line with our conclusion that foreign owners may choose for tax purposes to hold their assets in the form of interest-bearing loans, which means that the level of the group loans from abroad is high.

There is research pointing to differences in corporate tax rates to explain why and how multinational groups choose to divide loans between the group's different subsidiaries in different countries.[4] In addition, the Swedish regulations on tax deductions for interest paid on loans makes it beneficial to report interest expenditure in Sweden, as the costs are tax deductible. Interest payments abroad have also increased substantially during the 2000s.

Access to foreign capital market important to Swedish companies

However, there are several factors that can explain developments. Figure 5 shows that group liabilities to other countries have increased, even in companies which invest directly in subsidiaries abroad (the red field). These cases concern Swedish companies, for instance, multinational groups, which then take out loans with foreign companies within the group.

Here there may also be tax motives behind the increase in debt. For example, companies use tax planning to reduce or entirely avoid taxation in Sweden, which has been much debated in spring 2012. The debate concerns a large number of Swedish corporate groups with subsidiaries abroad, that is, companies with direct investment that is largely outward. By having extensive borrowing from their foreign subsidiaries, these companies can control the level of interest paid abroad and thereby also the level of profit reported in the Swedish company. This tax planning may thus have contributed to debts for outward direct investment having increased as shown in the red field in Figure 5.

There are also other possible explanations for this. Corporate groups with subsidiaries in several countries often use a central account to manage cash flows for the whole group. In the cases where such central accounts are held in Sweden, a debt arises to foreign subsidiaries when the group brings home liquidity to the Swedish operations. This process contributes to increasing the loan debt to the group companies abroad.

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[4] Ramb, Fred, ***Taxes and the Financial Structure of German Inward FDI***, *CESifo GmbH, CESifo Working Paper Series: CESifo Working Paper No. 1355, 2004*.

Another explanation for the growing foreign debt in the form of group loans is that some companies use their own foreign funding companies to issue securities on the international capital market. When the foreign funding company lends the funds it receives in issues to group companies in Sweden, the group debt to companies abroad also increases.

At present it is not possible to divide up group loan debts abroad on the basis of the purpose of the loan, as the available statistics do not show this.

How should intra-group loans be regarded from an imbalance perspective?

The scope of the lending within a corporate group mainly reflects how one tries to provide the companies within the group with loans and actually says nothing about the loan debts the group has in relation to other lenders. Inter-company loans within the same country thus have limited interest from the perspective of systemic risk or monetary policy.

When the analysis concerns the companies' funding, however, data on intra-group loans from other countries provide valuable information. The companies operating in Sweden are funded from abroad to a much greater degree than is shown in the statistics if we do not include inter-group loans. This means, for instance, that these companies are not affected as much by possible credit restrictions on the national market as companies dependent on loans from Swedish banks.

But by including intra-group loans from abroad in the definition of the debt measure, one also risks exaggerating a country's burden of debt. An economy that is more open and integrated with the international capital markets, and where it is common to have cross-border corporate ownership, may with this measure be allocated a larger debt ratio than a more closed economy. As we have illustrated by our earlier arguments, intra-group loans may arise as a result of several different activities related to liquidity management and funding and which can be managed on a global financial market, but these activities do not necessarily mean that the group has any problems with imbalances. It is common that companies both lend to and borrow from subsidiaries within their own group. When analysing corporations' indebtedness it may therefore be justified to regard the net result of group loans to and from other countries.

What conclusions can then be drawn with regard to the measure for corporations' debts as described above? A first conclusion is that the European Commission's measure with non-consolidated data gives an exaggerated picture of the level of the debts. We have therefore described in this commentary a consolidated debt definition, a measure which eliminated debt positions among units within the corporate sector in Sweden. We consider that this definition of the debts can also give an exaggerated picture of corporations' burden of debt. The level of intra-group loans from abroad is a consequence of how the group chooses to manage its funding and liquidity, which can over-inflate the gross debt. Instead, we need a statistic that for each group is based on the net result of intra-group loans to and from other countries. This type of statistic, which does not yet exist, would better illustrate the Swedish companies' dependence on funding abroad.

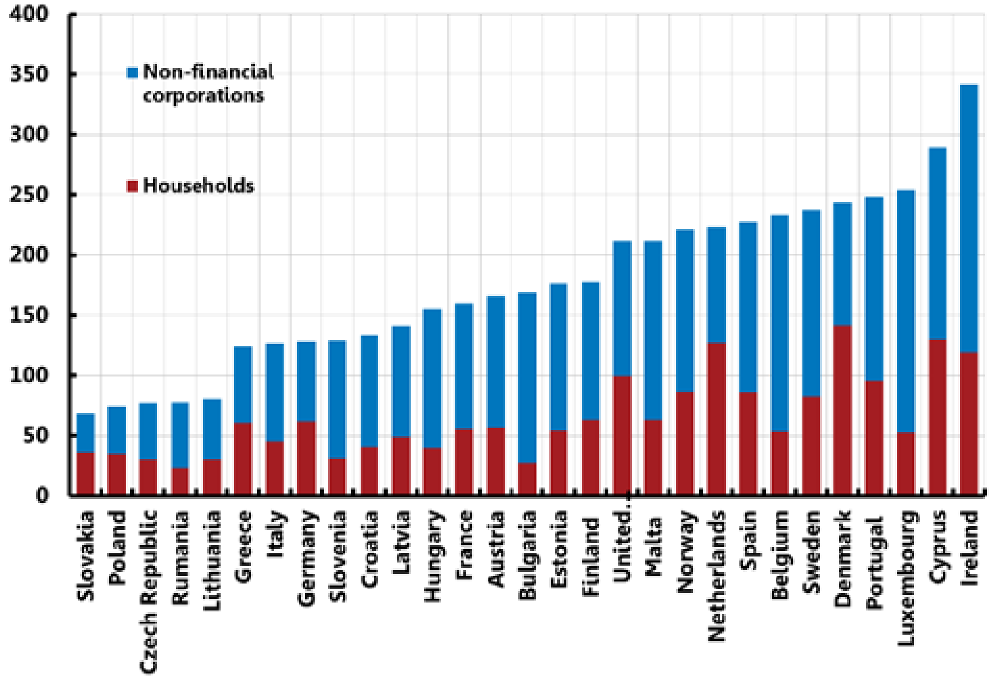
Intra-group loans should not be assessed in the same way as other credit market instruments (such as loans with credit institutions and interest-bearing securities) as the relationship between lender and borrower is different with these loans and their purpose can be to re-allocate tax expenditure within the group.

This means that one would obtain a fairer picture of the state of the Swedish non-financial sector with the aid of a different type of statistic than the traditional one used by the European Commission. The multinational corporations' global operations mean that group statistics are needed to be able to analyse their liabilities, assets and risks. The Bank for

International Settlements has data on consolidated banking groups, their balance sheets and their exposures to various countries and sectors. This type of international group statistic that is used in the financial sector could also serve as an example for the non-financial corporate sector, and could contribute to a better analysis of systemic risk and the development of debt.

Figure 1

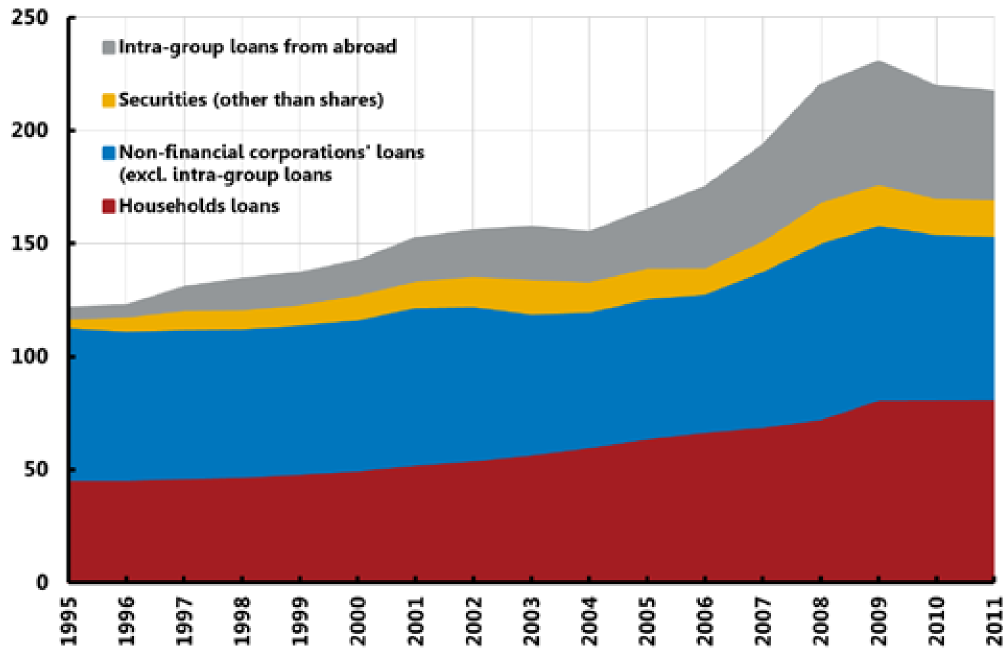
Private sector debt as a percentage of GDP, countries in Europe, 2010



Source Eurostat

Figure 2

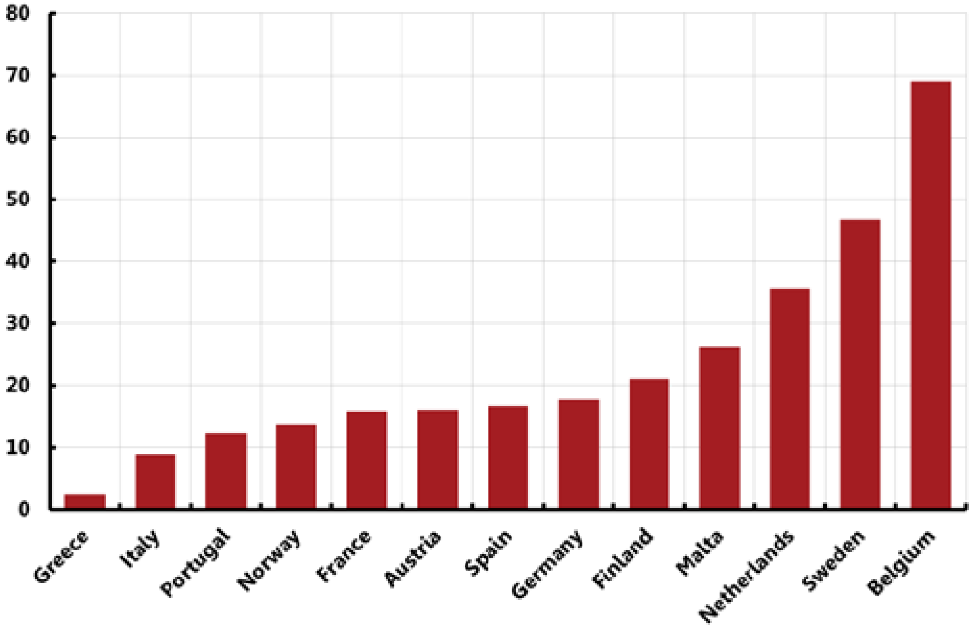
The private sector's consolidated gross debt as a percentage of GDP



Source: Statistics Sweden

Figure 3

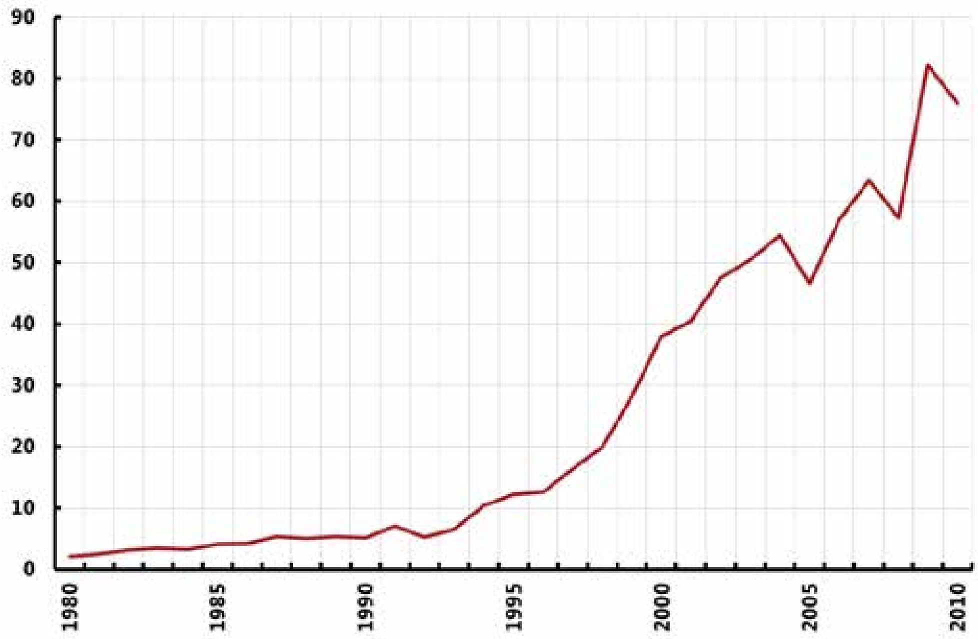
Intra-group loans abroad, gross debt as a percentage of GDP, sample of countries



Sources: IMF and Eurostat

Figure 4

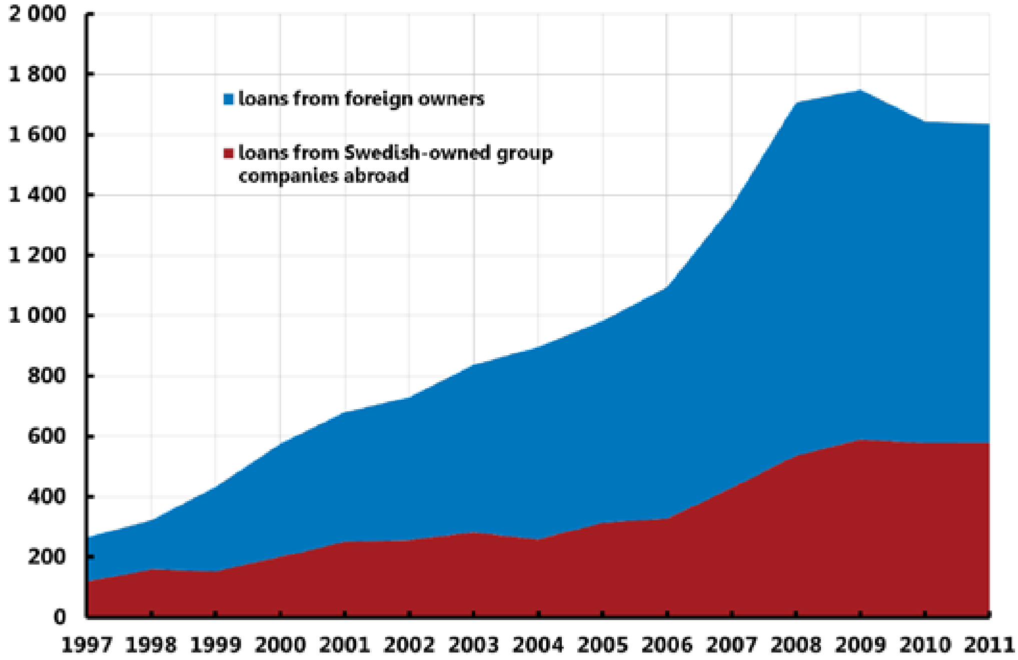
Foreign direct investment assets in Sweden as a percentage of GDP



Source: UNCTAD

Figure 5

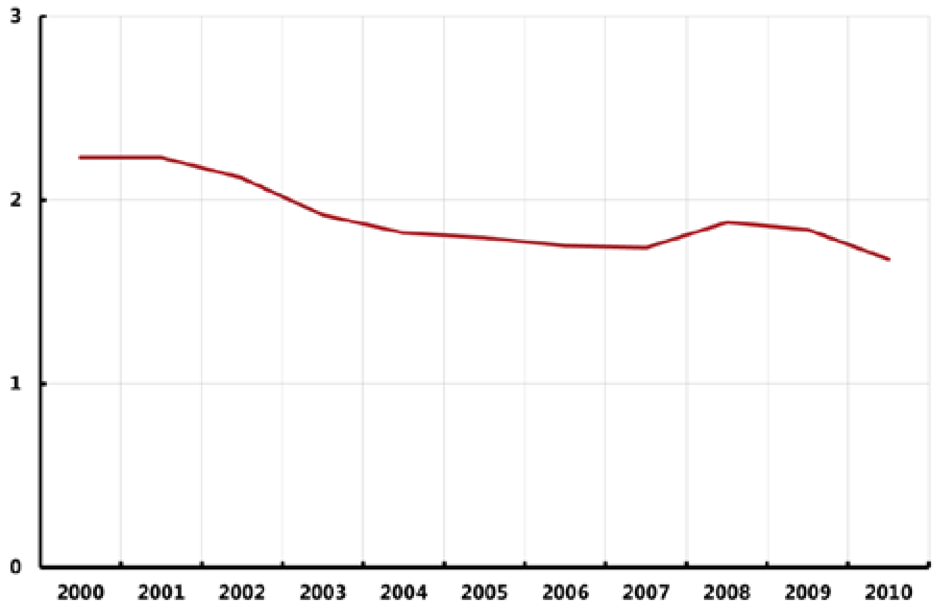
Intra-group loans from abroad, gross debt in SEK billion



Source: Statistics Sweden

Figure 6

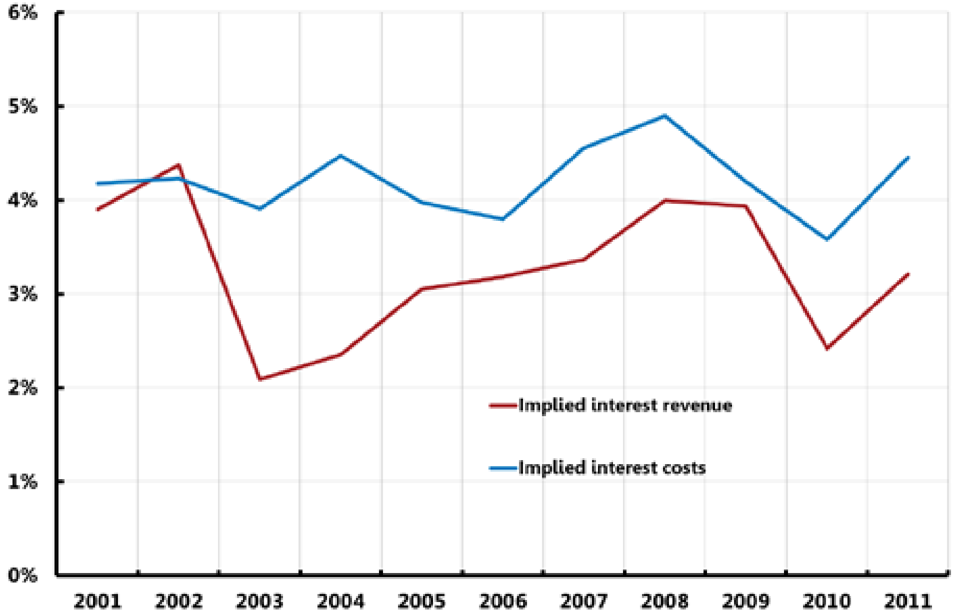
The Swedish corporate sector's debt/equity ratio



Source: Statistics Sweden

Figure 7

Implied rates, foreign-owned companies' intra-group loans to and from other countries



Source: Statistics Sweden and own calculations

Table 1

Private sector debt as a percentage of GDP, Sweden, 2010

Private sector debt, non-consolidated data	236,9
Positions regarding own domestic sector	*15,9*
Private sector debt, consolidated data	221,0
of which households	82,2
of which non-financial corporations	138,8
loans	*73,7*
securities	*16,1*
intra-group loans abroad	*49,0*

Source: Statistics Sweden

Sectoral interlinkages in balance sheet approach

Ryoichi Okuma[1, 2]

1. Introduction

The financial crises have emphasised the need to identify sectoral interlinkages, which indicate financial linkages either among economic sectors or between residents and non-residents. Sectoral interlinkages provide a useful tool to measure detail capital flows. This is discussed as one of “data gaps” in FSB and IMF (2009) and IMF and OECD (2011). However, it is very difficult to identify sectoral interlinkages, because there are few source data to do it accurately. Actually, there are only a few countries that specify sectoral interlinkages officially.[3]

Therefore, some studies have estimated sectoral interlinkages in balance sheet approach, which uses sectoral balance sheet, i.e. flow of funds accounts (FFA). Castren and Kavonius (2009), Hyun (2010) and Hagino and Takeuchi (2011) are the examples. The methods of estimating sectoral interlinkages by these studies are to allocate each sector’s assets to each sector including itself by pro rata of each sector’s portfolio of liabilities in the flow of funds accounts. So, these methods are called “the simple-pro-rata method” in this paper.

Although the simple-pro-rata method is easy to estimate, its sectoral interlinkages aren’t accurate enough with the two reasons. First, the actual allocation of each sector’s assets is different from that of each sector’s liabilities. Second, the simple-pro-rata method includes improbable linkages, such as transactions from “central bank” sector to “central bank” sector, from “rest of the world” sector to “rest of the world” sector and so on.[4]

This paper aims to estimate Japanese sectoral interlinkages by more accurate methods than the simple-pro-rata method and to analyze those. For these aim, first, this paper recompiles the Japan’s flow of funds accounts (J-FFA) into the sector-by-sector flow of funds accounts, which shows links between assets and liabilities holders for each transaction item, i.e. so-called “from-whom-to-whom” data (FWTW). This paper calls this renewed flow of funds accounts as the inter-sector-FFA. For compiling the inter-sector-FFA, this paper uses not only the J-FFA but also other supporting source data, i.e. the “detailed Japan’s flow of funds accounts (D-FFA)”, the “shareownership survey” and so on. Moreover, through the inter-sector-FFA, this paper analyzes the structure of sectoral interlinkages and its change in time-series.

Second, this paper applies input-output analysis to the inter-sector-FFA and simulates ripple effects of financial shocks transmitted in sectoral interlinkages. This paper gives a simple example of simulation. The analysis could also be extended to simulate transmission of policy effects among sectors.

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1 Research and Statistics Department, Bank of Japan.

2 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 and omissions.

3 In Australia, sectoral interlinkages of both net financial flows and net claims are published quarterly by Australian Bureau of Statistics.

4 In Japan, “central bank” sector is composed of only one institution, Bank of Japan. And “rest of the world” sector means the aggregated counterparty with domestic sectors. Therefore, there must not be transactions between central bank sectors and between “rest of the world” sectors.

The contents of chapter 2 through 5 are following. Chapter 2 illustrates the methods of recompiling the inter-sector-FFA. With the inter-sector-FFA, chapter 3 examines time-series analysis. Chapter 4 introduces how to apply input-output analysis into the inter-sector-FFA and gives a simple example to simulate any ripple effects of financial shocks transmitted between sectors. Chapter 5 is conclusion.

2. Methodology

For identifying sectoral interlinkages, this paper recompiles the J-FFA into the inter-sector-FFA. The J-FFA, published by Bank of Japan (BOJ), is statistics that record financial transactions and resulting claim/debt held by each economic entity (= sector) in various financial transactions' form (= transaction item).[5] In the J-FFA, both sectors and transaction items are categorized in so detail that there are 43 sectors and 51 transaction items. Although the J-FFA doesn't directly show the FWTW, these detail-categorized transaction items partially indicate it by each transaction item's features. For compiling the inter-sector-FFA, fundamentally using these features, this paper reallocates each sector's outstanding amount of assets to suitable debtors in the following method.

First, the number of sectors needs to be reduced for presentation, because detailed sectors' categories lower the inter-sector-FFA's accuracy. This paper summarizes sectors' categories into 8 sectors of the J-FFA's large scope sectors, i.e. "central bank (CB)," "depository corporations (DC)," "insurance and pension funds (IP)," "other financial institutions (OFIs)," "nonfinancial corporations (NFC)," "general government (GG)," "households (HH)" and "rest of the world (RoW)."[6]

The second step is to identify links between each sector's outstanding amount of assets and each debtor sector for each transaction item under the 8 sectors. The following four types of methods are applied. The degree of accuracy as a method to compile FWTW descends from type 1 to 4.

Type 1: Rearrangement of transaction items

Type 1 refers to the case where a transaction item can identify FWTW by its definition. For example, "currency" is issued only by central bank. Therefore, each sector's asset of currency has to be allocated to the liabilities of CB. Mostly, in this type's transaction items, there is only one sector on liabilities' side or assets' side.

The transaction item "loans by financial institutions" is another example of this type. D-FFA, which is the supplement of the J-FFA, shows borrower sectors of loans extended by financial institutions, and provides information for FWTW.

Type 2: Rearrangement of transaction items with additional information from other source data

Type 2 refers to the case where FWTW is identified by the J-FFA in combination with other source data. For instance, in "foreign currency deposit," there are two sectors (DC and RoW)

[5] The annual data of the J-FFA based on the 1993 SNA starts from 1980 on the fiscal year basis and 1998 on the calendar year basis. In order to analyze time-series data on the same basis as long as possible, this paper deals with data on the fiscal year basis. For 2011, however, calendar year basis data are used because 2011's data on the fiscal year basis were unavailable at the timing of writing this paper.

[6] Although there are also "other financial intermediaries," "financial auxiliaries" in the large scope sectors of the J-FFA, this paper settles the aggregation of these sectors equals with OFIs. Moreover, this paper settled HH is including "private nonprofit institutions serving households," which is in the large scope sectors of the J-FFA.

on liabilities' side, and it isn't able to allocate accurately only by the J-FFA. However, CB's asset is clearly allocated to RoW, and the data for the amount from GG to RoW is available from "international reserves/foreign currency liquidity" published by Ministry Finance of Japan. Remaining amount of "foreign currency deposit" liabilities of Row can be linked to DC's asset among other remaining sectors', because it is not common for other sectors to have an account directly at non-resident banks. Instead they tend to have foreign currency deposit at resident banks.

"Shares" is another example. Most information about shares' FWTW is available from "shareownership survey" published by stock exchanges. For details, see *Appendix*.

Type 3: Partial "pro rata" estimation in addition to Type 2

Type 3 refers to the case where FWTW can be identified only partially by the J-FFA and other source data. Unavailable information is complemented by estimation where the amount of asset is allocated proportionately to the amount of liabilities of related sectors. For example, "central government securities and FILP bonds" is issued by two sectors (OFIs and GG) and information is unavailable about who holds which sectors' securities.[7] So, this paper allocates each sector's amount of assets to these two issuing sectors by pro rata of the two sectors' amounts of liabilities in this transaction items.

Type 4: Estimation by "enhanced-pro-rata method"

It is impossible to identify the FWTW in Type 4. Therefore, it should be estimated by pro-rata approach. In order to enhance the estimating accuracy, this paper augments the simple-pro-rata method in chapter 1, which is called enhanced-pro-rata method. The enhanced-pro-rata method is more accurate than the simple-pro-rata method by removing transaction relations that cannot take place by definition. The examples include transactions between CB and CB, and RoW and RoW, which are included in the simple-pro-rata method.

The following example is the enhanced-pro-rata method applied to "accounts receivable/payable." In accounts receivable/payable, all sectors hold amounts on both assets and liabilities side. In the enhanced-pro-rata method, first, CB's amount is allocated. The amount of CB's asset issued by CB, which is CB's liabilities, is set at 0 and the amounts of the other sectors' assets to CB's liabilities are calculated as the following.

$$A_{i,CB} = L_{CB} \times \pi_i \ , \ \ \pi_i = A_i / (A - A_{CB})$$

$$i = \{DC, IP, OFIs, NFC, GG, HH\}$$

Where $A_{i,CB}$ stands for the amount from i sector to CB, A_i stands for the amount of the i sector's assets, A_{CB} stands for the amount of the CBs' asset, A stands for the aggregate amount of all sectors' assets, L_{CB} stands for the amount of the CB's liability in "accounts receivable/payable." This calculation is also performed in RoW as in CB (in the above calculation, CB is converted to RoW). After these calculations, the amount from each sector to the sectors, which is other than CB and RoW, is calculated in following.

$$A_{i,j} = \left[A_i - \left(A_{i,CB} + A_{i,RoW}\right)\right] \times \lambda_j \ , \ \ \lambda_j = L_j / \left[L - \left(L_{CB} + L_{RoW}\right)\right]$$

$$i, j = \{DC, IP, OFIs, NFC, GG, HH\}$$

7 This item is so-called "JGBs (long-term)."

Where $A_{i,j}$ stands for the amount from i sector to j sector, L_j stands for the amount of j sector's liabilities, L stands for the aggregate amount of all sectors' liabilities in this item. These compose the enhanced-pro-rata method. In this method, the inter-sector-FFA's aggregate amount of each sector or transaction item equals to that of the J-FFA, with removing the linkages of CB-CB and RoW-RoW.[8]

Table 1 summarizes these four types in details of each item's amount by sector in 2011. Through the table, it can be said that the inter-sector-FFA is accurate sufficiently with present source data. On the aggregate assets' side, 82% (81% on the liabilities' side) is identified entirely or partially. Although the residuals must be estimated by the enhanced-pro-rata method, even these are more accurate than prior researches as said above.

3. The results and time-series analysis

Table 2 is the inter-sector-FFA at the end of 2011, in which the J-FFA's detailed transaction items are summarized in larger scope. In the table, rows are kept blank where no assets and liabilities are held. Moreover, this paper compiles the inter-sector-FFA from 1981 to 2011.

Through the inter-sector-FFA, this paper analyzes sectoral interlinkages in time-series. This paper shows financial networks of both gross exposures and net exposures. Gross exposures show the sum of credits and debts between two sectors. On the other hand, net exposures show the difference of the credits and debts between two sectors, and indicate which inter-sector vectors of credit/debts relationships are main channels in the financial system.

Gross exposures

Chart 1 describes the outstanding amounts' networks of inter/each-sector gross exposures, which are settled as aggregate assets' amounts plus aggregate liabilities' amounts, in the end of 1981, 1991, 2001 and 2011. Following features can be observed from the chart. First, DC has the largest gross exposure especially in any time. It is attributable to the fact that indirect financing, which means DC mainly intermediates investors with fundraisers, has developed in Japan. Second, both DC-HH and DC-NFC are main inter-sector connections in the financial system in any time. HH's large amount of deposits explains the DC-HH's large exposure. DC-NFC's large exposure can be explained by DC's loans to NFC, and NFC's deposits and so on. Moreover, it is needed to check the net exposure about DC-NFC in the next section. Third, both DC-GG's and IP-GG's exposure have developed consistently. Specifically, DC-GG's exposure is the 3rd largest among inter-sector exposures in the end of 2011. This is because the JGBs' amounts have increased, and both DC and IP are main purchasers, as indicated in Kobayakawa and Okuma (2011).

Net exposures

Chart 2 shows the outstanding amounts' networks of inter/each-sector net exposures, which are settled as aggregate assets' amounts minus aggregate liabilities' amounts, in the end of

[8] In the result of the enhanced-pro-rata method, all transaction items have no difference between assets' side and liabilities' side in the inter-sector-FFA. However, in the J-FFA, there is a little difference between assets' and liabilities' side of only "other external claims and debts." This is because the item is including in "Gold and SDRs etc," which is outstanding on only assets' side of CB and GG in the J-FFA. On the other hand, in the inter-sector-FFA, this item is outstanding both on assets' side of CB and GG and on liabilities' side of RoW. However, this item's amount is very small relatively (less than 1% of total liabilities' amount of RoW). Therefore, it is no problem to say this difference between the J-FFA and the inter-sector-FFA doesn't lower the accuracy of the inter-sector-FFA.

1981, 1991, 2001 and 2011. Following features can be observed from the chart. First, HH has the largest net exposure in any time. Second, the net exposures from HH to both DC and IP are the 1st and the 2nd largest in the inter-sector net exposures. These are main channels of funding flow in the financial system. Third, the net exposure from DC to NFC has decreased especially from the end of 2001 to 2011. It is attributable to the NFC's financial restructuring that resulted in the reduction of their liabilities and to the increase of NFC's deposits in recent years. This point is made clear by calculating net exposure. Fourth, the net exposures from DC and IP to GG have increased. This is because of the JGBs as mentioned in the former section.

4. Input-output analysis

The inter-sector-FFA has a structure similar to input-output table (IO) and is useful in analyzing ripple effects among sectors by applying input-output analysis. The analysis could also be extended to simulate transmission of policy effects among sectors. This chapter transforms the inter-sector-FFA to IO structure, which is called the financial input-output table (financial-IO), and analyzes how each sector influences other sectors in terms of changes in assets' or liabilities' amounts. This chapter also introduces a simple example that simulates ripple effects of financial shocks transmitted between sectors with the financial-IO.

4.1 The financial input-output table

According to Tsujimura and Mizoshita (2002), the financial-IO is composed of the following matrices.[9]

$$Y = \begin{bmatrix} y_{CB,CB} & y_{CB,DC} & \cdots & y_{CB,RoW} \\ y_{DC,CB} & y_{DC,DC} & \cdots & y_{DC,RoW} \\ \vdots & \vdots & \ddots & \vdots \\ y_{RoW,CB} & y_{RoW,DC} & \cdots & y_{RoW,RoW} \end{bmatrix}, \ \varepsilon = \begin{bmatrix} \varepsilon_{CB} \\ \varepsilon_{DC} \\ \vdots \\ \varepsilon_{RoW} \end{bmatrix}, \ T = \begin{bmatrix} t_{CB} \\ t_{DC} \\ \vdots \\ t_{RoW} \end{bmatrix}$$

$$\rho = \begin{bmatrix} \rho_{CB} & \rho_{DC} & \cdots & \rho_{RoW} \end{bmatrix}$$

Where $y_{i,j}$ stands for the outstanding amount from i sector to j sector, ε_j stands for the amount of j sector's net liabilities (over-financing), ρ_i stands for the amount of i sector's net assets (over-investing), t_i stands for the total amount of i sector' assets or liabilities.[10] Moreover, T' is defined as a transposed matrix of T. Therefore, the financial-IO framework can be shown as a combination of these matrices as the following arrange.

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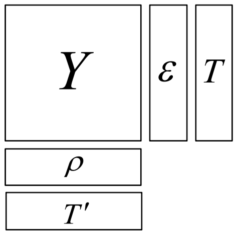
9 In Tsujimura and Mizoshita (2002), the method to recompile the J-FFA to the financial-IO is like as the simple-pro-rata method. Therefore, it can be said this paper's financial-IO is more accurate than their financial-IO.

10 If i sector has more total assets than liabilities, ε_i is set at 0. Similarly ρ_i is set at 0 if total liabilities exceed total assets. Therefore, the followings are true. $\sum_{j=1}^{m} y_{i,j} + \varepsilon_i = t_i \ \sum_{i=1}^{m} y_{i,j} + \rho_j = t_j$



The inter-sector-FFA can be transformed to the financial-IO easily: matrix Y is an extract of the inter-sector-FFA's "total" on liabilities' side. Similarly, other matrices can be made from the inter-sector-FFA. Therefore, table 3 is the financial-IO in the end of 2011.[11]

To analyze ripple effects among sectors, Leontief inverse matrix needs to be constructed. For this, first, the following matrix is defined.

$$C = \begin{bmatrix} c_{CB,CB} & c_{CB,DC} & \cdots & c_{CB,RoW} \\ c_{DC,CB} & c_{DC,DC} & \cdots & c_{DC,RoW} \\ \vdots & \vdots & \ddots & \vdots \\ c_{RoW,CB} & c_{RoW,DC} & \cdots & c_{RoW,RoW} \end{bmatrix}, \text{ where } c_{i,j} = {y_{i,j}}/{t_i}$$

C is so-called the input coefficient matrix. Using the matrix, the Leontief inverse matrix for financial-IO is defined as Γ in the followings.

$$CT + \varepsilon = T$$

$$T = (I - C)^{-1}\varepsilon$$

$$\Gamma \equiv (I - C)^{-1} \equiv \begin{bmatrix} \gamma_{CB,CB} & \cdots & \gamma_{RoW,CB} \\ \vdots & \ddots & \vdots \\ \gamma_{RoW,CB} & \cdots & \gamma_{RoW,RoW} \end{bmatrix}$$

The inverse matrix indicates an influence, both directly and indirectly, of a change in a sector's investing (assets') amounts on other sectors' investing amounts directly as well as indirectly. Its amount can also be calculated by multiplying Γ by the scale of changes. Furthermore, Γ can be used to calculate the power-of-dispersion index (PDI, p_j) and the sensitivity-of-dispersion index (SDI, s_i). PDI indicates influence of a unit of shock in j sector's financing demand on other sectors' financing demand. On the other hand, SDI indicates influence of a unit of shock in total sector's financing demand on i sector's financing demand. These indices are defined as follows.

$$p_j \equiv \frac{\sum_{i=1}^{m} \gamma_{i,j}}{\frac{1}{m}\sum_{j=1}^{m}\sum_{i=1}^{m} \gamma_{i,j}}, \quad s_i \equiv \frac{\sum_{j=1}^{m} \gamma_{i,j}}{\frac{1}{m}\sum_{j=1}^{m}\sum_{i=1}^{m} \gamma_{i,j}}$$

[11] According to Tsujimura and Mizoshita (2002), there are 2 types of the financial-IO, i.e. the financial-IO on liabilities' side and the financial-IO on the assets' side, and chart 5 is the former one. It is also easy to recompile the inter-sector-FFA to the latter one, which composes of a transposed matrix of Y, because this matrix equals with the inter-sector-FFA's "total" on assets' side.

Where m stands for the number of sectors, i.e. 8, in this paper. Chart 3 shows these indices in the end of 1981, 1991, 2001 and 2011, and indicates the following features. First, NFC's PDI has decreased and its SDI has increased. This implies NFC has shifted its investment style from the real asset investor to the financial asset investor. Second, GG's PDI has increased and its SDI has decreased. This background is the budget deficit has increased and has limited GG's extra financial investment. Third, DC's PDI has been high relatively. So, DC's financing has led the other sectors' financing. However, this has decreased recently.

4.2 Simulation

As a simple example of simulation with the financial-IO, this section simulates a ripple effect of an increase in "transferable deposits" of HH and NFC. HH and NFC have increased their amounts of this item recently because their preference for liquidity assets has risen through the financial crisis and the Great East Japan Earthquake (March, 2011), as mentioned in Kobayakawa and Okuma (2012). Therefore, DC's liabilities have increased as "transferable deposits" increases because its debtor is DC only.

This section sets 3 scenarios about the growth rate of "transferable deposits" in 2012: 1) rises as same pace as 2011, 2) doesn't change from 2011, 3) falls to the levels of 2010. This section also stimulates what amounts these increases bring to each sector's investment (chart 4).

The simulation's method starts from setting DC as an external variable, i.e. exclude $y_{DC,j}$ and $y_{i,DC}$ from Y, and add $y_{DC,j}$ ($y_{i,DC}$) to ε_j in ε (ρ_i in case of ρ) in 2011's data. This is because a ripple effect of an increase in "transferable deposits" spreads through DC's liabilities. Second, Γ is made from these renewed Y. Finally, this Γ is multiplied by the scenarios' amounts. In these ways, each sector's ripple effect on assets' side in 2012 can be calculated. Chart 5 shows the results. It is apparent that any scenario's increase of "transferable deposits" (the amount to DC) causes larger ripple effects in OFIs', IP's and NFC's assets.

Although the financial-IO is useful to simulate as in this section, this analysis's limitation should be noted; the financial shocks cause not only financial but also real ripple effects and this analysis doesn't capture it. Therefore, it is more appropriate to use the financial-IO's simulation with some macroeconomic models.

5. Conclusion

This paper recompiled the J-FFA to the inter-sector-FFA aiming to clarify sectoral interlinkages more accurately than the former studies and to analyze those. Furthermore, this paper applied input-output analysis to the inter-sector-FFA and simulated ripple effects among sectoral interlinkages.

Although the inter-sector-FFA can suggest more accurate sectoral interlinkages than the former studies, there are some points that should be improved in the inter-sector-FFA. This is because the inter-sector-FFA still had to be made by pro rata partially. More source data needs to be developed to improve FWTW.

Therefore, it is hoped that more source data will be enhanced and sectoral interlinkages will be clarified more accurately in the near future. These efforts will be useful to improve measuring detail cash flows and analyzing transmission of policy effects.

Appendix:
Estimating the FWTW of "shares"

Chapter 2 says the FWTW of "shares" is appeared largely in the "shareownership survey." This appendix explains this survey and how to use its FWTW for the inter-sector-FFA.

The "shareownership survey" is annually published by five domestic stock exchanges and records the FWTW for all listed stocks' outstanding amount on market value in Japanese stock exchanges.[12] The aggregated amount of all listed stocks equals to "shares" in the J-FFA, so the information about FWTW on the survey can used as source data for converting the J-FFA to the inter-sector-FFA. In using the survey, some issues about the category of issuers / investors should be mentioned.

First, issuers' category of the survey is almost the same as that of the J-FFA (table 4-1). Therefore, it is appropriate to allocate each sector's holding amounts to each issuing sector in the J-FFA under issuers' proportions of this survey.[13]

Second, there are some differences between investors' category of the survey and that of the J-FFA (table 4-2). Therefore, it is needed to adjust their differences as the following.

1. Accounts in banks

In the survey, "city & regional banks" and "trust banks" are composed of banking accounts, trust accounts and overseas branches accounts. On the other hand, their equivalent in the J-FFA, "domestically licensed banks" and "foreign banks in Japan," are composed of only banking accounts. Therefore, it is needed to estimate only banking accounts of "city & regional banks" and "trust banks." First, it is assumed that "city & regional banks" has only banking accounts due to limitation of source data.[14] Second, for "trust banks," the paper uses the data for banking accounts' shares in Trust Companies Association of Japan.

2. Holding through trust accounts

In the survey, it is impossible to identify shares' amounts held through trust accounts by some sectors, i.e. CB, "collectively managed trusts (included in DC)," "public pensions (in GG)." On the other hand, "investment trusts" and "annuity trusts" are identified as

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[12] Five domestic stock exchanges are Tokyo, Osaka, Nagoya, Fukuoka and Sapporo Stock Exchange. These are all of Japanese stock exchanges. And this survey's data are on a fiscal year basis.

[13] The outstanding amounts on market value in the "shareownership survey" are slightly different from that in the J-FFA. In this background, the survey is conducted with share units recorded by the shareholder register administrators (it isn't possible to identify and avoid counting a same shareholder among shareholder register administrators), and its total amounts are calculated as the aggregation of each investor's holding amount, which is set as multiplying each listed share's amount on market value basis and the investor's proportion on share units basis. On the other hand, the J-FFA records total amounts of stock issues on market value. Therefore, it is appropriate not to use the survey's amounts directly but proportions of that in order to allocate the J-FFA's amounts.

[14] In fact, just a few of "city & regional banks" have trust accounts and overseas branches accounts. So, this paper assumed that "city & regional banks" is only banking accounts.

components of “trust banks.”[15] Therefore, this paper deducts “investment trusts” and “annuity trusts” from “trust banks,” and allocates the residuals in “trust banks” to those unknown sectors by pro rata under the amounts of these sectors’ shares on assets.

3. Other financial institutions

In the survey, “other financial institutions” is composed some different kinds of the J-FFA’s detailed sectors, i.e. “financial institutions for agriculture, forestry, and fisheries (included in DC),” “financial institutions for small business (in DC),” “government financial institutions (in OFIs)” and “mutual aid insurance (in IP).” Therefore, because of the limitation of the source data to identify their data separately, this paper uses the FWTW data of “other financial institutions” to estimate the FWTW of all their detailed sectors in the J-FFA.

4. Business corporations

In the survey, “business corporations” also includes some different kinds of the J-FFA’s detailed sectors, i.e. “financial companies (included in OFIs),” “financial dealers and brokers (in OFIs),” “financial auxiliaries (in OFIs)” and NFC. Therefore, because of the limitation of the source data to identify their data separately, this paper uses the same method of 3. *Other financial institutions*.

In taking care of the above points, this paper transforms the J-FFA’s “shares” to the inter-sector-FFA using the survey’s FWTW. However, the survey’s data are available on the same basis from 1992, so this paper has to compile the former data by pro rata. Furthermore, the 2011’s survey isn’t published at the timing of writing this paper, so the 2011’s FWTW is assumed to equal that of 2010 in this paper.

[15] According to the guide of this survey, “investment trusts” and “annuity trusts” are included in “city & regional banks” and “trust banks.” However, it is appropriate to think almost all of these trusts are actually included in only “trust banks.” Therefore, this paper assumes “investment trusts” and “annuity trusts” are components of only “trust banks.”

Tables and Charts

Table 1

The Four Types of Transaction Items of the J-FFA in the End of 2011

<< ¥ 100 million >>

Transaction items		CB (A)	CB (L)	DC (A)	DC (L)	IP (A)	IP (L)	OFIs (A)	OFIs (L)	NFC (A)	NFC (L)	GG (A)	GG (L)	HH (A)	HH (L)	RoW (A)	RoW (L)
Currency and deposits	Currency		885,465	85,751		3,596		368		238,986		62		556,702		0	
	Deposits with the Bank of Japan		365,323	330,635		0		34,688									
	Government deposits		20,979									20,979					
	Transferable deposits			81,948	4,724,588	9,129		59,979		1,203,154		111,566		3,251,066		7,746	
	Time and savings deposits			1,221,572	6,691,036	31,391		65,617		486,276		141,133		4,766,985		10,081	32,019
	Certificates of deposit			17,606	370,677	69,714		17,279		167,036		97,249		1,782		11	
	Foreign currency deposits	1,452		97,665	230,996	0		6,675		51,565		32,608		57,306		27,222	43,497
Deposits with the Fiscal Loan Fund				0		47,091		3,836	437,006			386,079					
Loans	Bank of Japan loans	406,496			256,657	0			149,839								
	Call loans and money			225,940	223,109	45,872		69,112	153,434	32,292		3,327					
	Bills purchased and sold	0	0	0	0	0		0	0	0		0					
	Loans by private financial institutions			6,084,271	274,003	338,295	16,322	471,258	486,859		2,587,356		522,140		2,589,921		417,223
	Loans by public financial institutions			41,431		139,470		2,740,237	549,418		665,640		1,094,063		451,426		160,591
	Loans by the nonfinancial sector				512,488				128,861	325,623	436,320	257,875	23,506	29,545	90,209	713,836	135,495
	Installment credit (not included in consumer credit)				10,277		7,742	163,895	2,935	41,459	164,882				11,510		8,008
	Repurchase agreements and securities lending transactions	0	122,922	110,853	382,380	19,753	45,996	657,384	571,620	34,553	2,826	101,703	1,520	216	0	289,535	86,733
Securities other than shares	Treasury discount bills	240,564		830,129		33,171		69,001	5,000	741		193,023	1,637,011			275,382	
	Central government securities and FILP bonds	676,307		2,742,246		1,975,753		392,762	1,162,693	109,311		715,410	6,391,210	433,015		509,099	
	Local government securities			309,319		224,676		17,396		24,174	36,375	79,278	695,315	75,574		1,273	
	Public corporation securities			314,188		189,000		30,233	417,364	39,481	80,401	111,323	256,910	40,224		30,226	
	Bank debentures			100,760	154,185	13,655		10,965		7,943		12,881		7,981		0	
	Industrial securities	15,517		338,791	149,833	195,249	3,441	41,357	60,399	25,690	540,276	82,210		38,365		16,770	
	External securities issued by residents			74,204	18,684	5,305	1,698	7,610	46,935	0	71,772	14	1,275			53,231	
	Commercial paper	19,830		54,551	7,561	11,058	0	38,754	54,894	16,856	78,616	22					
	Investment trust beneficiary certificates	8,165		39,775		184,645		1,043	670,540	79,387	41,096	6,145		392,476			
	Trust beneficiary rights			18,391	73,515	3,843		4,157	0	22,168		2,430		22,526			
	Structured-financing instruments	0		72,888		46,516		9,051	260,764	125,352		177				6,780	
	Mortgage securities			0		0			62	25				37			
Shares and other equities	Shares	15,229		126,065	203,366	272,117	46,656	185,534	48,479	643,520	2,350,976	169,930		541,126		695,956	
	Other equities	1,002	1	195,708	329,568	35,470	88,145	162,851	265,717	756,753	1,463,318	765,070	175,925	316,637		89,183	
Financial derivatives	Forward-type instruments			492,916	519,586	16,515	7,854	11,337	17,289	10,395	37,329	0	509		691	224,158	172,063
	Option-type instruments			84,644	72,195	1,325	804	14,929	16,001	1,649	15,445			4,294	4,223	131,864	130,037
Insurance and pension reserves	Insurance reserves						2,204,833							2,204,833			
	Pension reserves						1,999,320							1,999,320			
Deposits money		2	83	22,557	2,546	22,351	20,274	39,875	84,619	294,288	436,831	57,843	2,499	110,160	284	60	
Trade credits and foreign trade credits								64,873		2,145,096	1,687,266	6,510	0		505,493	23,600	47,320
Accounts receivable/payable		1,526	94	34,572	62,170	336,656	323,793	61,262	107,043	115,798	365,004	100,916	80,312	341,183	29,206	35,481	59,772
Outward direct investment				133,668						418,822							552,490
Outward investments in securities		43,679		604,933		656,632		380,610		626,454		1,161,919		107,736			3,581,963
Other external claims and debts		27,992	13,757	433,974	318,301	36,696		1,807		70,995	25,959	78,846	19,060			377,077	592,449
Others		49,246	28	221,628	164,112	29,010	2,384	11,625	42,340	134,339	217,466	40,143	89,698	94,090	64,053	0	0

Table 1 (cont)

The Four Types of Transaction Items of the J-FFA in the End of 2011

																		Total (A)	Total (L)
Total financial assets / liabilities		1,507,007	1,408,652	15,543,579	15,751,833	4,993,954	4,769,262	5,847,360	5,740,111	8,250,181	11,305,154	4,736,671	10,990,953	15,393,179	3,747,016	3,518,571	6,019,660	59,790,502	59,732,641
Each type's share of total amounts (%)	Type 1: Rearrangement of transaction items	32%	91%	20%	80%	18%	88%	10%	15%	41%	29%	43%	15%	84%	81%	12%	89%	40%	54%
	Type 2: Rearrangement of transaction items with additional information from other source data	0%	0%	1%	1%	5%	0%	0%	0%	0%	0%	1%	0%	4%	0%	20%	1%	3%	0%
	Type 3: Partial "pro rata" estimation in addition to Type 2	65%	9%	69%	4%	66%	1%	68%	60%	11%	28%	29%	82%	6%	0%	24%	0%	39%	27%
	Type 4: Estimation by "enhanced-pro-rata method"	3%	0%	9%	15%	10%	10%	21%	25%	47%	43%	28%	3%	6%	19%	44%	11%	18%	18%

Note: Gray cells indicate no amounts in those.
Source: BOJ.

Table 2

The Inter-Sector-FFA in the End of 2011

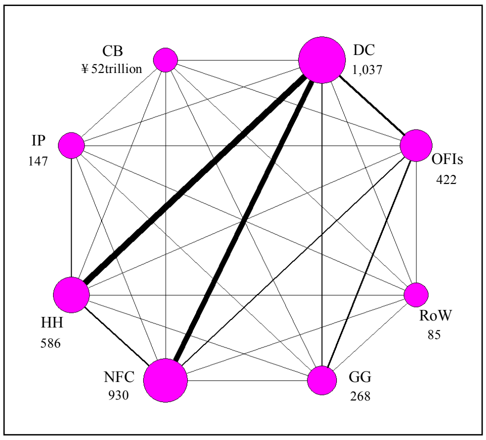
<< ¥ 100 million >>

		CB		DC		IP		OFIs		NFC		GG		HH		RoW		Total	
		(A)	(L)	(A)	(L)	(A)	(L)	(A)	(L)	(A)	(L)	(A)	(L)	(A)	(L)	(A)	(L)	(A)	(L)
Currency and deposits		1,452	1,271,767	1,835,177	12,017,297	160,921		188,442	437,006	2,147,017		789,676		8,633,841		45,060	75,516	13,801,586	13,801,586
	CB			416,386		3,596		35,056		238,986		21,041		556,702			1,452	1,271,767	1,452
	DC		416,386	1,351,311	1,351,311	110,234		149,550		1,908,031		375,972		8,077,139		45,060	67,480	12,017,297	1,835,177
	IP		3,596		110,234				47,091										160,921
to /	OFIs		35,056		149,550	47,091		3,836	3,836			386,079						437,006	188,442
from	NFC		238,986		1,908,031														2,147,017
	GG		21,041		375,972				386,079								6,584		789,676
	HH		556,702		8,077,139														8,633,841
	RoW	1,452		67,480	45,060							6,584						75,516	45,060
Loans		406,496	122,922	6,462,495	1,658,914	543,390	70,060	4,101,886	2,042,966	433,927	3,857,024	362,905	1,641,229	29,761	3,143,066	1,003,371	808,050	13,344,231	13,344,231
	CB			17,737	256,657			105,185	149,839									122,922	406,496
	DC	256,657	17,737	405,409	405,409	53,162	18,087	250,700	580,297	142,242	2,229,800	123,470	543,903	9,975	2,245,098	417,299	422,163	1,658,914	6,462,495
	IP			18,087	53,162	1,962	1,962	29,525	63,108	2,997	199,498	4,221	125,822	9	92,525	13,260	7,313	70,060	543,390
to /	OFIs	149,839	105,185	580,297	250,700	63,108	29,525	870,580	870,580	59,007	956,955	75,536	947,372	2,601	712,910	241,998	228,658	2,042,966	4,101,886
from	NFC			2,229,800	142,242	199,498	2,997	956,955	59,007	126,272	126,272	73,827	5,052	8,429	21,530	262,243	76,828	3,857,024	433,927
	GG			543,903	123,470	125,822	4,221	947,372	75,536	5,052	73,827	4,103	4,103	454	15,210	14,522	66,537	1,641,229	362,905
	HH			2,245,098	9,975	92,525	9	712,910	2,601	21,530	8,429	15,210	454	1,743	1,743	54,050	6,550	3,143,066	29,761
	RoW			422,163	417,299	7,313	13,260	228,658	241,998	76,828	262,243	66,537	14,522	6,550	54,050			808,050	1,003,371
Securities other than shares		960,383		4,895,242	403,778	2,882,871	5,139	622,329	2,678,651	451,128	848,536	1,202,913	8,981,721	1,010,198		892,761		12,917,825	12,917,825
	CB				4,147		71		121,482		22,642		812,042						960,383
	DC	4,147		199,280	199,280	57,599	2,444	26,431	781,917	36,120	362,266	31,652	3,549,335	38,131		10,418		403,778	4,895,242
	IP	71		2,444	57,599	955	955	281	650,948	117	190,757	375	1,982,611	175		720		5,139	2,882,871
to /	OFIs	121,482		781,917	26,431	650,948	281	108,355	108,355	247,458	59,270	184,835	427,992	461,816		121,838		2,678,651	622,329
from	NFC	22,642		362,266	36,120	190,757	117	59,270	247,458	37,795	37,795	75,087	129,637	58,200		42,519		848,536	451,128
	GG	812,042		3,549,335	31,652	1,982,611	375	427,992	184,835	129,637	75,087	910,964	910,964	451,876		717,265		8,981,721	1,202,913
	HH				38,131		175		461,816		58,200		451,876			0			1,010,198
	RoW				10,418		720		121,838		42,519		717,265			0			892,761
Shares and other equities		16,231	1	321,773	532,934	307,587	134,801	348,385	314,196	1,400,273	3,814,294	935,000	175,925	857,763		785,139		4,972,151	4,972,151
	CB				116		33		1,047		15,034	1				0		1	16,231
	DC	116		40,670	40,670	71,993	11,020	39,492	26,533	126,332	228,720	110,007	14,830	81,845		62,478		532,934	321,773
	IP	33		11,020	71,993	7,609	7,609	10,099	8,534	34,155	216,763	29,402	2,688	19,727		22,756		134,801	307,587
to /	OFIs	1,047		26,533	39,492	8,534	10,099	23,294	23,294	93,642	263,160	87,716	12,340	46,888		26,541		314,196	348,385
from	NFC	15,034		228,720	126,332	216,763	34,155	263,160	93,642	1,088,802	1,088,802	649,900	57,343	685,310		666,606		3,814,294	1,400,273
	GG		1	14,830	110,007	2,688	29,402	12,340	87,716	57,343	649,900	57,973	57,973	23,993		6,758		175,925	935,000
	HH				81,845		19,727		46,888		685,310		23,993						857,763
	RoW				62,478		22,756		26,541		666,606		6,758						785,139
Insurance and pension reserves							4,204,153							4,204,153				4,204,153	4,204,153
to /	IP													4,204,153				4,204,153	
from	HH						4,204,153												4,204,153
External claims and debts		71,671	13,757	1,172,575	318,301	693,328		382,417		1,116,271	25,959	1,240,765	19,060	107,736		377,077	4,784,763	5,161,840	5,161,840
	CB															13,757	71,671	13,757	71,671
	DC															318,301	1,172,575	318,301	1,172,575
	IP																693,328		693,328
to /	OFIs																382,417		382,417
from	NFC															25,959	1,116,271	25,959	1,116,271
	GG															19,060	1,240,765	19,060	1,240,765
	HH																107,736		107,736
	RoW	71,671	13,757	1,172,575	318,301	693,328		382,417		1,116,271	25,959	1,240,765	19,060	107,736				4,784,763	377,077
Others		50,774	205	856,317	820,609	405,857	355,109	203,901	267,292	2,701,565	2,759,341	205,412	173,018	549,727	603,950	415,163	409,192	5,388,716	5,388,716
	CB			18	14,025	36	682	12	3,754	62	19,005	20	7,734	53	5,481	3	92	205	50,774
	DC	14,025	18	349,548	349,548	38,393	16,970	11,848	30,431	52,390	132,066	17,719	37,361	47,112	25,145	289,573	264,778	820,609	856,317
	IP	682	36	16,970	38,393	106,962	106,962	20,869	40,861	47,963	148,734	34,043	30,856	111,751	12,766	15,869	27,249	355,109	405,857
to /	OFIs	3,754	12	30,431	11,848	40,861	20,869	13,134	13,134	67,513	106,793	22,367	6,765	59,236	17,561	29,995	26,919	267,292	203,901
from	NFC	19,005	62	132,066	52,390	148,734	47,963	106,793	67,513	1,942,120	1,942,120	101,906	31,155	244,037	502,214	64,680	58,148	2,759,341	2,701,565
	GG	7,734	20	37,361	17,719	30,856	34,043	6,765	22,367	31,155	101,906	14,343	14,343	41,664	8,794	3,141	6,220	173,018	205,412
	HH	5,481	53	25,145	47,112	12,766	111,751	17,561	59,236	502,214	244,037	8,794	41,664	20,088	20,088	11,901	25,786	603,950	549,727
	RoW	92	3	264,778	289,573	27,249	15,869	26,919	29,995	58,148	64,680	6,220	3,141	25,786	11,901			409,192	415,163
Total		1,507,007	1,408,652	15,543,579	15,751,833	4,993,954	4,769,262	5,847,360	5,740,111	8,250,181	11,305,154	4,736,671	10,990,953	15,393,179	3,747,016	3,518,571	6,077,521	59,790,502	59,790,502
	CB			434,141	274,945	3,632	787	140,253	276,122	239,048	56,681	21,062	819,776	556,755	5,481	13,760	73,215	1,408,652	1,507,007
	DC	274,945	434,141	2,346,219	2,346,219	331,381	48,521	478,022	1,419,178	2,265,114	2,952,852	658,820	4,145,429	8,254,202	2,270,243	1,143,129	1,926,996	15,751,833	15,543,579
	IP	787	3,632	48,521	331,381	117,487	117,487	60,773	810,543	85,232	755,752	68,041	2,141,977	4,335,815	105,291	52,605	727,890	4,769,262	4,993,954
to /	OFIs	276,122	140,253	1,419,178	478,022	810,543	60,773	1,019,200	1,019,200	467,620	1,386,178	756,534	1,394,469	570,542	730,471	420,372	637,994	5,740,111	5,847,360
from	NFC	56,681	239,048	2,952,852	2,265,114	755,752	85,232	1,386,178	467,620	3,194,989	3,194,989	900,721	223,187	995,975	523,743	1,062,006	1,251,247	11,305,154	8,250,181
	GG	819,776	21,062	4,145,429	658,820	2,141,977	68,041	1,394,469	756,534	223,187	900,721	987,382	987,382	517,987	24,004	760,746	1,320,107	10,990,953	4,736,671
	HH	5,481	556,755	2,270,243	8,254,202	105,291	4,335,815	730,471	570,542	523,743	995,975	24,004	517,987	21,831	21,831	65,952	140,072	3,747,016	15,393,179
	RoW	73,215	13,760	1,926,996	1,143,129	727,890	52,605	637,994	420,372	1,251,247	1,062,006	1,320,107	760,746	140,072	65,952			6,077,521	3,518,571
Difference between financial assets and liabilities			98,355		-208,254		224,692		107,249		-3,054,973		-6,254,282		11,646,163		-2,558,950		0

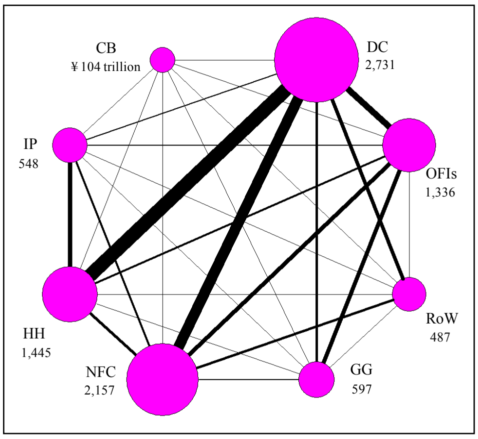
Note: (A) columns indicates assets' sides and (L) columns incicates liabilities' sides.
"Currency and deposits" is included "deposits with the Fisical Loans Fund."
"External claims and debts" is composed of "outward direct investment," "outward investments in securities" and "other external claims and debts."
"Others" is included "financial derivatives," "deposits money," "trade credits and foreign trade credits" and "accounts receivable/payable."

Chart 1
Gross Exposures' Networks in the Financial System of Japan

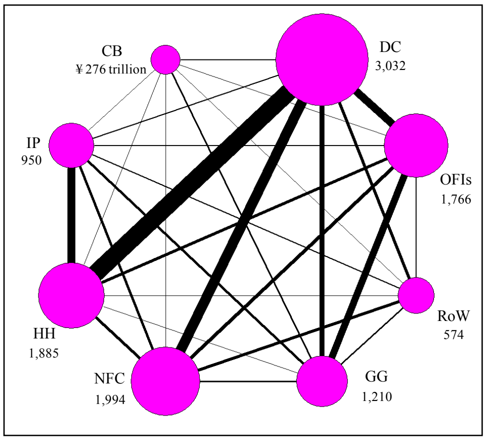
1. The End of 1981



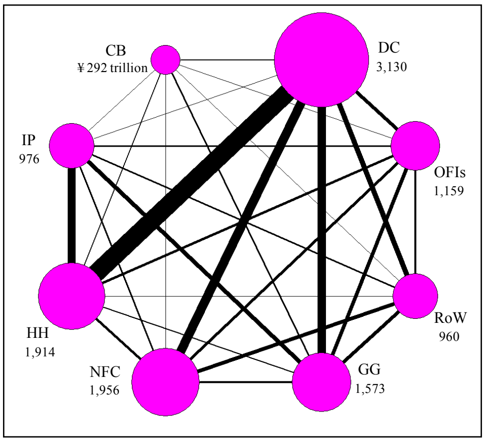
2. The End of 1991



3. The End of 2001



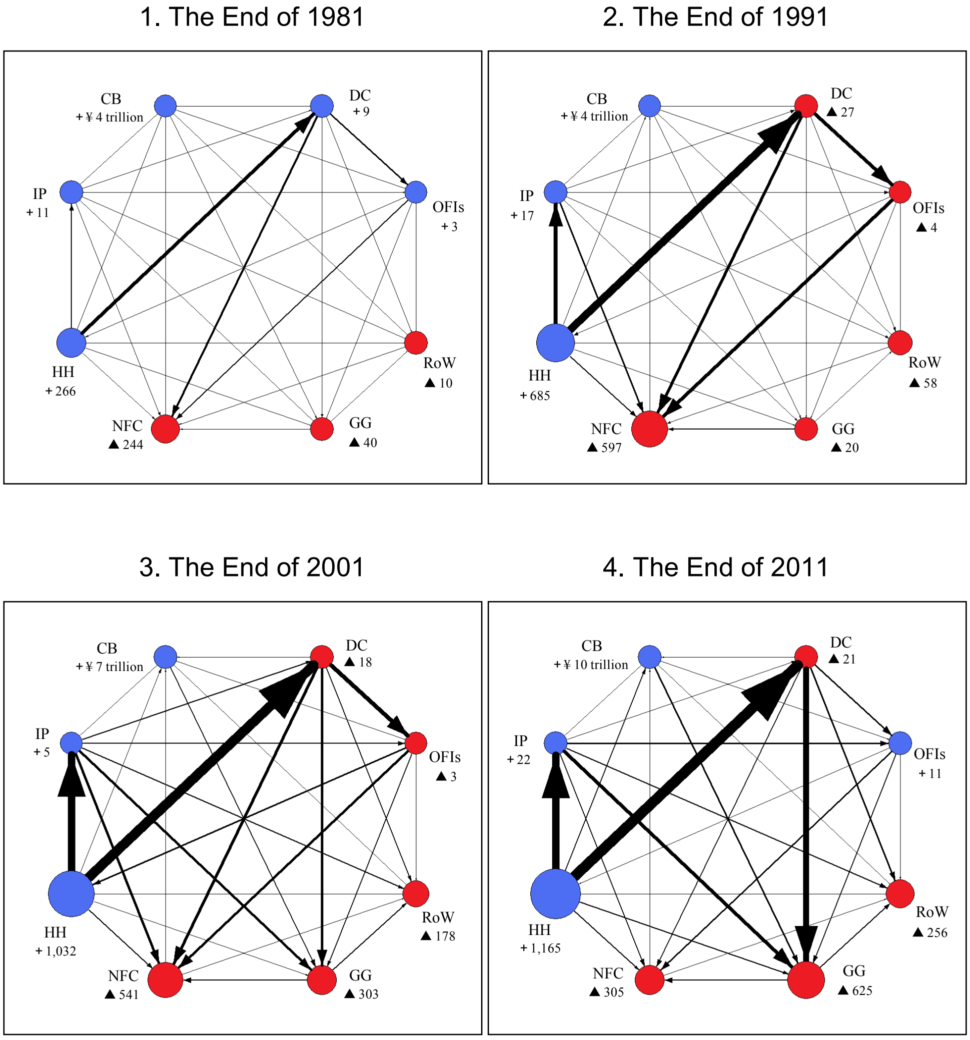
4. The End of 2011



Note: Circles indicate each sector. Both circle's size and amounts of money indicate amounts outstanding of each sector's gross exposure. Lines' thickness indicates amount outstanding of inter-sector gross exposures.

Chart 2

Net Exposures' Networks in the Financial System of Japan



Note: Blue circles indicate over-investing sectors and red circles indicate over-financing sectors. Both circle's size and amounts of money indicate amounts outstanding of each sector's net assets; if a sector's amount is plus (minus), the sector is over-investing (over-financing). Both allows' vectors and thickness indicate amount outstanding of net assets from a sector to the other sector.

Table 3

The financial Input-Output Table in the End of 2011

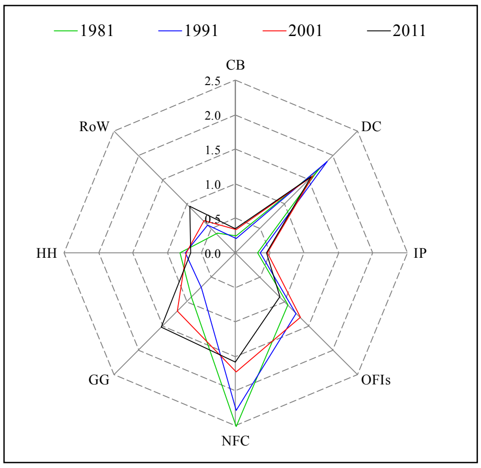
<< ¥ 100 million >>

i (Creditor) \ *j* (Debtor)		Y: CB	Y: DC	Y: IP	Y: OFIs	Y: NFC	Y: GG	Y: HH	Y: RoW	ε (Over -finaning)	T (Total assets/liabilities)
Y	CB	0	274,945	787	276,122	56,681	819,776	5,481	73,215	0	1,507,007
	DC	434,141	2,346,219	48,521	1,419,178	2,952,852	4,145,429	2,270,243	1,926,996	208,254	15,751,833
	IP	3,632	331,381	117,487	810,543	755,752	2,141,977	105,291	727,890	0	4,993,954
	OFIs	140,253	478,022	60,773	1,019,200	1,386,178	1,394,469	730,471	637,994	0	5,847,360
	NFC	239,048	2,265,114	85,232	467,620	3,194,989	223,187	523,743	1,251,247	3,054,973	11,305,154
	GG	21,062	658,820	68,041	756,534	900,721	987,382	24,004	1,320,107	6,254,282	10,990,953
	HH	556,755	8,254,202	4,335,815	570,542	995,975	517,987	21,831	140,072	0	15,393,179
	RoW	13,760	1,143,129	52,605	420,372	1,062,006	760,746	65,952	0	2,558,950	6,077,521
ρ (Over -investing)		98,355	0	224,692	107,249	0	0	11,646,163	0		
T (Total assets/liabilities)		1,507,007	15,751,833	4,993,954	5,847,360	11,305,154	10,990,953	15,393,179	6,077,521		

Chart 3

The Power-of-Dispersion Index and the Sensitivity-of-Dispersion Index by Sectors

1. The Power-of-Dispersion Index (PDI)



2. The Sensitivity-of-Dispersion Index (SDI)

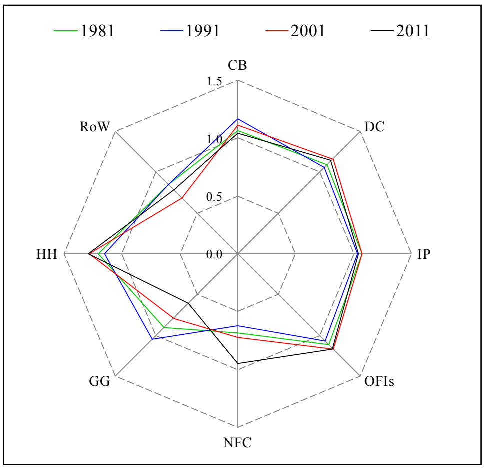
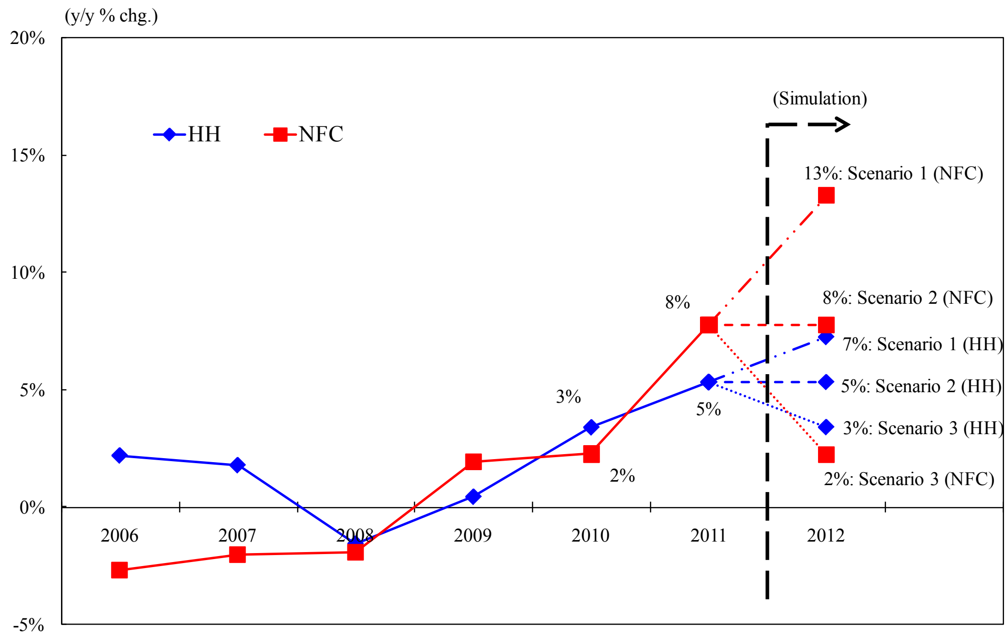


Chart 4

The Development of "Transferable Deposits" held by HH and NFC



Notes: The data is on the calendar year basis in this chart.

Source: BOJ.

Chart 5

The Results of the Simulation Chapter 4

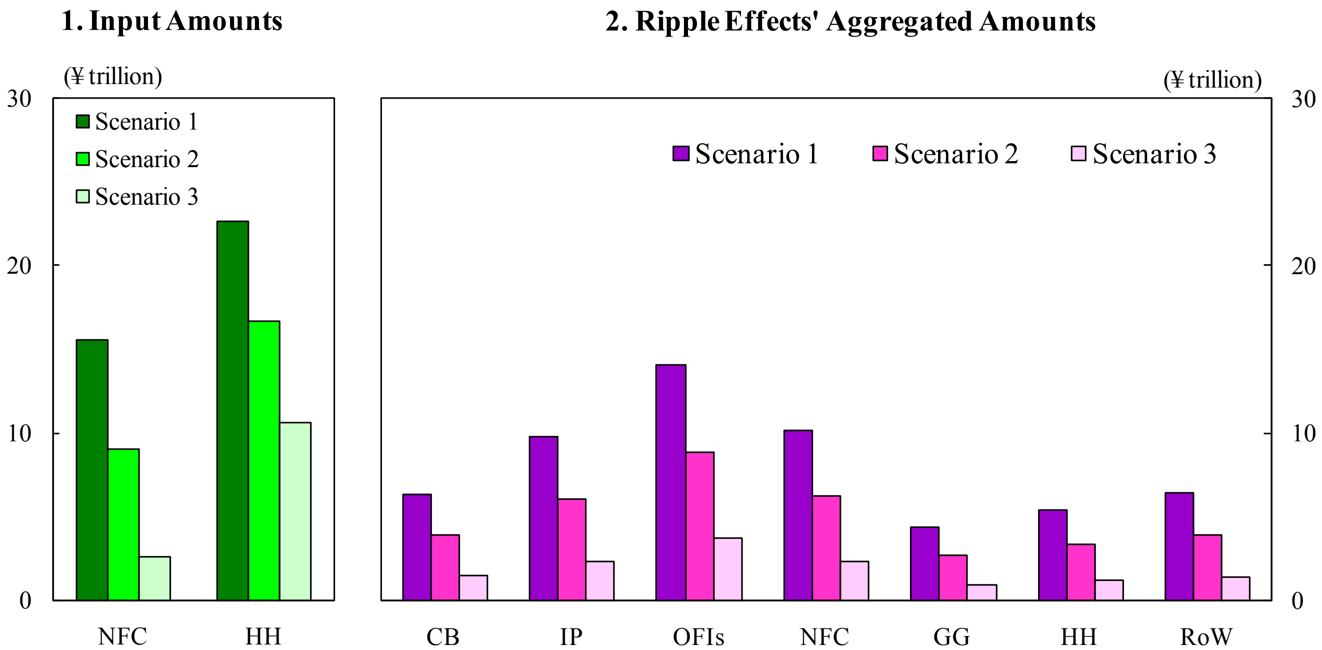


Table 4

The Issuers' and Investors' categories in the Shareownership Survey, the J-FFA and the Inter-Sector-FFA

Table 4-1. Issuers

Shareownership Survey	J-FFA (detailed sectors)	Inter-Sector-FFA
Banks	Domestically licensed banks	DC
Insurance	Life insurance	IP
	Non life insurance	
Securities & commodity futures	Financial dealers and brokers	OFIs
Other financing business	Finance companies	
Others	Private nonfinancial corporations	NFC

Note: "Others" is the total of nonfinancial industrial sectors.
Source: Tokyo Stock Exchange and BOJ.

Table 4-2. Investors

Shareownership Survey		J-FFA (detailed sectors)	Inter-Sector-FFA
Government and local government		Central government	GG
		Loacal governments	
City & regional banks		Domestically licensed banks	DC
		Foreign banks in Japan	
Trust banks	Investment trusts	Stock investment trusts	OFIs
	Annuity trusts	Pension funds	IP
	(Banking accounts)	Domestically licensed banks	DC
	(Others)	Collectively managed trusts	
		Central bank	CB
		Social securities funds	GG
Life insurance companies		Life insurance	IP
Non-life insurance companies		Nonlife insurance	
Securities companies		Securities companies	OFIs
Business corporations		Financial dealers and brokers (excluding securities companies)	OFIs
		Finance companies	
		Financial auxiliaries	
		Nonfinancial corporations	NFC
Foreign corporations		Overseas	RoW
Individuals		Households	HH
		Private nonprofit institutions serving hoseholds	

Note: Although "investment trusts" and "annuity trusts" are included in both "city & regional banks" and "trust banks" in the shareowner survey's explanation, this paper assumes these are included in only "trust banks" because of the actual condition.
In "trust banks," "banking accounts" is caluculated by the data of Trust Companies Association of Japan. So, "others" is calculated by substracting "investment trust," "annuity trusts" and "banking accounts."
Source: Tokyo Stock Exchange, Trust Companies Association of Japan and BOJ.

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Fiscal federalism in Brazil: the importance of data disclosure of subnational governments

Joanilson de Carvalho Santos[1]

1. Introduction

The monitoring of government policies gained prominence after the outbreak of the global crisis in 2008. The evolution of public deficit and debt has received increasing attention from analysts and policy managers. Although the focus of attention is usually directed to the central government, the demand for information on subnational governments (SNGs) is on the rise because of the autonomy that these governments have achieved to manage their finances. This process has brought risks to fiscal stability, and several central governments have been asked to take on unpaid SNGs' debts. Moreover, the default of SNGs may reduce the credibility of the general government. In order to prevent these problems, several measures have been adopted, including the enactment of laws regarding fiscal responsibility that impose limits and conditions for borrowing and require greater transparency of public accounts in order to avoid fiscal mismanagement.

The aim of this work is to show that in the Brazilian institutional arrangement that followed the subnational debt-restructuring operations in the 1990s and the enactment of the Fiscal Responsibility Law (FRL) in 2000,[2] financial disclosure of SNGs acquired greater importance, increasing the demand for high-quality, detailed and trustworthy statistics. In line with these demands, the Ministry of Finance and the Central Bank, the main agencies in Brazil responsible for releasing fiscal data, have attempted to increase information on subnational level. Some challenges, however, remain, such as the timely data collection. Considering that the disclosure of subnational fiscal data is a worldwide challenge, the discussion of the Brazilian case may be helpful.

The rest of the paper is organized as follows: section 2 briefly reviews the literature on subnational debt and deficit control. Section 3 discusses the role of institutions and the evolution of subnational finances in Brazil. Section 4 discusses subnational fiscal disclosure in Brazil and section 5 concludes.

2. Deficit and debt control in SNGs

The growth of SNGs' debt usually expresses the misallocation of tax resources between levels of government or the lack of borrowing transparency. The challenge of maintaining fiscal sustainability involves the creation of mechanisms that induce SNGs to follow responsible policies, keeping sustainable levels of indebtedness.

The control of loans to SNGs varies significantly between countries, and practices generally reflect the degree of central government control, the level of domestic financial market development and the current economic situation. Ter-Minassian and Craig (1997) distinguish four categories of subnational borrowing control: (a) administrative controls, (b) control based on cooperation between the various levels of government, (c) control based on legal rules

[1] Central Bank of Brazil. The views expressed in this work are those of the author and do not necessarily reflect those of the Central Bank of Brazil or its members.

[2] Supplementary Law 101.

(rules-based) and (d) control based on market discipline. It should be noted that these categories are usually nonexistent in pure form and there are often a mix of categories.

Administrative control is often exercised through approval of each loan request by the central government, or by setting limits on the deficit of each SNG. In the case of foreign loans, direct control of central government is more frequent, considering that there may be important implications for macroeconomic policy, especially in the foreign exchange policy, whose responsibility belongs more directly to the central government.

Cooperation between central and subnational governments approaches the previous model, but in this case all governments work together in setting goals and macroeconomic parameters, including limits on deficit and debt. It is obviously a very sensitive model, more likely to be successful in countries where there is already some fiscal discipline, and where central government is able to coordinate the various interests.

The control based on rules can include ceilings on indebtedness of SNGs, limits on the maximum amount of annual loans or repayments, or establish that loans can only be taken for specific purposes, such as investments in infrastructure projects. These rules are usually inscribed in the constitution or ordinary laws. A very common norm is the “golden rule”, which prohibits loans to current expenditures, restricting it to capital expenditure, particularly investment. One of the limitations to this approach is that its rules are often circumvented by the creation of extra-budgetary entities, the use of state-owned enterprises to obtain loans, or through reclassification of current to capital expenditures. Kopits (2001) outlines that there are usually two basic approaches in subnational fiscal rules: the autonomous and the coordinated approach. Under the first approach the initiative for establishing rules arise from each individual SNG. In the coordinated approach all SNGs are subject to uniform rules under the surveillance of a central authority.

Controlling the debt level through market discipline considers that economic agents are able to assess the borrowers’ risk, and are in charge of establishing debt limits and, consequently, the fiscal deficit. In order to establish effective market discipline there must be, firstly, a sufficiently developed financial market, free of regulations that require, for example, that financial institutions buy government bonds or place the government as a privileged borrower (Ahmad, 2005). Fiscal transparency, expressed by the disclosure of SNGs’ accounts, allows an efficient evaluation of the borrower's risk, based on its actual ability to pay. However, this requirement is not always fulfilled, especially in developing countries, which generally have limitations in the coverage, quality and timeliness of fiscal data. It should be noted that when the central government indicates the possibility of becoming the final risk taker, assuming unpaid liabilities, market discipline ceases to be a good way to control subnational borrowing.

As borrowing is a joint decision between debtor and creditor, limits have also been set to creditors, although the literature on fiscal discipline has focused on the incentives and constraints set to debtors (Liu and Webb, 2011). Lenders do not always take a cautious behavior, especially if there is an expectation that borrowers will receive help in case of repayment difficulties. The controls on the creditors can take, for instance, the form of direct regulation by the central bank, with increased capital requirement to operate with some debtors, such as SNGs.

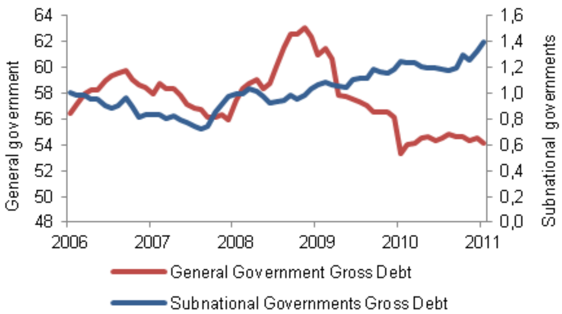
Finally, SNGs may have a role in counter-cyclical economic policy, which means that debt may increase during crisis. Despite the evidence that some SNGs, mainly in advanced economies, have adopted counter-cyclical measures since the outbreak of the financial crisis in 2008, one problem that may arise is that central governments and SNGs may take different paths when facing an adverse situation (OECD, 2010). The traditional view is that counter-cyclical policy should be carried out only by central governments because of the need to coordinate fiscal policy with other macroeconomic policies, which is usually beyond SNGs’ power (Ter-Minassian and Fedelino, 2010). In this context, SNGs’ data disclosure can be crucial to understand its fiscal stance and help intergovernmental policy coordination.

In sum, the disclosure of fiscal data may play a major role in controlling the SNGs' debt and deficit, especially when subnational borrowing control is market disciplined or rules-based. Also, it may help intergovernmental coordination, averting macroeconomic mismanagement.

3. The role of institutions and the importance of fiscal disclosure in Brazil's SNGs

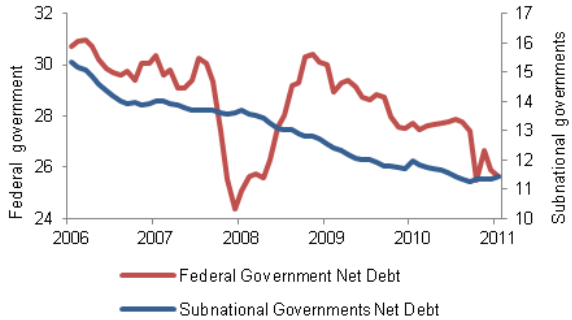
The general government gross debt in Brazil reached 54.2% of the GDP in 2011. The central (federal) government reached 53.7%, and the SNGs, 1.4%. However, most of the SNGs' debt in Brazil is with the central government, which does not appear in consolidated data and makes it important to focus on intergovernmental debt. Actually, the main SNGs' debt with the central government reached 10.8% of the GDP in 2011. To understand why the central government is the main creditor of SNGs and why the disclosure of subnational data has become more important it is necessary to analyze the fiscal and institutional developments in recent decades.

Figure 1 - General and subnational governments gross debt*
% of GDP



Source: Central Bank of Brazil
* It excludes intergovernmental debt.

Figure 2 - Federal and subnational governments net debt*
% of GDP



Source: Central Bank of Brazil
* It includes intergovernmental debt.

Growth in subnational debt in Brazil began in the 1970s as a way to circumvent the centralization of resources (Mora, 2002). With the 1988 Constitution, SNGs got more autonomy, increasing its share in total revenue, but the indebtedness at the end of the decade was already high and in 1989 the central government assumed and refinanced states' external debts.

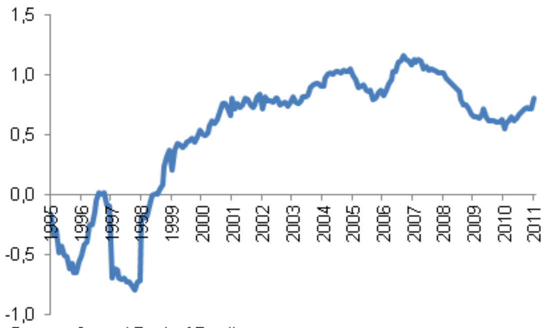
However, refinancing the states' external debt did not avoid the increase of SNGs' total debt in the early 1990s. In 1993, the debt with domestic financial institutions was accepted and refinanced by the central government, as part of negotiations that resulted in the Law 8,727. This law rescheduled loans taken until September 1991, giving a period of up to 20 years for repayment. Yet it kept unsolved the rapid growth in securities debt. Despite the ban on the issuance of new securities, except to repay the matured debt, the securities debt continued to grow due to the high interest rates that aimed at helping finance the balance of payments and maintain the parity of the Real - the new currency that was launched in 1994 - with the dollar, which was regarded essential to keep macroeconomic stability.

In the second half of the 1990s, given the growth of the SNGs' debt, a broad program of aid to state governments was drawn, demanding in return, for the first time, fiscal adjustment measures that would avoid the recurring financial crises. The negotiations resulted in the enactment of the Law 9,496 in 1997. This Law refinanced states' debt with the central government,[3] thus permitting a reduction of financial charges. The agreements established monthly repayments over 30 years, limiting them to a portion of net revenue, and the states had to set a fiscal adjustment program with annual primary surplus targets. After the agreements, the states improved their primary results, but the debt problem was transferred to the central government (Goldfajn and Guardia, 2004).

Although the subnational debt was concentrated in the states, in 1999 the central government launched a program to take on and refinance the municipalities' debt (Provisional Law 1,811), similar to what had been signed with the states, but without the requirement to implement any fiscal adjustment plan. The debt-restructuring plan particularly benefited the city of São Paulo, the largest in the country.

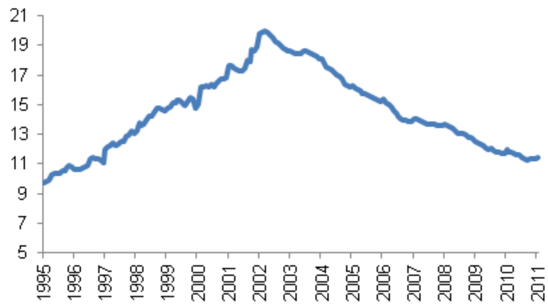
The structural reforms that began after the enactment of the Law 9,496 substantially changed the path of the primary result, initiating a consistent adjustment. Most of the states signed the debt refinancing agreements in the first half of 1998, and the effect in the SNGs' fiscal result is clear-cut. The primary deficit accumulated over a 12-month period, which reached 0,7% of GDP in June 1998, changed to a surplus from May 1999 onwards. Several works have highlighted the importance of the agreements to the adjustment. For instance, Giambiagi and Ronci (2004) emphasize the increasing in subnational revenues after 1998 as a result of the improvement in fiscal administration. Mello (2008) estimated a fiscal reaction function and found out that the institutions after 1998 played a major role in the subnational fiscal adjustment.

Figure 3 - Subnational governments primary result
Accumulated over 12-month
% of GDP



Source: Central Bank of Brazil

Figure 4 - Subnational governments net debt
% of GDP



Source: Central Bank of Brazil

In 2000, after a long negotiation process, the FRL was enacted, setting limits and rules of fiscal management for the three levels of government,[4] including limits on personnel payroll and rules for budgeting. It also states that the budget laws should set annual targets for both primary and nominal results, reinforcing a measure, regarding primary results, that had been followed by SNGs since the agreements. An important novelty was the prohibition of loans between governments. Thus, SNGs' bailouts by the central government, which occurred several times before the Law was published, are no longer possible. The bailout operations that took place before the Law were kept, but they cannot be rescheduled or amended. Another novelty was the reports on fiscal disclosure, including a four monthly report on debt

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[3] Twenty-five of 27 states had their debts refinanced by the central government in accordance with the conditions set in Law 9,496/1997.

[4] Brazil is a federal republic with a central (federal) government, 27 states (including the Federal District) and around 5,600 municipalities. Each unit has its own Executive and Legislative branches. The Judiciary is found only in federal and state levels. The tax base for each government level as well as mandatory transfers is clearly defined in the Constitution.

and borrowing. These reports aim to provide a comprehensive overview of fiscal situation, increasing the amount of information on SNGs.

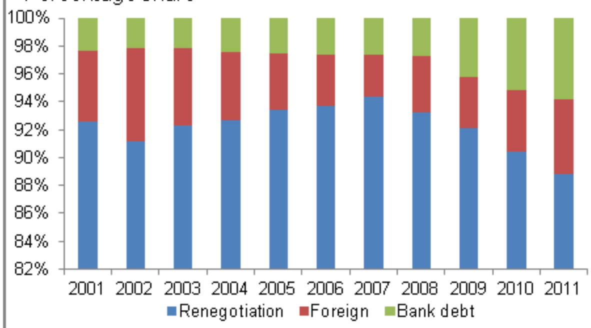
In addition to these rules, in 2001 the Senate[5] set new limits on the amount of public indebtedness. For the states, the consolidated net debt was limited to two times the current net revenue, and in the case of municipalities, to 1.2 times (Senate Resolution 40/2001). For SNGs whose ratios were above the limits, it was given a period of fifteen years to address the issue. The Senate also set limits for the annual amount of disbursement and debt repayment (Senate Resolution 43/2001). For states and municipalities, the maximum disbursement was set at 16% of current net income, taking into account the annual schedule. On the other hand, debt repayment, including interest and other charges, was limited to 11.5% of current net income. Besides these limits, the golden rule applies to all government levels and the Central Bank cannot grant loans to any government.

When a SNG wants to take a loan, its financial situation is examined by the Ministry of Finance, according to the limits and conditions set by the Senate. Financial institutions (creditors) may perform it own analysis and are free to reject any loan request.

Finally, there are also rules limiting the supply of domestic bank credit to the public sector. These rules are set by the National Monetary Council (CMN). The CMN has limited the amount of loans that each financial institution may offer to the public sector to 45% of its net worth (Resolution 2,827, of 2001). There is also a limit for loans to the public sector altogether.[6] These limits are controlled by the Central Bank.

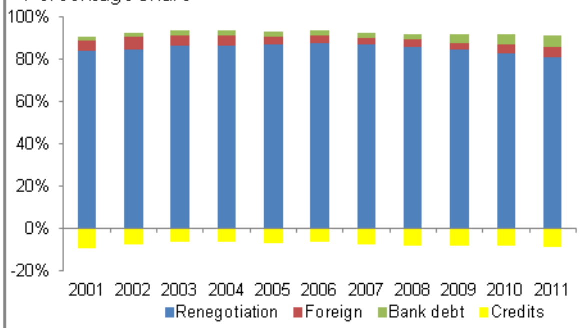
The new rules and adjustment measures that have been adopted are helping dealing with the debt question. Since the early 2000s subnational net debt has declined when compared to the GDP. This fall in total net indebtedness of SNGs is mostly a consequence of the reduction of debts renegotiated with the central government, compared to the GDP. On the other hand, new loans have been contracted with financial institutions, which are increasing the amount of bank debt and changing the composition of total subnational debt. The improvement in the fiscal situation has therefore increased confidence in the SNGs and allowed the growth in bank debt to finance subnational public investments.

Figure 5 - Itemization of subnational governments gross debt
Percentage share



Source: Central Bank of Brazil

Figure 6 - Itemization of subnational governments net debt
Percentage share



Source: Central Bank of Brazil

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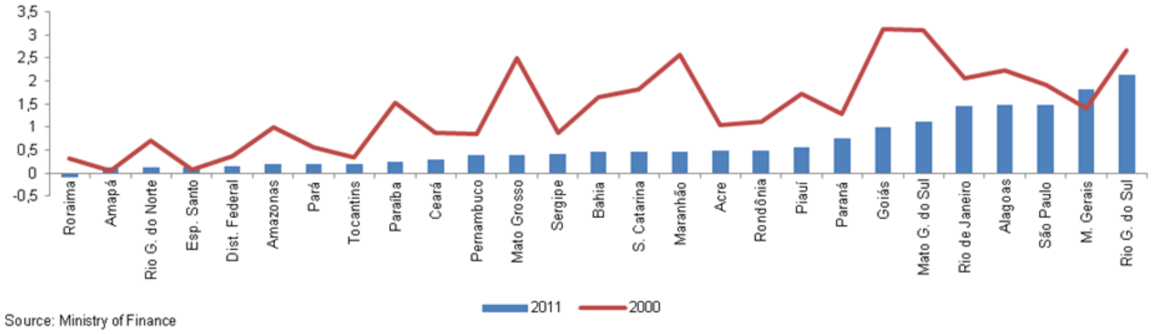
5 According to the Constitution, the Senate is responsible for regulating public indebtedness. Each Brazilian state has three representatives in the Senate, totaling 81 members (26 states and the Federal District).

6 There are some exceptions, e.g., the Tax Modernization Program of the Municipalities (PMAT), which seeks to improve administrative efficiency.

It should be noted that there are major differences in the financial position of SNGs, which makes the analysis of disaggregated data (each state and each municipality) essential. In the case of the states, for instance, data show that the ratio between consolidated net debt and net current revenue - the indicator set by the Senate to gauge the limits of indebtedness - vary widely. At the end of 2011, the State of Rio Grande do Sul had the highest ratio (2.14), and the State of Roraima, the lowest (-0.1). This shows that financial institutions and other economic agents should evaluate the status of each SNG in order to avoid biased analysis.

Figure 7 - State governments: ratio of consolidated net debt/current net revenues



Source: Ministry of Finance

The current control of the SNGs' indebtedness in Brazil can therefore be regarded as a mixture of administrative, rules-based and market discipline models, with controls ex ante and ex post. The debt-restructuring agreements that imposed a fiscal adjustment program, along with the new Senate's Resolutions and the new rules set in the FRL, have made possible to achieve an effective and permanent fiscal adjustment in SNGs, with increased discipline and transparency. The deficit and debt rules evolved over the last decades toward a more responsible approach, which is why fiscal disclosure has become more important.

The figure that follows summarizes the main rules for debt and deficit control in SNGs.

Table 1 - Controls for subnational governments in Brasil*

	For Borrowers	For Lenders
Ex ante controls	- Debt and deficit ceilings - Limits and restrictions on borrowing - Analysis of borrowing capacity according to Senate's rules **- Publication of detailed budget and fiscal results**	- No direct Central Bank finance - Regulations by National Monetary Council
Ex post consequences	- No bailouts from central government - Debt service witheld from transfers to SNGs **- Publication of detailed budget and fiscal results**	- Strong supervision of banks - Regulations require capital write-offs for losses from SNG debt

* Based on the model of Liu and Webb (2011).

4. Subnational fiscal disclosure in Brazil

The Ministry of Finance and the Central Bank are the main agencies that disseminate fiscal statistics in Brazil. The Ministry of Finance regularly publishes, for each SNG, information on indebtedness and in compliance with the limits set in the FRL and the Senate's Resolutions.

The source of the information is the SNGs, and most time series begun in 2001. Another important agency that publishes fiscal data is the Brazilian Institute of Geography and Statistics (IBGE), which releases data on National Accounts, including government revenues and expenditures. Unfortunately, the IBGE's fiscal data are disclosed with a long lag, restraining its use.

More importantly, although the FRL determines that states and municipalities must disclose their accounts, there is still some uncertainty about the quality of this information because of the lack of standardization. In this sense, the data published by the Central Bank, based on internationally accepted methodology, are well regarded by the market.[7]

Fiscal statistics compiled by the Central Bank have as its main objective to measure the impact of public sector operations on aggregate demand, a fundamental information to the formulation of monetary policy. The data monthly published by the Institution include stocks and flows, displaying in detail the evolution of the country's fiscal situation. The data cover the non-financial public sector - federal government, Social Security System, SNGs, the Central Bank and the state-owned non-financial enterprises of the three government levels.

The Central Bank calculates the fiscal results by the methodology "below the line", or, in other words, through the evolution of government's assets and liabilities. This is possible because the Central Bank has access to the major sources of public sector net debt: the banking system, custody's systems of securities and the balance of payments. Getting its information primarily from government's creditors and debtors adds greater transparency and credibility to the data released by the Central Bank. Therefore, these data, whose time series begin in 1991, have served as a parameter to measure the country's fiscal targets, set in the annual Guideline Budget Law. In addition, they are widely used by public managers, analysts, international organizations and researchers, in monitoring the fiscal situation in Brazil and in carrying out works and studies on public finance.

Information about SNGs disclosed by the Central Bank by the end of 1997 did not distinguish states and municipalities, only presenting aggregated data for the SNGs altogether. In 1998, as a result of agreements with the International Monetary Fund, Brazil began to set primary surplus targets by level of government. To allow a better monitoring of targets, the Central Bank that year began the publication of disaggregated data for the set of states and the set of municipalities.

The next challenge was to disseminate information for each state and each municipality. In 2009, the Central Bank began publishing disaggregated data, separating each state, each capital and also the set of major cities in each state. The itemization outlines bank debt, foreign debt, net financial assets and debts renegotiated with the central government. There are also information on primary deficit, nominal deficit (overall balance) and accrued interest. According to the Central Bank, the data, which have a 4-month basis, will have its frequency changed to a monthly or a quarterly basis.

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[7] The methodology followed by the Central Bank is based on *Government Finance Statistics Manual - 1986*, by the International Monetary Fund, adapted to the Brazilian case.

Table 2 - States and municipalities[1/] net debt - Conditioning factors

Accumulated in the year

R$ million

State	2010 December Net Debt	2011 Flows accumulated in the year [2/] Nominal: Primary	Nominal: Nominal interest	Nominal: Total [4/]	Other [5/]	2011 December Net Debt [3/]
Acre	1354	-236	131	-105	21	1270
Alagoas	5 944	-261	556	295	42	6 281
Amapá	-132	122	26	149	1	17
Amazonas	1856	-666	-72	-739	103	1 220
Bahia	10 532	-1070	1110	41	-75	10 498
Ceará	1931	-390	256	-135	424	2220
Distrito Federal	1 969	-278	272	-6	-50	1 913
Espírito Santo	690	-168	184	16	-41	665
Goiás	11 355	- 473	1181	708	450	12 512
Maranhão	4 002	-1027	95	-931	29	3 099
Mato Grosso	5 091	- 911	542	-369	-95	4 626
Mato Grosso do Sul	5 651	-542	628	87	79	5 817
Minas Gerais	59 750	-3 111	7 809	4698	782	65 230
Pará	2076	-1113	216	-898	61	1 240
Paraíba	1 827	-556	48	-507	23	1 343
Paraná	14 655	-1971	1 681	-290	-218	14 146
Pernambuco	3 366	-417	320	-97	709	3 978
Piauí	1 804	-215	181	-34	17	1 787
Rio de Janeiro	58 836	-3 974	6 900	2 926	1786	63 548
Rio Grande do Norte	695	-498	132	-366	1353	1682
Rio Grande do Sul	42 326	-2 191	4 894	2703	586	45 615
Rondônia	1 546	-386	226	-161	1	1 386
Roraima	725	-68	100	32	0	757
Santa Catarina	10 466	-2616	1351	-1265	62	9 263
São Paulo	221 228	-15 488	26 714	11 226	-3 986	228 468
Sergipe	1522	36	179	216	223	1 960
Tocantins	482	-132	38	-94	30	418
Total Brazil [3/]	471 548	-38 599	55 696	17 097	2 313	490 959

Source: Central Bank of Brazil

1/ Includes information about the states and their major municipalities.

2/ (-) Surplus; (+) Deficit.

3/ The net debt in the period t+1 is obtained by the sum of the net debt in the period t, the nominal result and the other flows.

4/ The nominal result is obtained by the sum of the primary result and the nominal interest.

5/ Includes adjustment in the foreign exchange variation, acknowledgement of debts and privatizations.

One problem that persists in SNGs' statistics is the difference usually found between above and below the line results. An important source of this difference is the arrears. SNGs disclosure their results above the line taking accrued expenditures as reference, which include spending that should have already been paid (arrears). This methodology, based on Brazilian public account legislation, seeks to avoid underestimated expenditures, which could generate misleading results. On the other hand, below the line statistics in Brazil does not usually consider arrears as liabilities because they are debts not intermediated by financial institutions. The impact of arrears in below the line statistics occurs when they are actually paid, reducing currency and deposits.[8] Therefore, below and above the line statistics may display over-time discrepancy in their results.

Another source of discrepancy between above and below the line results in SNGs is the time on which the systems of data records are affected in each statistic. In some cases, for instance, the revenue-expenditure recording system may register a specific operation that will affect the assets-liabilities recording system afterwards (the following month or year), displaying different results in each period. Also, operations performed by a state-owned enterprise may be registered as if it was a government entity, and the results for the

8 This is the methodology followed by the Central Bank, for instance, whose primary results are compiled on a cash basis. It should be noted that the impact of the arrears in the result is indeed considered, but only when the debt is paid.

government will be misleading. To address these issues, several programs that seek to improve and update fiscal administrations have been performed in SNGs.

The Central Bank began in 2009 a project to disseminate its below the line methodology among SNGs. According to the Institution, the SNGs are not accustomed to dealing with this methodology, and the dissemination may help them manage their finances, making it easier to budget and financial programming, as well as to the long-term planning of subnational finances. The project has also allowed to understand the differences between the data compiled by the Central Bank and by the SNGs. In 2011 the Ministry of Finance joined the project and the two agencies together have promoted meetings with SNGs' staff all over the country.

Finally, both the Ministry of Finance and the Central Bank are currently involved in activities that seek to align its methodologies with the Government Finance Statistics Manual 2001, by the International Monetary Fund. A migration plan to adopt the presentation of fiscal data in the new format was defined by Brazilian authorities and has been implemented in collaboration with the IMF. This implementation involves changes in the public account legislation and an extensive training program for technicians who work in SNGs. The challenge is tremendous, because the GFSM 2001 represents a major step forwards in the standards of fiscal statistics, and SNGs in Brazil are very diverse.

5. Final remarks

The control of SNGs' deficit and debt in Brazil has evolved over the last decades. The 1980s and 1990s were marked by subnational indebtedness crisis that resulted in bailout operations from the central government. These operations reinforced the view that the central government would always provide debt reliefs, thus reducing SNGs' cost of borrowing and introducing a moral hazard. Moreover, permissive rules regarding debt rollover contributed to a growing indebtedness. Several measures taken since the late 1990s addressed the issue in a satisfactory way, promoting fiscal discipline and reducing the indebtedness.

The new framework that emerged after the debt-restructuring agreements, the FRL and the Senate's Resolutions was effective in restoring credibility and increasing transparency in SNGs. One consequence of this new framework is the greater importance of market discipline in controlling indebtedness, insofar the creditors are well aware that bailout operations are no longer possible, and lending to problematic SNGs may lead to losses. This has increased the demand for information on SNGs, because the analysis of each government's financial status and ability to pay has become essential.

This situation has imposed new challenges to the agencies responsible for the disclosure of fiscal data. The disclosure rules stated in the FRL represent major progress compared to the former ones, but improvements are still necessary, particularly in public accounting legislation, accounting systems and staff training.

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Measuring the value of employee stock options

Tomotaka Hiroki and Ryoichi Okuma[1, 2]

1. Introduction

In Japan, employee stock options (hereafter ESOs) were introduced in 1997. Corporations increased the amount of ESOs issues in recent years. Thereby, the measurement of ESOs has become important in order to evaluate the indebtedness of private corporate sector in Japan's Flow of Funds Accounts (hereafter JFFA). 2008 SNA also recommends that ESOs should be measured.

This paper introduces the BOJ's attempt to evaluate the value of ESOs. Available data for the outstanding amounts of stock acquisition rights are equivalent to ESOs in Japan, but they are evaluated at book value. Thus, we made an attempt to estimate market value of ESOs using the book value data.

The contents of Chapter 2 through 4 are as follows. Chapter 2 explains the basic framework for ESOs in Japan. Chapter 3 illustrates the estimation to capture the marked-to-market value of ESOs in Japan. Chapter 3-1 describes the background of the following measurement of the value of ESOs. Chapter 3-2 discusses the cases of measurement of the marked-to-market value in Japan. Section 4 concludes.

2. The basic framework for ESOs in Japan

2.1 General characteristics

In Japan, corporations are able to offer their employees tax-favored ESO plans and this tax-qualified ESO is used commonly. The framework of tax-qualified ESOs is explained as follows by "Sozei tokubetsu sochi ho" [Act on Special Measures Concerning Taxation] and Nakazato et al. (2006).

Provided a plan qualifies under the tax code, employees obtain tax benefits: employees pay no tax when they receive the option; pay no tax when they exercise the option and buy stock; and pays tax only at capital gains rates when he eventually sells that stock. To qualify for advantageous tax treatment, an option program must stay within several limits: (a) less than 12 million yen's worth of stock can be purchased in a year by exercising options; (b) options can be exercised within 2 to 10 years after receiving them; (c) options are non-negotiable; and (d) exercise price of options has to be at stock price or higher at the time of receipt.

Most non-tax-qualified ESOs in Japan, on the other hand, are called "1-yen ESOs," and their exercise price is one yen.

The ESOs are, as it were, the rights for getting the stocks with free of charge and mainly offered as retirement bonuses for executives.

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[1] Research and Statistics Department, Bank of Japan.

[2] 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.

2.2 Application of the 2008 SNA recommendations on ESOs

AEG paper (Eurostat (2004)) explains the idea of 2008 SNA recommendations concretely.[3] The paper states that if ESOs were spread across the vesting period, one would either need to create assets/liabilities in financial derivatives, or assets/liabilities in "Other accounts receivable and payable" which would then be extinguished by the creation of a financial derivative at vesting date. The Annex 1 of the paper also suggests that "Other accounts receivable and payable" should be valued at fair value at grant date and should reflect no revaluation effect from grant date to vesting date, and that "financial derivatives" should be valued at market value and should reflect revaluation effects, or change in value. Figure 1 shows an example.

The main source data for ESOs in Japan is "Financial Statements Statistics of Corporations by Industry, Quarterly" (hereafter FSSCIQ) published by the Ministry of Finance, which compiles the accounting data of Japanese corporations as recorded in their financial statements for the quarter. The FSSCIQ identifies the outstanding amounts of stock acquisition rights which can be regarded as the outstanding amounts of ESOs in Japan. As previous studies pointed out, however, these outstanding amounts data are not sufficient for the JFFA because they are neither evaluated at market price nor represented at fair value. They are evaluated at book value.[4] Under Japanese accounting standard ESOs are evaluated at the initial market value when they are offered and subsequent changes in their value are not reflected on financial statements. To conform to the recommendations of the 2008 SNA, the market value of ESOs and its changes have to be captured.[5]

Once market value is captured, all three accounts in the FFA, i.e. transactions, amount outstanding, and reconciliation between flow and stocks, can be compiled accordingly. Market value and the term-on-term difference on the book value of ESOs are recorded as stock and transaction flow respectively.

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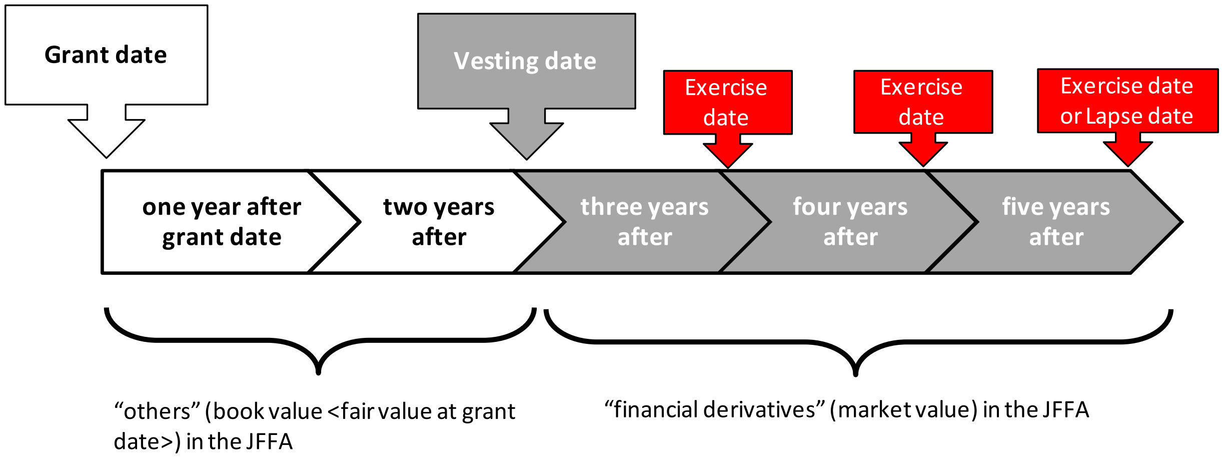
3 From a basic point of view, see Eurostat, IMF, OECD, UN and World Bank (2009).

4 See Hagino, Hiroki, Inadachi, Sakuraba & Sato (2011) and Sakuramoto & Hagino (2011).

5 In respect of other aspects of ESOs in the 2008SNA, such as compensation of employees, see Yoshino (2011).

Figure 1

A case of timing and accounting of ESOs



3. Measuring the marked-to-market value of ESOs

3.1 Tools, methodologies and assumptions

We made an attempt to estimate market value of ESOs from book value data using a market-price-to-book-value ratio.

The relevant section of 2008 SNA, paragraph 13.83, reads as follows.

> *Employee stock options (ESOs) should be valued by reference to the fair value of the equity instruments granted. The fair value of equity instruments should be measured at grant date using a market value of equivalent traded options (if available) or using an option pricing model (binomial or Black-Scholes) with suitable allowance for particular features of the options.*

3.1.1 Tools (an approach to measure the fair value of the ESOs)

John Hull and Alan White (2002) presented an ESOs-valuation model to calculate fair value of ESOs and offered employee stock option software that accompanied the model.[6] The software provides two approaches to measure the value.

The first approach is a simple one using the Black-Scholes-Merton formula with option's expected life. The expected life refers to the average period for which employees hold the option before it is exercised or expires. Another approach is based on Cox, Ross, and Rubinstein binominal tree model. The original model is modified to account for the vested amount of option, the probability of exercising option, and so on. Both approaches can be chosen under accounting standard in Japan.[7]

The first approach lacks theoretical background as John Hull (2012) explains: *There is no reason why the value of a European stock option with the time to maturity set equal to the*

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[6] See http://www.rotman.utoronto.ca/~hull/ESOPS/index.htm.

[7] Based on the standard, financial statements show the amount outstanding of ESOs at initial market value when ESOs are offered to employees. See Accounting Standards Board in Japan (2006) for further details.

expected life should be approximately the same as the value of the American-style employee stock options. Nonetheless, it is practical and Hull also says t*he results given by this approach are not totally unreasonable*. In fact, the following trial calculations using this approach proved that the approach could approximate the second approach, a more sophisticated approach based on a binomial tree model.

3.1.2 Methodologies

Based on the assumptions listed in section 3.1.3, we measured current fair values of ESOs. Input parameter as follows:[8]

Stock price = TOPIX (the Tokyo Stock Price Index, which is capitalization weighted index of all corporations listed on the First Section of the Tokyo Stock Exchange)

Exercise price = TOPIX at grant date, when tax-qualified ESOs; 0.1, when non-tax-qualified ESOs

Time to vest = 2 years

Expected life = 3 years at vesting date (5years at grant date)

Expected volatility = historical volatility of the TOPIX (% per year), using daily data for the period that corresponds to the remaining life of the options[9]

Risk-free rate = the yield on Japanese government bonds for the period that corresponds to the remaining life of the options (% per year)

Dividend yield = capitalization weighted average of dividend yield of all firms listed on the First Section of the Tokyo Stock Exchange (% per year)[10]

Employment exit rate pre-vesting = 0

On this condition, we measured both current and initial fair values for ESOs.[11] And then, we took the ratio of current to initial fair values. Since initial fair values at grant date are maintained on financial statements and are equal to current book values, the ratio can be regarded as a market-price-to-book-value ratio. Finally, we can arrive at the marked-to-market value of ESOs in Japan by multiplying book value of ESOs, i.e. which are available as source data, by this ratio.

3.1.3 Assumptions

Measuring the fair value of the ESOs based on John Hull and Alan White (2002) relies on the following assumptions.

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[8] A formula for pricing of a European option on a stock paying a dividend yield can be applied to evaluation of a European option for an index. In this case, stock price is set equal to the value of index, volatility is set equal to the volatility of index, and dividend yield is set equal to the average annualized dividend yield on the index during the life of the option. See Hull (2012).

[9] As respect the period of data, we apply accounting standards in Japan. See Accounting Standards Board in Japan (2006).

[10] With reference to the risk-free rate, we conform to accounting standards in Japan. See Accounting Standards Board in Japan (2006).

[11] The value of ESOs with expected life of 1 to 3 years, i.e. exercisable ESOs, offers current fair value. We backcast initial value when they were granted 3 to 5 years ago using parameters above.

a. The actual amount of granted ESOs is assumed to have the same composition and weight as the TOPIX: Strictly speaking, we must calculate fair values of each ESO individually and sum up these values. However, it is not practical.[12] We calculate fair value by multiplying book value-based ESOs macro data by market-price-to-book-value ratio on the assumption that the actual amount of granted ESOs has same composition and weight as the TOPIX.

b. The volatility of the TOPIX is assumed to be equal to that of macro ESOs: Admittedly, the volatility of the TOPIX tends to have negative bias comparing to averaged volatility of each ESOs. This assumption can be acceptable, however, when the ratio of two fair values, i.e. fair values at present and at grant date. When we calculate fair value itself, the assumption is too strong to be accepted. On the other hand, however, the numerator and the denominator of the ratio of the two fair values tend to be biased in the same direction. Hence, we consider the bias caused by undervalued volatility can be acceptable when the bias is sufficiently small compared with the level of numerator and denominator.

c. Exercise price of tax-qualified ESOs is the TOPIX at grant date. Exercise price of non-tax-qualified ESOs is 0.1 points: Exercise price of the tax-qualified ESOs usually equals stock price at grant date in Japan. This knowledge is acquired from a major securities company saying, “On the ground that ‘Act on Special Measures Concerning Taxation (Article 29-2)’ requires that exercise price of tax-qualified ESOs is over or equal stock price at grant date, almost all companies set exercise price of the ESOs at lower limit, stock price at grant date.” Most non-tax-qualified ESOs, on the other hand, are “1-yen ESOs” in Japan as mentioned above. In terms of index of the TOPIX, one yen is converted into 0.1points.[13]

d. Expected volatility is historical volatility, which is the estimate of the standard deviation of the return using closing price, for the period that corresponds to the remaining life of the ESOs.

e. Time to vest is 2 years and expected life at vesting date is 3 years: The assumption that the period between the grant date and vesting date is 2 years is acquired from a major securities company saying “Tax-qualified ESOs are major in Japan and the time to vest of the ESOs is usually 2 years on the ground that ‘Act on Special Measures Concerning Taxation (Article 29-2)’ requires that time to vest of the ESOs be over or equal 2 years but less than 10 years.” The assumption that expected life at vesting date is 3 years is also acquired from a major securities company saying “Although there is no evidence that the average period between the vesting date and exercise date is 3 years, it seems to be consistent with our views.”

f. ESOs one year after vesting date account for one third of the entire ESOs and those of two years after and those of three years after also account for one third respectively: Since there is not enough data to make a reasonable estimation, we assume that the options are evenly granted every year when we estimate the market-price-to-book-value ratio. In consequence, on the condition that expected life

[12] The same assumption is applied to other part of JFFA. In the case of bonds, although each sector holds each portfolio, market value-based issues and holding amounts of many sectors are calculated by multiplying face value-based macro data by one market price index on the assumption that each sector holds the same as the portfolio of entire market. See Bank of Japan (2006b).

[13] The Nikkei 225 Stock Average is a widely quoted average of Japanese equities and this unit is yen. Broadly speaking, the NT ratio, the ratio of the Nikkei 225 Stock Average to the TOPIX, is about 10. Thus, we convert one yen into 0.1 points of the TOPIX.

at vesting date is 3 years as mentioned above, ESOs one to three year after vesting date account for one third of the entire ESOs respectively.

g. Tax-qualified ESOs account for about three fourth of the entire ESOs and “1-yen ESOs” account for about one fourth: Although it is based not on amount outstanding but on the number of ESOs, Tax-qualified ESOs account for 72.6% of the entire ESOs in Japan and “1-yen ESOs” account for 27.4%, according to the information from a major security company.

h. Employee exit rate pre-vesting is assumed to be zero: There is no information about employee exit rate pre-vesting and it seemed reasonable to suppose that few Employees exit after the grant of ESOs in Japan.

3.2 Cases of measurement of the marked-to-market value in Japan

See chart 1. On the ground that the Japanese stock prices decline, the market valuations of ESOs are much lower than book valuations. The ratio of current to initial fair values tends to be less than 1.

As mentioned above, the exercise price of tax-qualified ESO is over or equals stock price at grant date. When stock price is on a downtrend trend and is much lower than exercise price, market value of tax-qualified ESOs is almost zero. Generally speaking, the value of call option is almost zero when stock price is much lower than exercise price. It means that the probability that stock price will become higher than exercise price approaches to zero when stock price is much lower than exercise price.

The book valuation of tax-qualified ESO, on the other hand, is rarely equal to zero. Stock price is a positive value and equals exercise price when booking. It means that the probability that stock price will become higher than exercise price is not zero.

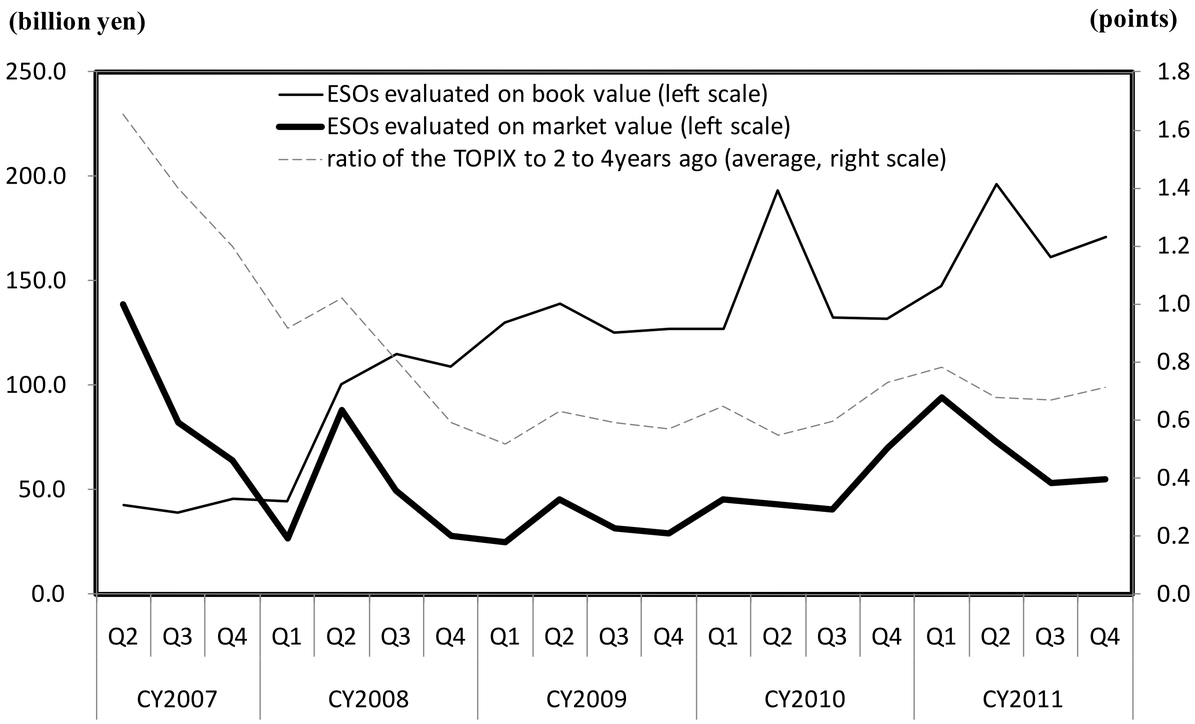
Consequently, the ratio of the two values above, i.e. market-price-to-book-value ratio, is much lower than 1 and the estimations of market valuations of ESO in Japan are much lower than book valuations.

Market value of “1-yen ESOs” stays above zero and almost equals stock price itself regardless of the level of stock price. However, it accounts only for 27.4% of the entire ESOs.

Altogether, the market valuations of the entire ESOs are estimated much lower than book valuations.

Chart 1

Book value VS Market value of ESOs in Japan



Sources: Bloomberg; Ministry of Finance; Tokyo Stock Exchange.

4. Concluding remarks

In this paper we aimed at showing the way to evaluate ESOs. We presented the way to estimate market value of ESOs using book value source data. Since the Japanese stock prices has fallen, market valuation of ESOs was found much lower than book valuation. When the difference between market and book values widens, it has a significant impact on the implicit indebtedness of private corporate sector that cannot be read from their financial statements.

We relied on some assumptions in the estimation. Some of the assumptions had to be relatively strong to allow us to utilize available source data. Although we found that the method we took was practical and yields reasonable results, there may be room to improve in measuring market value of ESOs more accurately.[14, 15] We plan to continue making effort to measure ESOs in more sophisticated ways and to balance cost and benefit.

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[14] Measuring more accurately means collecting large amount of micro data (stock price, exercise price, expected Life, volatility, etc. of each ESO) and pricing each ESO respectively.

[15] Concerning the way to compile in the JFFA, see Bank of Japan (2006a) and (2006b).

APPENDIX:
Estimation of the marked-to-market value using data by industry

This paper presented the way to estimate market value of ESOs from book value source data using index data, the TOPIX. However, index data are not individual stock data but weighted averages of each of the stocks. To verify our estimation method we attempted to use the Stock Price Index by Industry. Conceptually, the TOPIX is a weighted average of the Stock Price Index by Industry, and Stock Price Index by Industry is a weighted average of each of the stocks. Thus, by measuring the difference between the estimations of market value using the TOPIX and those using the Stock Price Index by Industry, we can infer the difference between the estimations using the TOPIX and those using each of the stock data.[16]

In measuring the difference FSSCIQ can be used as source data because data are available industry by industry. Based on the data, we extracted main industries' data with respect to the ESOs. The amounts of outstanding of main industries' ESOs account for about 80% of ESOs of all industries. Then, we calculated market value of ESOs for each of the main industry by the pricing model and estimated market-price-to-book-value ratio for them. For the remaining 20%, we estimated market values using the TOPIX.

We added them together and obtained market values of ESOs. And then, we compared it to the estimation of market value using the TOPIX only.

See chart 2. Two bold lines that represent market values are almost identical and the difference is negligible. Some reasons can be pointed out. First, when stock price is at much lower level than exercise price, the value of call option approaches to zero whatever stock price is chosen as a parameter, i.e. the Stock Price Index by Industry or the TOPIX. Second, broadly speaking, the Stock Price Index by Industry had the same trend as the TOPIX has. Finally, while the level of the Stock Price Index by Industry is clearly different from that of the TOPIX, our objective value is the market-price-to-book-value ratio, the ratio of a fair value to a fair value, as mentioned above. Calculating this ratio using the Stock Price Index by Industry, the numerator usually has the difference from the estimation using the TOPIX and the denominator has the difference to the same degree. Hence, these differences are balanced at the ratio.

Note that these estimations using the Stock Price Index by Industry are one-shot estimations. Taking cost-benefit performance into consideration, we will use the TOPIX when we compile the JFFA every quarter.

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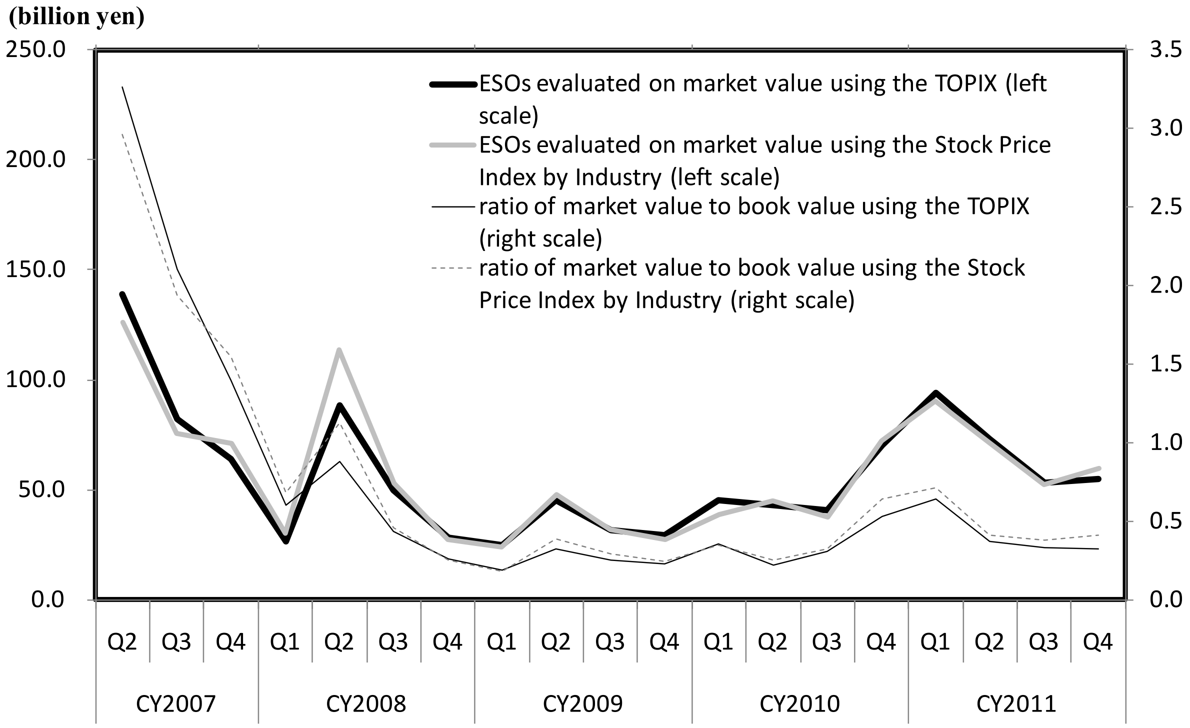
[16] We may also be able to calculate the market value using each of the stock data as one-shot estimation in future.

Chart 2

Using the TOPIX VS Using the Stock Price Index by Industry



Sources: Bloomberg; Ministry of Finance; Tokyo Stock Exchange.

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Securities by securities database and the Chilean financial accounts

Alfredo Fuentes G.[1, 2]

1. Introduction

The Central Bank of Chile has the function of compilation and publishing of the main national macroeconomic figures, including those of a monetary and foreign exchange nature, the balance of payments and national accounts or other global systems of social and economic accounting.

In this context, the financial accounts and balance sheets from the different sectors of the economy are published, where the transactions and the stocks of assets and liabilities are shown with detail of financial instruments and by institutional sector. These statistics are useful to improve macroeconomic analysis of the different institutional sectors, integrating the point of view of financial and real effects.

In search of the necessary information for the elaboration of the financial accounts and balances, Depósito Central de Valores (DCV), Chilean Custody Service, provides us with registrations weekly of value to value data, available from June 2008. With this data, Chilean statistics of the assets have breakdown of holders' position according to the type of financial instrument. In addition, these statistics include financial transactions (net purchases), exchange rate valuation adjustment or UF[3] (inflation) and price valuation adjustment.

Subsequently, this document describes the different debt securities and the methodologies utilized in the compilations of the financial accounts of Chile since the year 2008.

2. Backgrounds

2.1 Concepts

The national accounts of the Chilean economy are made with the guidelines of the System of National Accounts 1993 in all their concepts, including the measurement of debt securities in the financial accounts.

The system of national accounts includes the opening and closing balance sheets of the accounting period. Besides, a complete registration illustrates the changes of assets and liabilities between the beginning and the end of a period. Schematically, the difference between both balances is explained in the following way:

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[3] Unidad de Fomento (UF) is a index used in Chile, adjusted according to inflation. The ISO code is CLF. It was created on January 20, 1968, for the use in determining principal (monetary item) and interest (constant real value non-monetary item) in international secured loans (monetary items) for development, subject to revaluation according to the variations of inflation.

Table 1.

Balances, transactions and other adjustments

(1)	(2)	(3)	(4)	(5)= (1)+(2)+(3)+(4)
Initial balance	Net transactions	Other adjustments	Exchange rate valuation and price valuation adjustment	Outstanding amounts at the end of period

The column (2) of the table 1 represents the transaction of financial and non financial assets. If it is non a financial asset, the operation is registered in the capital account. While, the financial account contains transactions relating to the financial assets that take place between the institutional units or the rest of the world, whose resulting surplus is the net lending or the net borrowing. This way, the following categories of assets are distinguished:

F.1 Monetary gold and special drawing rights (SDRs)

F.2 Currency and deposits

F.3 Debt securities, excluding financial derivatives

F.4 Loans

F.5 Shares and other equity

F.6 Insurance technical reserves

F.7 Other accounts receivable/payable

The instructions of SNA[4] manual indicates that the transactions of financial assets are registered according to the price in which the operation was arranged. Excluding the costs of the service, fees, commissions and other payments for the services given to carry out the transactions. Regarding the time of the registration, this is carried out when the transaction takes place.

According to what was mentioned previously, the main focus of this paper is to value debt securities. In this category, we included: bonds, certificates of deposit, commercial papers, debentures, and other instruments in the financial markets.

The capital gains (column (4)) are represented by the changes in the price of assets. They can be of two types: profit by neutral possessions, that reflect variations in the general level of prices; and profits by real possession that reflect variations in the relative prices of assets.

2.2 Depósito Central de Valores

Depósito Central de Valores[5] S.A., (DCV) is a corporation established in accordance with Chilean Law in 1993. Its regulations and rules depend on the Superintendence of Securities and Insurance (SVS, Chilean supervisor). DCV's purpose is to electronically process and register transfer transactions in stock exchange and the over-the-counter market, and coordinate and provide the necessary information for financial settlement of such transactions.

4 System of National Accounts

5 Depósito Central de Valores – Annual Report 2011(www.dcv.cl)

About ownership, DCV belongs to the main agents of the Chilean capital market; stock exchanges, insurance companies, managers of pension funds, banks and broker-dealers, and since 2010 the foreign custody companies have also been incorporated to DCV.

In relation to market share, DCV is a monopoly in custody service of electronic securities for the Chilean financial market, being a product of a gradual process (1993 to 2001). The first step was to hold all paper stock certificates in one centralized location, and automate the process by keeping electronic records of all certificates and securities clearing and settlement (changes of ownership and other securities transactions). These securities include time deposits, stocks, and bonds – public and private – among others. In general terms, the value of fixed income securities held at DCV was115.316 million dollars at the end of the year 2011, 95.7% of them has been dematerialized. This amount represents 96.5% of the total debt securities issued in the Chilean market. Likewise, for the year 2011, 99% of total transactions were of clearing and settlement performed by DCV.

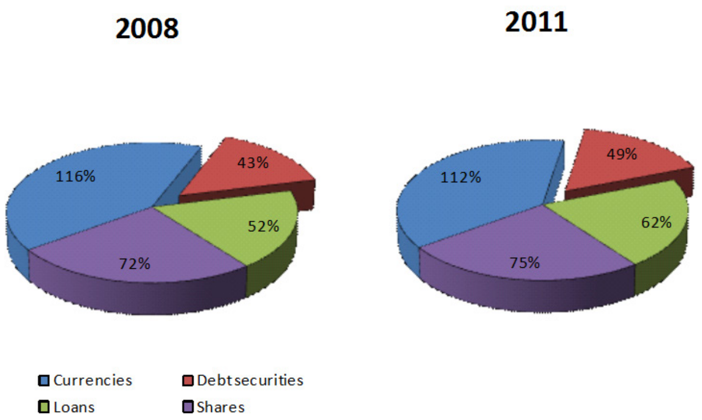
2.3 Financial accounts in the Chilean statistics context

To contextualize the present paper, figure1 show the size of Chilean market as percentage of GDP and breakdown with several instruments for the years 2008 and 2011, where the relevance of the capitalization of bonds can be observed. Chilean bonds market is raised on 51% of GDP, high value relating to medium-high income economies or the rest of Latin-American economies. This relative importance of fixed income market possibly is in line with other characteristics of the Chilean economy as the opening to the international trade, liberalization of the capital flows or private pension funds.

Figure 1

Capitalization by security (2008– 2011)

(Percentage of GDP)



Source: Central Bank of Chile

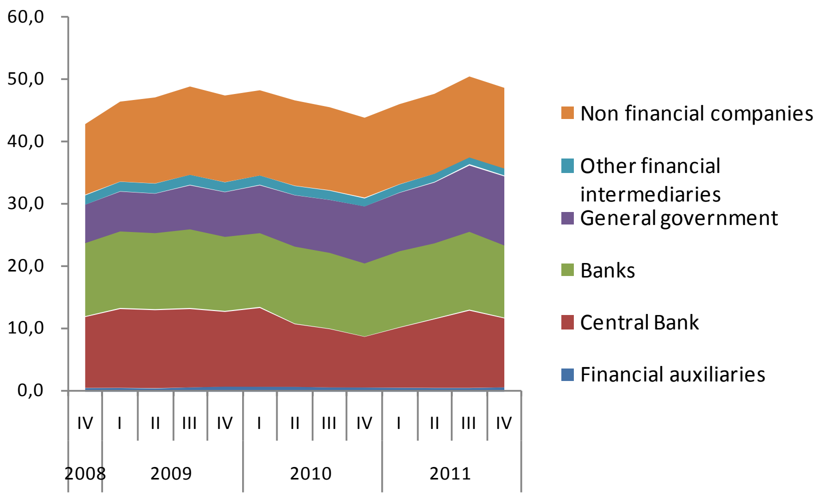
Upon analyzing for issuer sectors of bonds (figure 2). It can be observed the most important issuer sector is Non financial companies, followed by Banks and *Saving and loans associations*.

Likewise it emphasizes the General government and Central Bank that as a group add issues by the 22% of GDP. Finally, another characteristic of the Chilean market is the not authorization of issue to the rest of the public sector except the General government and the small relative size of other financial intermediaries, financial auxiliaries and Special purpose vehicle.

Figure 2

Issuer of the debt securities of the Chilean economy

(Percentage of GDP)



Source: Central Bank of Chile

3. General methodology

3.2 Estimation of market prices

The objective of the methodology is to determine the opening and closing balances to market price, transactions and the gains by nominal possession according to the definitions given in the point 2 of this paper.

The first step of the methodology is to value to market prices, the balance to the start and closing dates from all debt securities reported by the DCV. With the objective of this calculation, the daily listing of prices published by the Chilean Superintendence of Pensions (SP) are utilized, these prices are expressed as percentage of the face value.

Nevertheless, the information of the securities of DCV can be to face value or to par value that means the face value more interests. For the instruments, where their price are at face value, the market values are obtained applying directly the price from SP with exception of the bond of the old security social system for which a new price is estimated. While those instruments that are called to par value, the face value are calculated with aid of complementary information to be able to apply the prices of the SP.

An additional way, prior to the calculations of balance to market value, transactions and variations of price; are carried out estimations of the full interests by each type of instrument. For this, the weekly balance to par value is multiplied for the weekly rate of issue of the instrument and by the index of currency depends on every case. Continuing the classification carried out in the table 2, the securities at face value were estimated at par value using payments flows information from the cash flows schedule. On the other hand, the securities without rate of issue are attributed them the median of the rates categorized by type of instrument considering the residual time.

These complementary sources are where to be able to obtain the face value of every instrument or cash flows schedule in order to obtaining the face value. This information is the monthly report with issues and settlement of bonds recorded in the registration of the SBIF, corporate bonds and debentures issues statistics of the SVS. To obtain the active positions of every instrument, the information of the available holder in the base of the DCV is utilized.

Table 2

Source of information

Information	*Frecuency*	*Source*
Securities by securities database	Weekly	Depósito Central de Valores (DCV)
Listing of prices	Daily	Superintendence of Pensions (SP) www.spensiones.cl
Cash flows schedule		Risk América
Monthly report with issued bonds	Monthly	Superintendence of Banks (Sbif) www.sbif.cl
Statistics of issued debentures	Monthly	Superintendence of Securities and Insurances (SVS) www.svs.cl

3.2 Estimation of transactions

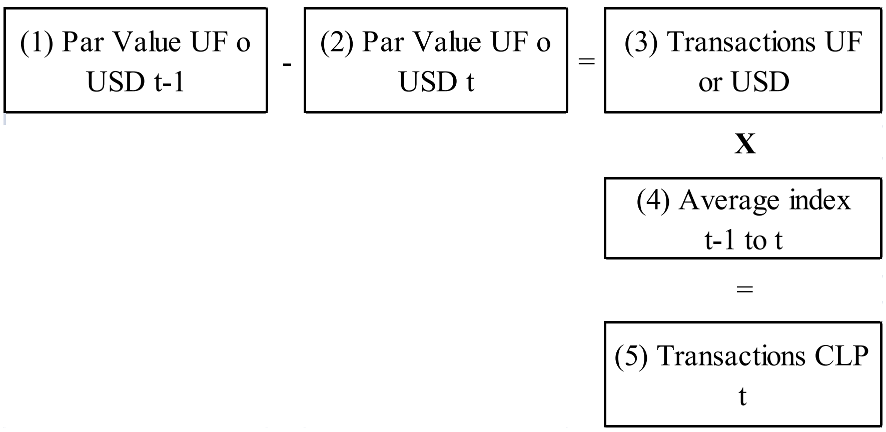
After estimation of the market value, the financial operation is projected as the outcome of the issue of new debt minus payments of capital as well as interest yielded in a period of time. Likewise, the definition mentioned can be expressed like the remainder of the par value at the end of a period and the par value at the start of the period.

Nevertheless, the simple subtraction between par values in securities with nominal values different from Chilean pesos (CLP) incorporates the fluctuation between the unit of emission and CLP. Due to this, the kind of nominal denomination should be distinguished among Chilean pesos, American dollars, UF´s or others.

Whether you consider an issued bond in UF or dollars, the difference between the par values shows the financial operations of the period in the currency of issue (3), this is the payment of coupons or interest, including the effect of fluctuation against the Chilean peso.

At the end, the result of the financial operation in Chilean pesos for securities not issued in CLP is obtained from the difference of the par values (1) and (2), that multiplied by the average (4) of the monetary index that convert the unit of issue in Chilean pesos (value of the UF or the exchange rate between Chilean peso and American dollar) obtaining the financial operation in Chilean pesos (5).

Figure 3



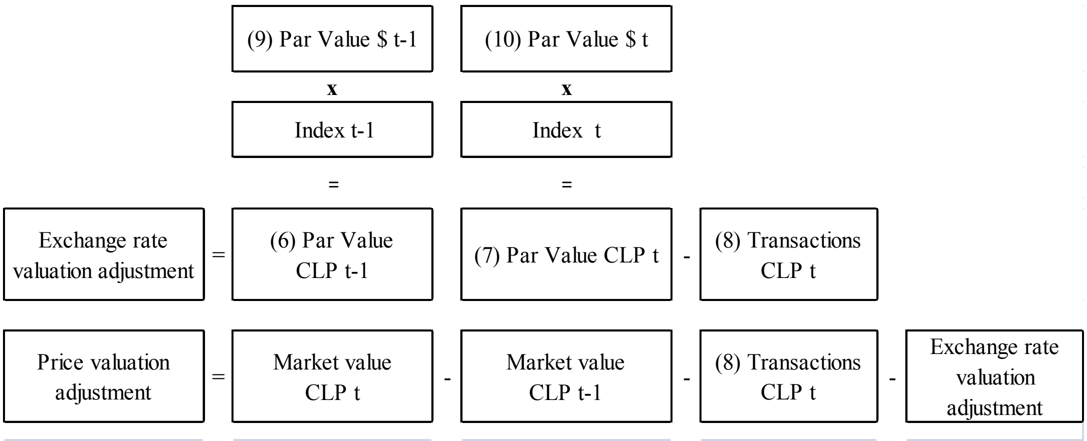
Source: Central Bank of Chile

On the other hand, in figure 4, the calculation of the financial operation for bonds issued in Chilean pesos, it is observed that there is not fluctuation of the value of the currency, being the financial operation difference between par values (10)-(9).

3.3 Estimation of price valuation adjustment and exchange rate valuation adjustment

The calculation of the rest of effects is basically the difference between the adjustment to market prices and the financial operation. The exchange rate valuation adjustment is the difference between the subtractions of par values in Chilean pesos and the financial operation mentioned, in the case of debt securities issued in UF this value will be zero.

Figure 4



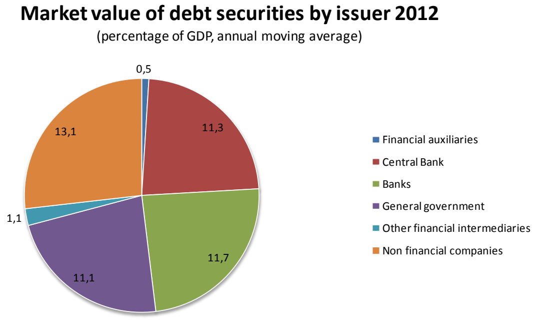
Source: Central Bank of Chile

4. Results

The product obtained from the DCV base, for the period 2008–2011, is worthy because it contains different glances for the analysis. Besides par values mentioned, market prices and financial operations, these figures can be seen from the point of view of issuing sectors, holders, currencies and maturities.

The results detailed by issuers (figure 5) show Non financial companies sector as the main issuer sector, with emissions of debt securities of 13.1% of GDP that represents 27% of the total fixed income market to December 2011. Non financial companies sector is followed by Banking sector with issues of 11.7% of GDP, nevertheless since this sector has decreased in the relative weight of the issues, representing 28% of the total at the end of 2008 as well as 24% at the end of 2011. Likewise, among the issuers such as the Central Bank and the General Government with issues of 11.7% and 11.1% of GDP to December 2011 are outstanding.

Figure 5



Source: Central Bank of Chile

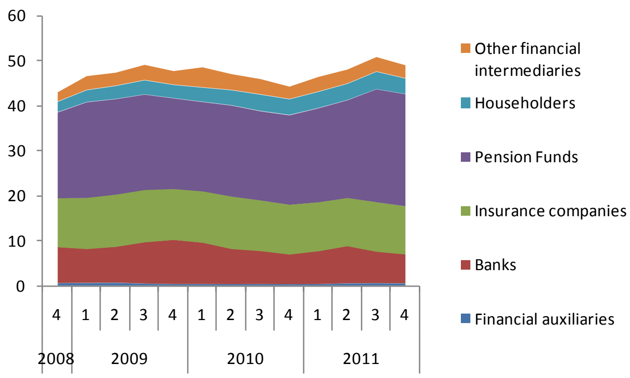
The results detailed by holders (figure 6) show that Chilean pension funds are the most important debt securities holders of the local market with an asset under management close to 25% of GDP, being 51% of the total market to December 2011. Subsequently, insurance companies and the commercial banks are observed with 21% and 13% of the total of debt securities market.

Likewise, as the supervisor of the Chilean pension funds publishes the value of portfolio, is an important source of validation of the results obtained. As it is observed in the second graph of figure 6, the values published by the Superintendence of Pensions (SP) are closed to our value, on average these results are around 98% of the ones obtained with the DCV base.

Figure 6

Holders of the debt securities of the Chilean economy

(Percentage of GDP)

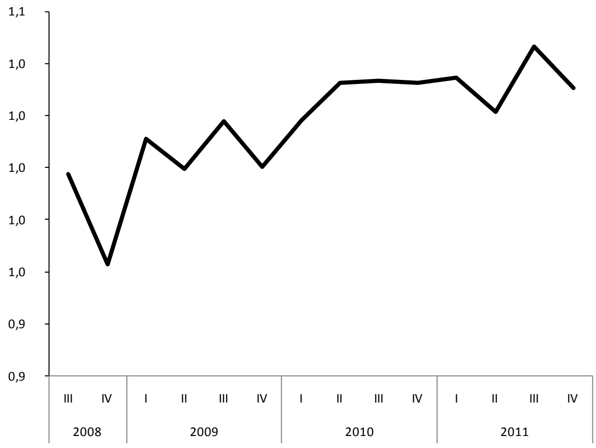


Source: Central Bank of Chile

In figure 7, another product of the DCV base can be observed, the explanation of the variations of the final balance. In the first graph, it is observed as the second half of 2009 and the beginning of 2011, net issues were increased and the deceleration of these subsequently, and the institutional sectors that are behind these operations. In graph 2 of figure 7, the behavior of general prices of market against par value of debt securities is detailed, this information can be related to the operations or the preferences by other assets such as shares or real assets.

Figure 7

Evolution of par value



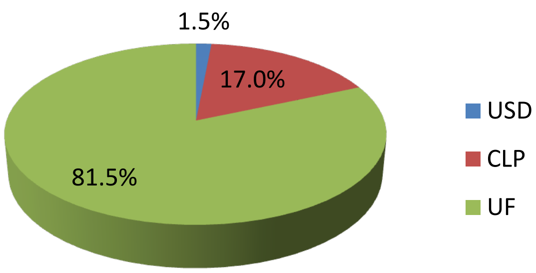
Source: Central Bank of Chile

In addition, breakdown by currency for each kind of instrument, the DCV reports also its currency denomination. The alternatives are: i) domestic currency in nominal terms (17%), ii) foreign currency (1.5% US dollars), and iii) domestic currency and UF linked (81.5%) Figure 8.

Finally, DCV base gives us the point of view by maturity. The DCV provides information with respect to the residual term of the outstanding instruments. Figure 9 presents the outstanding bonds' allocate by maturity term. This figure suggests that the composition of bonds by maturity is distributed homogenously across categories. In effect, the shortest term instruments (<360 days) accounts for 6% of total assets, the category between 1 and 5 years also represents 62%, the category between 5 and 10 years is equal to 28%, and finally the assets with maturity over 10 years corresponds to 4%.

Figure 8

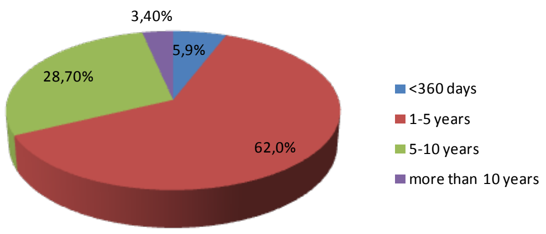
Breakdown by currencies



Source: Central Bank of Chile

Figure 9

Breakdown by maturity



Source: Central Bank of Chile

5. Summary

The function of this article was to explain the use of the DCV database as a complementary source of information to compiling the Chilean financial accounts. This dataset contains information on asset holdings that accounts for 98% of total fixed income market, providing detailed information about the issuer, nominal value of each issue, maturity and class of agent that holds each asset (Bank, Mutual Fund, Pension Fund, Insurance Company, etc.). This information is available since June 2008 on a weekly basis.

In this sense, this article gives details about the calculation of concepts used in National Accounts. Given the above, the estimate depends on currency denomination mainly.

Finally, this paper shows main results detailed by issuers, holders, currencies and maturities. These different glances help to improve the analysis, above all to monitoring the financial stability of the Chilean market.

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National System Accounts 2003

Security-by-security data on holdings of securities: the importance for national and euro area accounts

Isabel Lavrador,[1] Romana Peronaci[2] and Nuno Silva[3]

Introduction

Recent economic developments have highlighted important gaps in the statistical framework, both at national and international level. In particular, the crisis exposed gaps in information for financial stability (macro-prudential) analysis, revealed the lack of transparency in a number of financial markets, and emphasised the difficulties in assessing information on financial linkages within and between institutional sectors and countries, and the exposure of sectors to both domestic and foreign counterparties.

According to Sola and Strobbe (2010), the information available for these purposes refers mainly to highly aggregated data. The same applies for financial accounts statistics: data on overall holdings of securities of each resident sector are available for most countries, but they do not allow the identification of the institutional sector of the issuer of these securities (from-whom-to-whom view[4]). Such a detailed breakdown of securities holdings data has been requested by European System of Central Banks' (ESCB) users for a long time, not only for structural and economic analysis, but also for monetary analysis. For instance, to allow a better estimate of money and of its counterpart information on short-term (up to two years) debt securities issued by Monetary Financial Institutions (MFIs).

Against this background, the ESCB launched an initiative to collect micro-data on holdings of securities on the basis of a short-term approach, i.e. collect existing security-by-security information on a voluntary, best effort basis. In parallel, it also started the necessary work to develop a steady-state Security Holdings Statistics Database (SHSDB), which will bring together comprehensive information on holdings of securities by euro area residents on the basis of a European Central Bank (ECB) Legal act.

This study presents some estimates on the integrated compilation framework of financial accounts and securities holdings statistics, considering the breakdowns by holding and issuer sector and country. It illustrates how experimental data on securities holdings statistics can be combined with other euro area data sources to compile euro area accounts on a from-whom-to-whom approach. It also explains how these estimates can provide a better understanding of the financing and financial investment decisions of euro area sectors, as well as relationships with the euro area rest of the world.

The remainder of this paper is structured as follows: Section 2 briefly describes the data needs on holdings of securities; Section 3 introduces the approaches for the compilation of experimental data on securities holdings and the on-going developments towards a steady-state approach; Section 4 explains the importance of a micro-database on holdings of

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[4] Double-entry matrices that allow evaluating which institutional sectors are financing the economy, in terms of securities. These tables show the holdings of various financial instruments by the different institutional sectors, both on the asset and the liability side.

securities and its use in the compilation of sectoral accounts statistics (particularly of the euro area accounts); Section 5 provides empirical evidence on the use of these statistics; finally, Section 6 concludes and presents the steps ahead.

1. Data needs on holdings of securities

The importance of having accurate information on the exposure of economic sectors to specific classes of securities on a security-by-security basis has become more evident in recent years. Aggregated data cannot help in identifying risks to financial stability related to contagion mechanisms running at the level of individual financial institutions and generated by specific classes of securities. In addition, monitoring financial imbalances and balance sheet vulnerabilities of key financial intermediaries has become a need also for monetary policy purposes when assessing the medium to long term risks to price stability and the monetary policy transmission mechanism.

The lack of consistent and granular information on investors' holdings of securities, and on the related counterparts, for euro area countries, undermined the possibility to analyse in an effective and efficient manner inter-linkages between institutions, sectors and countries.

Security-by-security information on investors' portfolio is a crucial tool which allows combining securities held by institutional sectors with information on individual issuers across the world. Therefore, a detailed database on holdings of securities, linked with information on the issuer of each security would allow cross-classifying detailed data on holdings of securities by country and institutional sector, with the country and institutional sector of the issuers of these securities. This information provides a comprehensive data framework to monitor the build-up and evolution of financial imbalances and the links between financial and non-financial investors.[5]

Although euro area statistics disseminate aggregated data on financial positions and flows by euro area sectors, for the large majority of the cases information on a from-whom-to-whom basis is still lacking, particularly for securities. A detailed presentation of securities with counterpart information would enable a more comprehensive analysis of portfolio allocation decisions and the compilation of broader liquidity aggregates, which complement the classical monetary aggregates.[6]

Moreover, price changes have a considerable impact on net financial wealth and, consequently, on economic agents behaviour towards consumption and investment, and thus on the real economy. A from-whom-to-whom mapping of price changes is in this context also of great relevance to understand the channels of propagation of shocks and threats and is pivotal in research and analysis on the activity of the different economic and financial agents.

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[5] This was also recognised by the G-20 Finance Ministers and Central Bank Governors, which endorsed 20 recommendations to address the data gaps described in the report "The Financial Crisis and Information Gaps" (available at http://www.imf.org/external/np/g20/pdf/102909.pdf), prepared by the Financial Stability Board Secretariat and International Monetary Fund (IMF) staff. Most of these recommendations, directly or indirectly, call for more detailed information on securities holdings and issuances.

[6] The importance of the assessment of these inter-linkages on a from-whom-to-whom basis has been explored in recent literature. As described by Lavrador (2010) and Mink et al. (2012) from-whom-to-whom statistical information enriches considerably the approach of monitoring monetary transmission processes, general government debt and securities issues and holdings. A from-whom-to-whom framework allows exploring how the risk exposures and dependencies across sectors are influenced by developments in assets and liabilities of other sectors.

A meaningful risk analysis should bring together harmonised from-whom-to-whom information for all relevant financial instruments, including securities, both at euro area and national levels. In particular, the wide coverage of a securities holdings database in terms of the different financial instruments and detailed information on investor sector, country, main financers and counterparties, allow for the compilation of valuable statistical outputs which are of key importance for policy makers.

2. Experimental data on securities holdings and the steady-state approach

2.1 Experimental data

In 2009, the ESCB started assessing the possible approaches towards the collection of security-by-security data on holdings of securities, with the purpose of overcoming the existing data gaps. As a result, the ESCB developed a "short-term approach" for the collection of experimental data on holdings of securities (SHES project), reported by euro area (and some European Union) National Central Banks (NCBs). Based on the available data sources (security-by-security data on holdings of securities were already available for some statistics produced by the Eurosystem/ESCB) and without implementing a new data collection from reporting agents, the main objective of this approach was to set-up a framework for the compilation of quarterly estimates of euro area statistics on securities holdings. The reporting of data to this experimental database is on a best effort (voluntary) basis.

As explained by Sola and Strobbe (2010), security-by-security data are collected on a quarterly basis for a sample of securities, in the form of micro statistics. On the investor side, positions by investor country and institutional sector or sub-sector are reported.[7] This experimental data collection scheme aims at identifying the holdings of securities by all euro area investor sectors. Detailed data on securities holdings include stocks of short- and long-term debt securities, quoted shares and mutual fund shares. The methodological framework applied to this experimental database follows the national accounts statistical standards (SNA93, ESA95, supplemented by the BIS/ECB/IMF Handbook on Securities Statistics).

Furthermore, apart from the data available on holdings of securities by institutional sector, reference data with the classification of each security and its issuer were already available in the Centralised Securities Database (CSDB). This database stores information on the characteristics of individual securities and issuers, with the aim of providing complete, accurate, consistent and up-to-date information on all individual securities relevant for the statistical purposes of the ESCB. The attributes in the CSDB include type of instrument, name, sector or sub-sector, country of the issuer, issue date, redemption date, currency of denomination, issue price, redemption price and outstanding amount or market capitalisation (ECB, 2010; Mink et al., 2012).

The experimental database has been used as a testing platform that merges individual security data on holdings of securities identified by the International Securities Identification Number (ISIN code), with reference data from the CSDB, for the classification of financial instruments and issuer entities (including institutional sectors).

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[7] The main sectors and sub-sectors considered in the compilation of SHES are: Monetary Financial Institutions; Insurance Corporations and Pension Funds; Other Financial Intermediaries and Financial Auxiliaries; Non-Financial Corporations; and Households.

The quality of the data transmitted is regularly monitored through internal ECB consistency checks. In addition, a cross-checking with alternative sources is performed, in order to assess the consistency of the experimental dataset. Moreover, combining euro area accounts data with international investment position data provides an additional comparison opportunity to evaluate the coverage and completeness of experimental data on holdings by participant countries and the Rest of the World.[8]

2.2 The steady-state approach

The ESCB has also started the development of a joint database on holdings of securities with a steady-state perspective, i.e. a comprehensive database where all euro area/EU holdings of securities could be pooled together. For this purpose, an IT project has been launched to set up a database for storing the securities holdings data, the Securities Holdings Statistics Database (SHSDB), which is expected to be up and running in 2014. Following the main concepts of the SHES, the SHSDB will pool together security-by-security holdings from euro area residents, to be collected via an ECB Regulation to cover all institutional sectors.

Quarterly security-by-security information on holdings of securities is expected to be collected systematically from euro-area custodians and financial end-investors. The aim will be to produce both detailed and timely regular and ad-hoc statistical aggregations, which enables the delivery of improved and more detailed (e.g. on counterparty sector) information on holdings of securities.

3. The use of securities holdings statistics in the euro area accounts

The ECB and Eurostat, in close collaboration with the relevant national statistical authorities (NSAs), are publishing quarterly euro area and European Union (EU) accounts by institutional sector (the European sector accounts) since June 2007.[9]

The euro area component of the accounts (hereinafter, the euro area accounts – EAA) provides a comprehensive overview of the euro area economy. It shows all "real" and financial transactions and (changes in) balance sheet positions of non-financial corporations, financial corporations, general government and households, as well as the interactions among them and between them and the (euro area) rest of the world.[10]

The EAA are not the simple sum of the national accounts of the euro area member countries. The most visible example of this fact being the compilation of the euro area rest of the world account, which entails the "consolidation" of the cross-border transactions and positions between euro area member states. Therefore, although the compilation process starts with the transmission of the national (financial and non-financial) accounts by euro area member states to the ECB/Eurostat, these are subsequently combined with other euro area data sources, namely the euro area balance of payments statistics and international investment position statistics (BoP/IIP), monetary and financial statistics, quarterly government data, and the ECB accounts (part of the euro area MFI sector).

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[8] The term "Rest of the World" on a euro area perspective consists of all the countries outside the Eurosystem.

[9] See the ECB website for more details on EAA: http://www.ecb.europa.eu/stats/acc/html/index.en.html.

[10] The financial part of the accounts comprises a more detailed breakdown of the financial sector (monetary and financial institutions (MFIs), other financial institutions (OFIs), and insurance corporations and pension funds (ICPFs).

Furthermore, the financial and non-financial accounts are compiled in parallel and integrated in three dimensions. First, for each transaction category (financial and non-financial) and each financial balance sheet category, total uses must equal total resources and total (changes in) financial assets must equal total (changes in) liabilities, when summed over all institutional sectors and the rest of the world (the so-called horizontal consistency[11]). Second, for each sector and the rest of the world, the sum of all resources and changes in liabilities should be equal to the sum of all uses and changes in assets (so-called vertical consistency). In the current EAA statistics vertical consistency has been achieved for the general government and financial corporations institutional sectors, as well as for the rest of the world.[12] Third, the change in balance sheets (stocks) for each asset category is equal to the changes arising from transactions and from other flows (stock-flow consistency). Other flows comprise revaluations and other changes in volume.

Debt securities and shares and other equity are important financial instruments traded in the financial markets. They account to close to 40% of the financial assets of the euro area (as at end-2011). From a financial stability perspective, the importance of securities makes the new statistics relevant in assessing the stability of the financial system.

The data available in the existing experimental SHES database (please refer to Section 3) are not directly used in the compilation of the EAA statistics. While these data could be used in the compilation of major tradable instruments (debt securities, quoted shares and mutual fund shares), existing limitations justify the use of alternative data sources. Indeed, the short time frame (time series starting in 2009Q1), the lack of transactions data and the relative under-coverage (data reported on a best-effort basis) make the use of national financial accounts preferable in the estimation of total holdings of tradable securities by institutional sector. However, existing national SHS are in one way or the other used in the compilation of national financial accounts; therefore, indirectly used in the compilation of the EAA statistics.

Experimental SHS data and other recently available euro area data sources have, however, made the compilation of experimental from-whom-to-whom data for the above mentioned tradable securities possible in the context of the EAA. Indeed, experimental SHS, investment funds statistics (IF) and additional BoP/IIP details, in combination with other existing statistics (e.g., monetary financial institutions balance sheet information - BSI) allows the compilation of equally experimental euro area from-whom-to-whom stock matrices for debt securities, quoted shares, and mutual fund shares. As Mink et al. (2012) put it, the construction of the euro area accounts on a from-whom-to-whom basis is an important compilation tool for enhancing the quality and consistency of the data. It allows for the cross-checking of the information from both debtor and creditor sides, thus allowing for a full consistency in terms of values and timing for recording transactions, other flows, and positions.

The scope of the experimental EAA from-whom-to-whom tables for securities is determined by the scope of the experimental SHS, and therefore is limited to stocks, starting in the first quarter of 2009. The compilation process is defined in such a way that the from-whom-to-whom detail is fully consistent with the total holdings and issuances by institutional sector as officially published in the EAA statistics, 120 days after the end of the reference quarter.

The methodology underlying the compilation of experimental euro area from-whom-to-whom tables for securities is at this stage rather simple, mostly based on weights derived from

[11] For instance, for a certain instrument type, the sum of the net acquisitions by all sectors and the rest of the world must be equal to the sum of the net issuances by all sectors and the rest of the world.

[12] Contrary to the BoP statistics, the EAA statistics do not show “Errors and omissions”, i.e., it shows vertical consistency for the rest of the world.

experimental SHS and other data sources,[13] since estimates are produced for stock (strictly positive numbers).

The compilation would however need to be considerably more elaborated if attempted for the overall matrices at once and also when considering transactions. For the latter, it is worth mentioning that a combination of positive and negative observations makes the reconciliation between the EAA totals and the interior of the matrices a more challenging exercise in technical terms.

Efficiency and timeliness considerations are often listed as reasons to base the compilation of EAA statistics as much as possible on existing euro area data sources; instead of requiring national authorities to compile and report comprehensive national accounts.[14] The outstanding ECB plans to compile comprehensive EAA 90 days after the end of the reference quarter fit for monetary policy purposes, requires a slight change in the EAA compilation paradigm. For securities, this will imply a more intensive use of timely steady-state SHS data in the estimation of holdings of securities by sector and the CSDB for the corresponding total issuances.

While the final use of the experimental euro area from-whom-to-whom stock matrices is currently rather limited, it serves a multitude of other relevant statistical purposes. For example, it provides very valuable references for the development of interest income matrices and the breakdown of other flows into other volume changes and revaluations using modelling approaches.

4. First experimental from-whom-to-whom estimates

To test the overall feasibility of compiling euro area from-whom-to-whom tables for securities in the context of the EAA statistics, the ECB developed experimental euro area from-whom-to-whom aggregates for selected securities on the basis of existing information.

These data provides rather detailed structural information, which helps identifying individual sectoral investment and financing decisions and analysing credit exposures. This provides concrete evidence on the empirical assumption of a high interconnectedness of financial markets and institutions.

While initial estimates reassured the feasibility of the overall project, several developments are deemed necessary to ensure better quality and a full integration of SHS with EAA. This is envisaged in the SHS development towards a steady-state approach, which will not only improve the overall quality of the existing (stock) data but will also bring data on transactions.

This section presents selected estimates derived from this experimental exercise. Due to their nature, the estimates should be taken with care and seen from a statistical angle, instead of taken at face value for economic analysis.

4.1 Debt securities

In the current economic crisis, one of the most valuable pieces of information is the exposure of the various sectors to government debt. While a static view (stocks) already provides very good insights to the overall sectoral risks and on the consequences of certain decisions, a

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[13] In practice, the process is slightly more complicated because of data selection and reliability considerations.

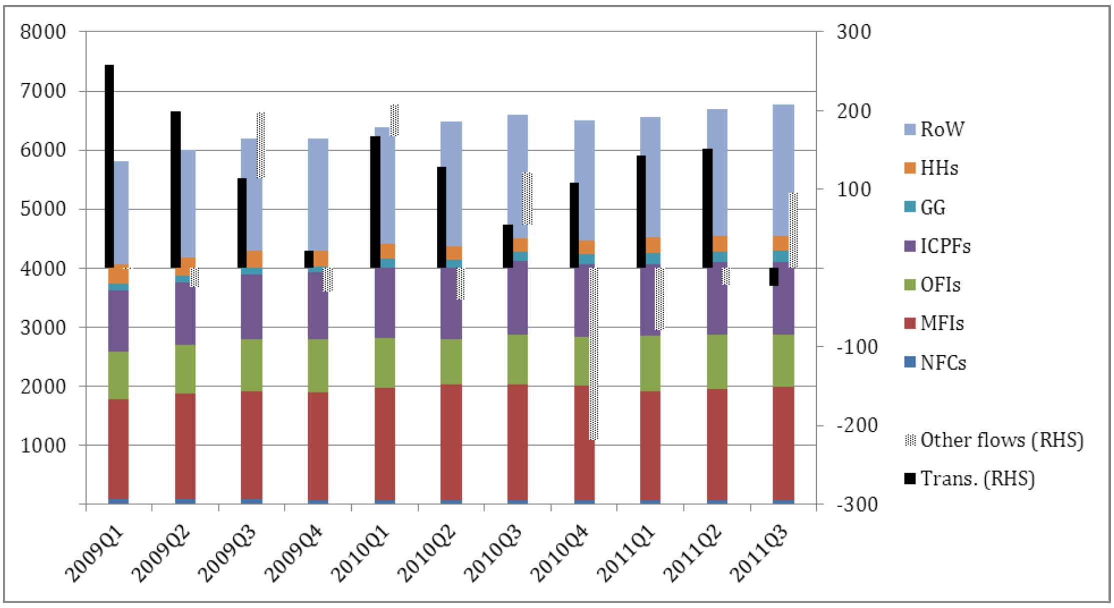
[14] It is important to recall that the new responsibilities in the area of macro-prudential surveillance that have been entrusted to the ECB call for the availability of comprehensive national data, in addition to high quality euro area/EU aggregates.

more dynamic approach relying on quarterly transactions would shed additional light on investment decisions and therefore better picture the development of financial conditions.

In this context, Chart 1 provides an overview of the sectoral exposures to government debt securities over the period from 2009Q1 to 2011Q3. In addition, it shows (RHS - right hand scale) net issuances of government debt securities (transactions) and other changes in stocks (other flows, mostly price changes or revaluations) to better explain total changes in stocks.

Chart 1

Sectoral holdings of debt securities issued by general government (*EUR billions*)[15]



Source: ECB

As expected, the total amount of debt securities issued by general government (GG) has steadily increased over the period under analysis, mostly explained by positive net issuances. Indeed, the slight decreases observed in the total amount of outstanding government debt securities in 2009Q4 and 2010Q4 were fully explained by large negative revaluations (price effects).

On the counterpart sector allocation, one observes a decrease in the holdings of households (HHs), which was compensated by a similar increase in the holdings of non-residents (RoW). Moreover, although not very significant in absolute terms, the increase in the intra-government holdings of debt securities was quite remarkable over the period. This may reflect additional acquisitions by social security funds in the context of increased difficulties to place new sovereign debt in open market operations by some Member States.

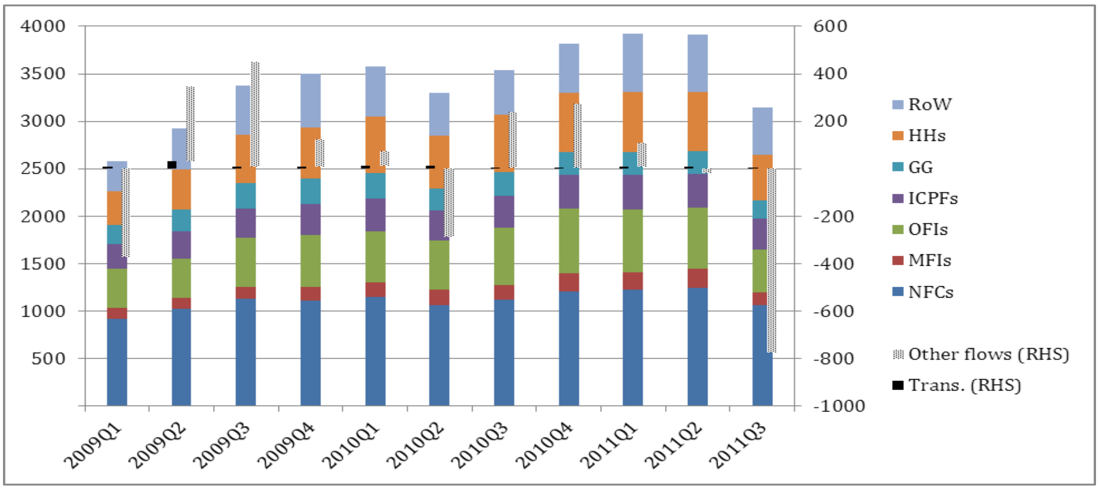
15 RoW-Rest of the world; HHs-Households; GG-General Government; ICPFs-Insurance Corporations and Pension Funds; OFIs-Other Financial Intermediaries; MFIs-Monetary and Financial Institutions; NFCs-Non Financial Corporations.

4.2 Quoted shares

Chart 2 provides an overview of the sectoral exposures to quoted shares issued by non-financial corporations (NFCs) over the period from 2009Q1 to 2011Q3. It also shows (RHS - right hand scale) net issuances (transactions) and other changes in stocks (other flows, mostly price changes or revaluations) to better explain total changes in stocks. In comparison to debt securities, these estimates are of a lower quality, mostly because of the difficulty to distinguish between the various equity components within the International Investment Position (IIP).[16]

Chart 2

Sectoral holdings of quoted shares issued by non-financial corporations (*EUR billions*)



Source: ECB

Quoted shares issued by NFCs are mostly held by other NFCs, Other Financial Intermediaries (OFIs), HHs and the RoW. The volatility of the stock is extremely high mirroring the on-going stock market volatility. Indeed, although positive all over the period, the weight of transactions on changes in stocks is rather negligible, also reflecting the unattractive pricing conditions to raise new capital.

4.3 Mutual fund shares

Out of the three instruments for which experimental from-whom-to-whom matrices were developed, mutual funds shares is by far the one with more comprehensive data sources, even overlapping in certain areas, mostly owing to the recent availability of comprehensive investment funds statistics and to the data arising from the regular exercise to compile M3 by sector (including an estimate of money market fund shares by counterpart sector). The overlapping data sources, in particular as regards total mutual funds shares issued by OFIs, still shows methodological differences between EAA and IF statistics.

Chart 3 provides an overview of HHs' exposure to mutual funds shares broken down by issuing sector over the same 2009Q1-2011Q3 period. It also shows (RHS - right hand scale)

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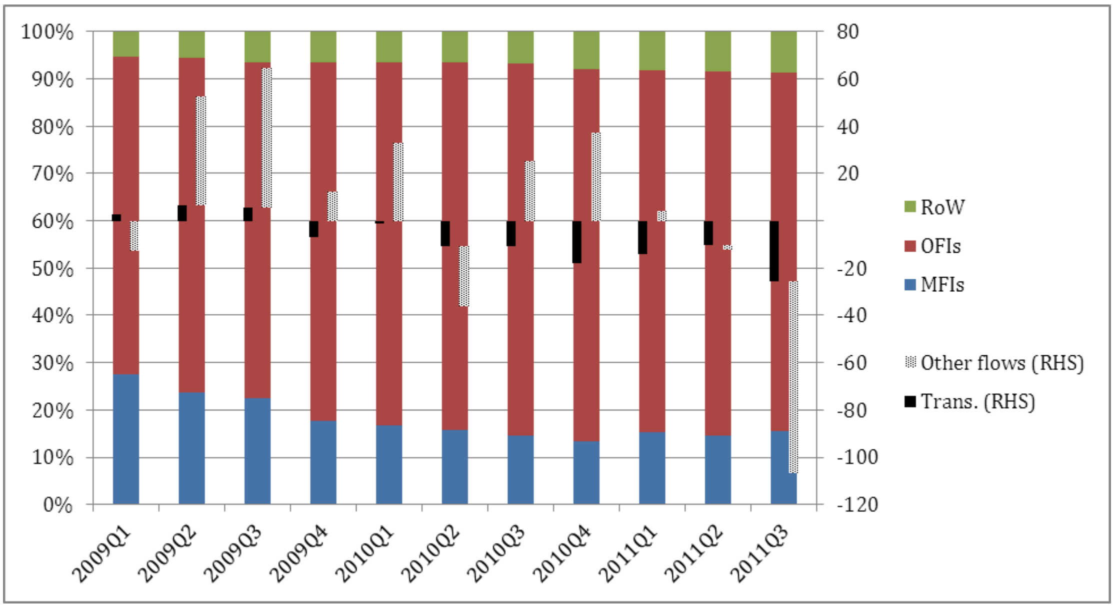
[16] In fact, because of this difficulty the breakdown of shares and other equity is currently not disseminated in the context of the EAA.

net acquisitions (transactions) and other changes in stocks (other flows, mostly price changes or revaluations) to better explain the portfolio decision of households as regards mutual funds shares.

Chart 3

Households' holdings of mutual funds shares by issuing sector (*Percentage (%), EUR billions*)



Source: ECB

The most striking development from Chart 3 is the clear drop in the weight of mutual funds shares issued by MFIs (i.e. money market funds - MMFs) in the overall mutual fund shares portfolio of HHs, until the end of 2010. This may be explained by the uncertainty over the soundness and liquidity of some money market funds following the sub-prime crises. Another interesting fact is the increase in the holdings of mutual fund shares issued by non-residents. This may reveal both, a move to offshore centres for fiscal reasons and/or a preference for investments in foreign currency.

5. Conclusions and way forward

A detailed database on holdings of securities would directly or indirectly (via the EAA) satisfy most of the outstanding user needs regarding data on securities. This would provide both, very detailed micro (security-by-security) data and the means for the compilation of macro aggregates. The former would assist on detailed analysis by individual issuer and holder, while the latter would allow a detailed assessment of the inter-linkages between countries and sectors.

The existing experimental securities holdings statistics proved that these objectives can be achieved in the steady-state approach. Although on the basis of rather tight confidentially limitations, the ad-hoc use of the security-by-security data has already been possible in the context of the on-going financial and economic crisis. Moreover, the experimental from-whom-to-whom tables for debt securities, quoted shares and mutual funds shares, as presented in Section 5, have also provided a first overview of the inter-linkages between institutional sectors in the euro area and vis-à-vis these sectors and the rest of the world.

The full value of comprehensive securities holdings statistics would, however, only materialise with the introduction of the steady-state approach in 2014. This would additionally provide detailed data on holdings of monetary instruments by sector, to be used in the compilation of M3 by institutional sector, and on the exposures to debt instruments by residual maturity or currency. In fact, given the flexibility of such detailed security-by-security database, several geometries of aggregates and analysis would be possible, without addressing additional data requests to reporting agents.

The steady-state approach would also facilitate the expected quantum leap in the timeliness of the EAA, by providing core (stock and transactions) data for the compilation of holdings by institutional sector 90 days after the end of the reference quarter, as requested for monetary policy purposes. It will also allow the compilation of from-whom-to-whom tables in the EAA context, also comprising information on revaluations. The integration of these data would, however, bring new challenges to the EAA compilation when attempted for the overall matrices at once within a rather tight timeline.

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Patterns of credit ownership in Poland – A multi-group latent class approach

Piotr Białowolski[1]

1. Introduction

Although there are country-specific differences, the scale of households' participation in the financial market in the EU27 countries amounts to an average of 60% of the total GDP (Pyykko 2011). From this perspective, Polish credit market for households is still at an early stage of development. Polish households incurred 526 billion zloty of debt (ca. 125 billion euro) at the end of March 2012, which amounted to 34% of Polish GDP. It is not only lower than the EU average, but also lower than the average for the New Member States (equal to 42%). The gap between Poland and other EU member states with respect to the households' credit ownership differs between the areas of credit for current consumption and mortgages. The penetration rate of credit for consumption purposes amounts to ca. 9% of Polish GDP being close to the average for New Member States and slightly above the average for all other Member States. Mortgages in relation to GDP account for 21%, which is however still much below the average both for the New and the Old MS. However, contrary to Old Member States, changes in the value of debt of Polish households were considerable with almost twofold increase in the penetration rates of the consumer credit and over fivefold increase in the penetration rate of mortgages (2003 – 2011).

The rapid changes were a consequence on the one hand of the credit market transition processes associated with the changes in the attitudes of Polish citizens and changes in the product offer but on the other hand changes in incomes and other socio-economic characteristics of Polish households. The arguments provided by Paas et al. (2006) indicate that acquisition of financial products is strictly connected to the socio-economic characteristics like age and income level, as these factors direct the needs of households into different groups of products. Nevertheless, accessibility of financial products plays also a vital role over time, especially when it changes, as a consequence of the evolution of the supply side of the credit market. The changes on the supply-side might be even more vital in the case of markets in transition like Poland, where a large group of households "misses" their life-cycle needs associated with credit products as the accessibility of products is limited due to a low-level of credit market development at the certain point of their life-cycle stage.

A distinction between factors associated with the transition process of the Polish credit market (including those connected with supply-side changes during the crisis[2]) and the socio-economic determinants of households' credit demand comprises the main objective of the paper. The starting point of the analysis is the period specific segmentation of households with respect to their credit ownership patterns. Establishing the number of segments enables tracking the determinants of their evolution including the socio-economic characteristics of households.

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[2] The change observed in the period 2009 – 2011, when most of the effects of the financial crisis started to be visible in the households sector, was driven by two factors: (1) change in households' attitudes with respect to credit products, but also (2) a significant change in the policy of banks and financial intermediaries with respect to their core activity (see Białowolski et al. 2009). It was observed in the increase of strictness in providing credit and also by financial regulation introduced by the Polish Financial Supervision Authority.

Usually, the analyses of credit market are oriented on evaluation of the supply-side, while little attention is given to the households' characteristics potentially driving the change from the micro-perspective. Nevertheless, factors determining micro-level behavior might be also considered highly relevant to the market (Bijmolt et al. 2004). Moreover, a note provided by Bijmolt et al. (2004) suggests that "product ownership represents highly relevant information to support decisions regarding product development, product introduction, cross-selling and segmentation" (p. 324).

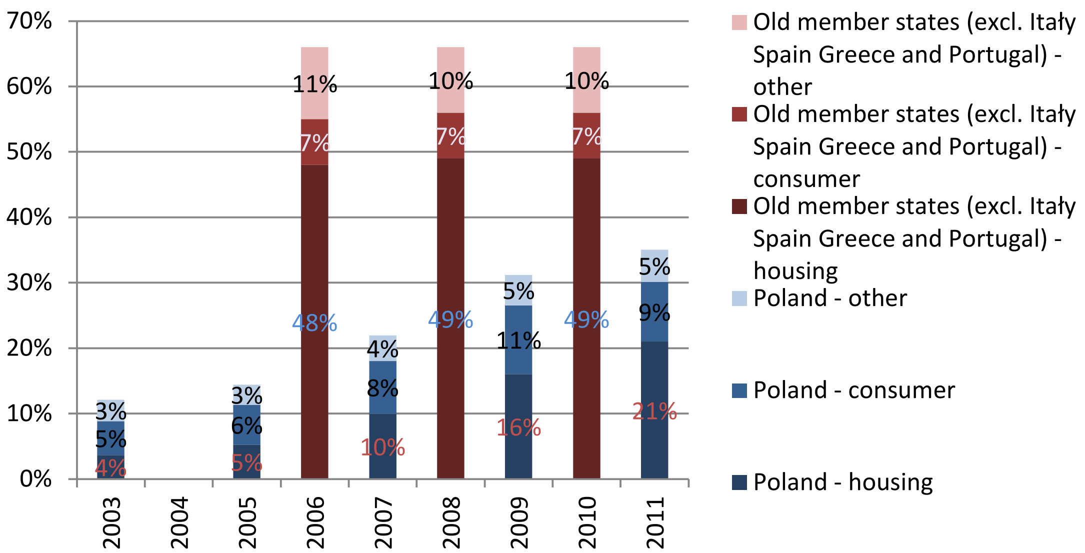
The paper is organized as follows. In section 2, Social Diagnosis Survey is presented and basic statistics concerning ownership of credit products are presented with emphasis on their evolution in time. In section 3 multi-group latent class models are described. Section 4 provides details on the results of estimation of multi-group latent class models, which are a tool for segmentation of Polish credit market for households. In this part it is evaluated whether the change in the structure of segments of households having occurred on the credit market should be considered significant. The remainder of the section is devoted to selection of determinants of household's participation in the credit market and segment latent membership. It is checked whether there is an influence of age of head of household, household's income or place of household's location on membership in latent classes.

2. Changes in patterns of credit ownership among Polish households in 2003 – 2011

The most visible changes in the Polish credit market for households are associated with growth in the penetration rates of credit in all areas – consumer, housing and other. The rapid growth in Poland was observed in line with apparent stabilization in other European countries (Figure 1).

Figure 1

Relation to GDP of housing, consumer and other credit for households in Poland and Old Member States (excluding Portugal, Italy, Greece and Spain).



Source: National Bank of Poland, Polish Central Statistical Office, Pyykko (2011).

The source of these changes is subject to examination in this paper. Social Diagnosis study serves as the source of data for analysis (Social Diagnosis 2011). It covers the state of households' credit portfolios for the period 2003 – 2011 and is a panel-type study in which the panel attrition is accounted for by inclusion of new households from a representative sample. The Social Diagnosis Survey was also evolving during the past decade which resulted in increase of the sample size (Table 1).

Table 1

Number of households participating in the Social Diagnosis Survey by wave

	20003	2005	2007	2009	2011
No. of households	3961	3851	5532	12381	12386

Source: Social Diagnosis 2011.

The development of the Polish credit market for households was not linear from the perspective of the total credit value. The surveys conducted in 2003, 2005 and 2007 covered the period of its rapid growth. The study conducted in March 2009 evaluated the situation on the Polish households credit market shortly after the outburst of the financial crisis. Due to inertia in the patterns of credit possession, at that time changes in households' credit portfolios were probably very limited. The restrictions introduced by Polish financial institutions and Polish Supervisory Authority were either in the preparation stage or present at most for a very short period of time. The study performed in 2011 allowed to evaluate the consequences of the financial crisis on households' credit portfolios.

In the Social Diagnosis Survey credit decisions of households are depicted with respect to dimensions of credit source, objectives for taking credit and the value of credit. The evolution of the share of households with respect to different loan/credit sources is presented in Table 2.

Table 2

The percentage of households with respect to the source of a loan/credit (among borrowers) in the years 2003 - 2011

Source of a loan/credit	2003	2005	2007	2009	2011	P-value for the difference 2011 – 2003
banks	78,4	80,8*	87,9***	90,6***	90,9	0.000
other financial institution	29,7	23,9***	18,1***	12,4***	11,9	0.000
family/friends	10,8	11,8	5,7***	4,3***	5,1*	0.000
average total no. of sources	**1,19**	**1,16**	**1,12**	**1,07**	**1,08**	

Difference with respect to the previous survey: *** significant at 0.01 level; ** significant at 0.05 level; * significant at 0.1 level.
Source: Own calculations based on the Social Diagnosis Survey.

In the last decade Polish credit market became much more institutionalized with a rapid increase in the share of households indebted in the banking sector and significant decrease in the role of other financial institutions and/or private persons. In year 2003 most of indebted households owned a loan/credit granted by a bank (78.4%) but credit from other financial institutions (mostly financial intermediaries) was also very wide spread – 29.7% of all indebted households. In the following years the growth of banks was mainly at the expense of other sources of borrowing. Major changes occurred between 2005 and 2009, when the accessibility of credit from the banking sector increased. It translated into a growth from 80.8% to 90.6% of the share of households indebted in banks. There was a parallel considerable reduction in the share of households with a loan from other financial institution. In 2009 the share of such households declined to only 12.4% of all indebted households. The role of private persons was also significantly reduced in that time. In the period of the most rapid opening of the banking sector (2005 – 2007) the share of households with a loan from private persons slumped from 11.8% to merely 5.7%.

An additional consequence of rapid institutionalization of the credit market for households in Poland was a reduction in the scale of borrowing from diversified sources.[3] In 2003 the average indebted household obtained its debts from 1.19 sources on average. This average had been decreasing till 2009 and then stabilized in 2011. Currently average indebted household uses 1.08 sources of credit, which indicates that mostly households do not mix loans obtained from the banking sector, financial intermediaries and private persons.

The situation with respect to the objectives of taking credit was also subject to considerable changes during the last decade (Table 3).

Table 3

The percentage of households with respect to the objectives of taking a loan/credit (among borrowers) in the years 2003 - 2011

Objectives of a loan/credit	2003	2005	2007	2009	2011	P-value for the difference 2011 – 2003
current consumption expenditures (e.g. food, clothing)	22.7	23.1	17.5***	17.7	17.5	0.000
fixed charges (e.g. house maintenance)	15.3	14.4	12.1**	8.7***	8.0	0.000
purchase of durable goods	38.6	39.9	37.0*	38.5	37.0	0.255
purchase of a house/flat	13.7	11.1**	14.6***	16.6**	18.0*	0.000
renovation of a house/flat	33.9	33.2	36.0*	34.9	31.2***	0.051
medical treatment	10.8	10.9	9.7	8.4*	6.4***	0.000
purchase/rent of working equipment	3.3	3.1	3.3	3.4	2.5***	0.095
vacations	4.2	3.2	3.2	3.2	2.5**	0.000
purchase of stocks	0.4	0.0**	0.3**	0.2	0.1	0.049
repayment of previous debts	10.2	10.7	11.5	7.5***	7.9	0.005
development of own business	8.3	7.0	6.5	6.0	5.6	0.000
education/training	8.8	9.6	6.5***	4.7***	3.4***	0.000
other purposes	14.0	13.9	12.0*	12.9	10.5***	0.000
average total no. of objectives	**1.84**	**1.80**	**1.70**	**1.63**	**1.51**	

Difference with respect to the previous survey: *** significant at 0.01 level; ** significant at 0.05 level; * significant at 0.1 level.

Source: Own calculations based on the Social Diagnosis Survey.

Polish households became more goal-oriented in their behavior on the credit market. In 2003 the average household with credit was financing on average 1.84 objectives. In the subsequent surveys this number declined reaching finally 1.51 in 2011. This change is probably a consequence of increasing affluence of Polish households which reduces the role of credit as a source of money for current needs. Share of respondents indicating the following goals: current consumption expenditures, fixed charges, had decreased very significantly between 2003 and 2011. Better affluence was also reflected in a decline in the share of households that need to finance repayment of their previous debts with a new credit/loan. Share of these households dropped the most between 2007 and 2009, when the growth of per capita income amounted to 20% in real terms. The improvement in the financial situation of Polish households was also visible in lower number of households that applied for credit in order to finance their vacations and/or medical treatment.

[3] It does not imply that the number of credit agreements per indebted household decreased. It only shows that there was no longer a need to search for a loan from different sources.

The areas in which stabilization of the share of households was observed comprise credit associated with the purchase of durables and credit/loan to finance renovation of an apartment. These two goals are the most widespread motives for taking a credit. Only in the area of house/flat purchase credit had become increasingly popular throughout the period of analysis – especially between 2005 and 2009. The share of households financing this expenditure rose from 13.7% in 2003 to 18.0% in 2011.

Although there were changes in the objectives and sources of taking credit in the past years, the most visible were the changes in the value of debt with respect to average monthly incomes.

Table 4

The percentage of households with respect to the value of a loan/credit (among borrowers) in the years 2003 - 2011

Value of a loan/credit (relative to household's monthly incomes)	2003	2005	2007	2009	2011
up to monthly incomes	23.6	24.4	23.8	24.3	22.1
above monthly incomes - up to quarterly incomes	32.6	31.1	28.7	24.0	22.6
above quarterly incomes – up to semi-annual incomes	20.4	18.7	19.4	18.4	16.7
above semi-annual incomes – up to annual incomes	12.7	14.1	12.5	14.3	14.8
above annual incomes	10.7	11.7	15.7	18.9	23.8
P-value of the chi-square test for differences in consecutive waves	---	0.482	0.009	0.000	0.000

Difference with respect to the previous survey: *** significant at 0.01 level; ** significant at 0.05 level; * significant at 0.1 level.

Source: Own calculations based on the Social Diagnosis Survey.

Only between 2003 and 2005 there was observed insignificant difference in the value of debt among households with credit/loan. In the following years there was an abrupt increase in the value of debt, which is especially visible in the share of households with debt exceeding their average annual incomes. In 2003 they accounted for merely 10.7% of all indebted households, while in 2011 the percentage reached 23.8%. There was a very little change in the share of households possessing debt of a value not exceeding monthly incomes, which might suggest that low value loans preserved their position on the market. On the other hand, there was a decline in the share of medium-value loans. Share of households indebted at the level ranging from their monthly to their semi-annually incomes declined from 53.0% in 2003 to 39.3% in 2011.

3. Multi-group latent class model in accounting for credit product ownership patterns

Latent-class models can be applied as a segmentation technique in order to define the optimal number of homogeneous segments on the market. In this application, it is assumed that the correlations between indicators (questions) are explained only by the latent class membership, which is a latent explanatory variable for the answering pattern. Thus, it is assumed that within the latent class, answers to different indicators (questions) are independent of each other.

The main advantages of latent-class based clustering over other clustering methods were summarized by Vermunt and Magidson (2002):

1. It is a modeling based approach, which provides results that can be subject to formal (or semi-formal[4]) testing. It is assumed that data are generated by a mixture of probability distributions;
2. Restrictions on parameters can be made and tested in order to obtain more parsimonious model;
3. No scaling decisions are necessary and the scaling of variables does not affect the result.

A characteristic feature of the latent class analysis is that the latent variable is also discrete. Classes are designed to identify groups of individuals that possess a certain pattern of behavior and to test whether this pattern can be explained by the class membership.

Multi-group latent class modeling is an extension of latent class modeling. It was originally developed for the analysis of latent structures of categorical latent variables across different number of groups (Kankaras et al. 2011). It serves as a useful tool for segmentation, which additionally, through a series of constraints, enables testing of the homogeneity of segments' pattern among groups. In this paper different groups correspond to different time points of analysis, which enables testing equivalence of the meaning of segments in time.

Multi-group latent class model can be defined with N manifest variables A_1 A_2 .... A_N (answers to questions) each having M_i $(m_1=1..M_1;\ m_2=1..M_2;\ ...;m_N=1..M_N)$ answer categories, one latent variable X with k=1,...,K classes and one grouping variable T with t=1,...,L groups. In this setting, it is possible to define L cross-tables each with N-dimensions that represent interrelations between manifest variables in each group (in our case at each time-point). Including latent variable X leads to the following form of the model:

$$\pi^{A_1A_2...A_NX|T}_{m_1m_2...m_Nkt} = \pi^{X|T}_{kt}\pi^{A_1|XT}_{m_1kt}\pi^{A_2|XT}_{m_2kt}...\pi^{A_N|XT}_{m_Nkt}$$

(1), where

$\pi^{A_1A_2...A_NX|T}_{m_1m_2...m_Nkt}$ defines conditional probability that respondent with the set of answers ($m_1,m_2,...,m_N$) given in period t belongs to the latent class k, while $\pi^{X|T}_{kt}$ defines conditional probability of belonging to class k given period t, and $\pi^{A_i|XT}_{m_ikt}$ defines probability of providing answer m_i to item A_i given class membership (k) and given the period of analysis (t). Latent class models in such specification are based on an assumption of local independence, which implies that answers to manifest questions (A_1, A_2, ..., A_N) are independent of each other, given the latent class k.

In this paper conditional probabilities $\pi^{A_i|XT}_{m_ikt}$ in a latent class model are specified with l logistic type parameterization. In such a case, probability of providing a given answer can be defined as follows:

$$\pi^{A_i|XT}_{m_ikt} = \frac{e^{thresh_{m_i,k,t}}}{1+e^{thresh_{m_i,k,t}}} - \frac{e^{thresh_{m_i-1,k,t}}}{1+e^{thresh_{m_i-1,k,t}}}$$

(2), where

for each question there are M_{i-1}*K*L estimated thresholds with constraints $\forall_{k\in K\wedge t\in L} thresh_{0,k,t} = -\infty$ and $\forall_{k\in K\wedge t\in L} thresh_{M_i,k,t} = +\infty$. Latent class membership depends also on the unconditional class

[4] In the group of semi-formal tests, model selection based on the information criteria can be placed.

membership ($\pi_{kt}^{X|T}$), which is estimated with the multinomial logistic regression of the form

$$\pi_{kt}^{X|T} = \frac{e^{thresh_{k,t}}}{1 + \sum_{i=1}^{K-1} e^{thresh_{i,t}}} . \quad (3)$$

Measurement invariance, associated with homogeneity of the segmentation pattern between groups, can be defined at two levels. The most basic multi-group latent class model with measurement invariance assumes equality of thresholds for the probabilities of question answers, which can be formally stated as: $\forall_{i \in N; m_i \in M_i; k_1, k_2 \in K; t_1, t_2 \in L} thresh_{m_i, k_1, t_1} = thresh_{m_i, k_2, t_2}$. This level of measurement invariance is sufficient to ensure structural equivalence of the model (McCutcheon 2002), which takes the form:

$$\pi_{m_1 m_2 \ldots m_N kt}^{A_1 A_2 \ldots A_N X|T} = \pi_{kt}^{X|T} \pi_{m_1 k}^{A_1|X} \pi_{m_2 k}^{A_2|X} \ldots \pi_{m_N k}^{A_N|X} \quad (4)$$

In this specification indicator variables – question answers – are not directly dependent on the grouping variable (time). The understanding of latent classes (segments), as expressed by its indicators (questions), is invariant of the grouping variable. At this level of measurement invariance, change in the probability of answering to given question depends only on the latent class membership, which however can be different between time points. Such model can be described as partially homogeneous (Kankaras et al. 2011).

Higher level of measurement invariance is obtained in a completely homogenous model. It requires that the probabilities of class membership are constrained to be equal between groups. At this level formal definition of measurement invariance requires also: $\forall_{k \in K; t_1, t_2 \in L} thresh_{k,t_1} = thresh_{k,t_2}$. The model can be formally presented as follows:

$$\pi_{m_1 m_2 \ldots m_N kt}^{A_1 A_2 \ldots A_N X|T} = \pi_{m_1 m_2 \ldots m_N k}^{A_1 A_2 \ldots A_N X} = \pi_{k}^{X} \pi_{m_1 k}^{A_1|X} \pi_{m_2 k}^{A_2|X} \ldots \pi_{m_N k}^{A_N|X} \quad (5),$$

which implies that the probability of a given answer set does not depend on the grouping variable (time). In applied research this level of measurement invariance is less interesting as, if established, does not allow to account for differences in group shares between periods of analysis. However, if established for some groups only, might provide interesting insights concerning the characteristics of groups.

The multi-group latent class analysis can be extended by including descriptive variables that serve as predictors of latent class membership and are included in an equation for

$$\pi_{kt}^{X|T} = \frac{e^{thresh_{k,t} + \sum_{j=1}^{J} \alpha_{j,k} \cdot x_j}}{1 + \sum_{i=1}^{K-1} e^{thresh_{i,t} + \sum_{j=1}^{J} \alpha_{j,k} \cdot x_j}}$$

(6), where $\{x_1, \ldots, x_J\}$ is a set of explanatory variables while $\alpha_{j,k}$ represent estimated parameters which are set equal to zero for a selected, reference class.

In the multi-group approach the comparison between models and the selection of the proper one can be either completely formal, based on the absolute fit defined by tests of likelihood-ratio chi-square (L^2) and Pearson's chi-square (χ^2) or based on the information criteria. With respect to the L^2 and χ^2 tests of absolute model fit, there is a controversy concerning their ability to deal with sparse tables, which are very common in latent class models. These tests reject models too often, while the possible flaws might be associated with lack of the chi-square distribution of the p-value due to low number of individuals in a given cell of a sparse table (Kankaras et al. 2011). Additionally, with large number of observations absolute fit tests tend to be too rigorous and reject plausible models. A commonly adopted approach is thus to conduct a model comparison with information criteria (AIC, BIC, CAIC), which enables comparisons of different kinds of models leading to the selection of the best one.

In this paper, in order to check for the measurement invariance an approach based on the BIC is adopted and the following procedure is applied: (1) the optimal number of groups is established in model for each period separately; (2) the partially homogeneous model is tested for specification with number of latent classes the same as in the heterogeneous model (period-specific) but also for specifications with equal number of classes in all periods – ranging from minimum to maximum number of latent classes obtained for a single period model; (3) for completely homogeneous specification models with number of classes ranging from minimum to maximum are tested,[5] (4) the preliminary solution is selected based on the information criteria, (5) the solution is subject to testing for different constraints associated with time evolution of latent classes.[6] With such an approach it is checked whether heterogeneous, partially homogeneous or completely homogeneous models should be adopted to explain the evolution of the structure of Polish credit market.

For the analysis of factors influencing the latent class membership the adopted procedure comprised: (1) inclusion of all possible explanatory variables in the model (age of household's head, income level, labor market status, number of people in the household, type of community) (2) indicators with largest p-value are eliminated until only indicators with p-value lower than 0.05 are left.

4. Results

In order to detect the number of homogeneous segments in all time points, latent class models were initially estimated separately for years 2003, 2005, 2007, 2009 and 2011. During the estimation process (see Appendix 1) it was established that in 2003 and 2005 the best fitting models are those with 7 classes, in 2007 the best-fitting model is the 8 class one and in 2009 and 2011 the best fitting models are those with 10 classes. Following the procedure for the assessment of measurement invariance presented in section 3, three types of models were estimated. At first model with unconstrained class probabilities and unconstrained conditional response probabilities (in a logistic specification – threshold structure) was estimated. In the second step a model with constrained conditional response probabilities was estimated, however the possibility of varying class probabilities between time points was left. In this specification, it was allowed to compare the probabilities of class membership in different groups (time points) as the meaning of latent classes was preserved in all periods of the analysis. Finally, a model with not only constrained thresholds, but also with constrained class probabilities was estimated. In such a specification, it was possible to compare the meaning of classes and to state that the response pattern did not depend on the group membership (time point). In this specification it was however required to set equal number of latent classes for all periods of analysis. The values of BIC for the three specifications of the model are presented in Table 5.

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[5] In this specification model with period-specific number of classes cannot be obtained as latent class probabilities are constrained to be equal.

[6] The constraints are associated with pattern of time evolution of class membership probabilities. It is checked whether models with sequential elimination of time-specific parameters are better than models with assumed linear trend in evolution of period specific parameters.

Table 5

BIC for heterogeneous, partially homogeneous and completely homogeneous models

BIC	heterogeneous	partially homogeneous	completely homogeneous
different no. of classes	352815.833	346527.263	---
10 classes	---	344405.594	344592.348
9 classes	---	345485.717	345719.600
8 classes	---	346610.769	346885.934
7 classes	---	348659.039	349862.964

Source: Own calculations in Mplus.

Based on the results the best fitting model is 10 class partially homogeneous one with varying probabilities of class membership between periods. Further estimations proved that some period-specific parameters in the 10-classes partially homogeneous solution are not significantly different from zero. Moreover, in some cases a trend in values of parameters associated with time was noticed, which implies that there was a similar difference between estimated thresholds for the consecutive periods in equation (2). As multi-group latent class models might be tested for the presence of period specific effects, two alternative sets of constraints were imposed in the partially homogeneous specification with 10 classes. In the first specification, it was checked whether the information criterion improves for a model with period-specific parameters constrained to zero for parameters with p-value above 0.05. Second specification was based on parameters obtained in 10-class partially homogeneous model but when a visible trend was observed, the parameters were constrained accordingly to the hypothesized pattern either to follow a linear trend, trend with a break in 2009 (associated with the outburst of the crisis) or to be equal for some periods. In the first specification an improvement in the model fit was observed (BIC = 344231.707). However, in the second specification the fit improved even more considerably and BIC amounted to 344147.389. This result advocates for adopting a partially homogeneous model with period specific thresholds allowed to follow a trend in some classes.

In the following step all explanatory variables were included in order to account for class membership. Afterwards, the number of variables was sequentially reduced in order to reduce these insignificantly different from zero. A model with reduced number of explanatory variables (BIC = 337123.134), where all of them were characterized by the p-value lower than 0.05, was adopted as the final solution. Item response probabilities in each latent class for the final model were presented in Table 6.

Table 6

Response probabilities in latent classes

		Results in probability scale									
		c.1	c.2	c.3	c.4	c.5	c.6	c.7	c.8	c.9	c.10
	credit ownership	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.000
credit value (in the value of monthly incomes)	Zero	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000
	< 1	0.199	0.055	0.099	0.240	0.379	0.337	0.304	0.048	0.397	0.000
	1 – 3	0.263	0.168	0.191	0.290	0.294	0.359	0.362	0.064	0.322	0.000
	3 – 6	0.229	0.230	0.232	0.201	0.160	0.166	0.196	0.087	0.155	0.000
	6 – 12	0.175	0.244	0.252	0.143	0.099	0.086	0.079	0.146	0.077	0.000
	above 12	0.134	0.303	0.226	0.126	0.067	0.053	0.059	0.655	0.049	0.000
credit source	Banks	1.000	0.968	0.996	1.000	1.000	1.000	0.180	1.000	0.162	0.000
	other financial institution	0.049	0.271	0.023	0.038	0.015	0.006	1.000	0.040	0.100	0.000
	family/friends	0.015	0.257	0.040	0.011	0.005	0.010	0.015	0.023	1.000	0.000
credit target	current consumption expenditures (e.g. food, clothing)	0.048	0.574	0.021	0.029	0.042	0.613	0.193	0.017	0.578	0.000
	fixed charges (e.g. house maintenance)	0.006	0.478	0.008	0.009	0.005	0.305	0.091	0.004	0.386	0.000
	purchase of durable goods	0.284	0.431	0.263	0.145	1.000	0.063	0.381	0.120	0.155	0.000
	purchase of a house/flat	0.020	0.087	0.043	0.004	0.005	0.021	0.096	1.000	0.045	0.000
	renovation of a house/flat	1.000	0.454	0.145	0.000	0.000	0.143	0.441	0.126	0.145	0.000
	medical treatment	0.040	0.341	0.014	0.029	0.021	0.217	0.083	0.002	0.179	0.000
	purchase/rent of working equipment	0.000	0.048	0.347	0.002	0.001	0.002	0.005	0.002	0.003	0.000
	Vacations	0.022	0.103	0.011	0.009	0.016	0.026	0.079	0.011	0.006	0.000
	repayment of previous debts	0.036	0.558	0.054	0.032	0.015	0.116	0.059	0.010	0.178	0.000
	development of own business	0.003	0.075	0.715	0.000	0.000	0.003	0.013	0.012	0.017	0.000
	education/training	0.026	0.239	0.042	0.027	0.012	0.095	0.081	0.010	0.034	0.000
	other purposes	0.060	0.259	0.068	1.000	0.000	0.052	0.139	0.023	0.099	0.000
No. of credit purposes		1.545	3.647	1.731	1.286	1.117	1.656	1.661	1.337	1.825	0.000

Source: Own calculations in MPlus based on data from The Social Diagnosis.

The final model comprises an implicit description of the latent classes of households in Poland on the credit market. There are nine distinct groups of households active on the credit market (classes 1 – 9) and a group of households not participating in the market. With respect to groups (classes) the following description can be provided:

Class 1 – Households with rather low value of debt, which was always acquired in a bank (rarely supported by a loan from other financial institution). The debt was always devoted to renovation of a house/flat (100%) and sometimes to purchase of durables (28.4%).

Class 2 – Households indebted for many purposes (average 3.647) and very often with high value of debt (54.7% with debt exceeding their semi-annual incomes). Their sources of credit are mainly banks (96.8%), but they also often search for credit in other financial institutions (27.1%) and among their friends and family (25.8%). In this group there is a very high probability of credit for current consumption (57.4%) and repayment of previous debts

(55.8%), with fixed charges, purchase of durables and renovation of a flat (each of the last three exceeding 40%). Due to very high value of debt and goals associated with current consumption (or repayment of debts) this group of households can be classified as overindebted.

Class 3 – Households with above average value of debt ; almost always in banks (99.6%) and extremely rarely elsewhere. Their objective of taking credit is to develop their business (71.5%) or, which is a very close counterpart, purchase working equipment (34.7%). However, these households are only slightly less active than average in acquiring very popular credit products – for purchase of durables (26.3%) and renovation of a flat (14.5%).

Class 4 – Households that have a debt of a below-average value. They acquire it always in banks (100%) and very rarely support it by a loan from other sources. They use it always to finance other purposes (100%) and rarely purchase of durables (14.5%).

Class 5 – Households with relatively small value of debt (67.3% with debt below their quarterly incomes). Similarly to households in latent class 4 they always acquire credits in banks (100%) and extremely rarely elsewhere. Debt is devoted almost solely to purchases of durables (100%).

Class 6 – Households with low value of debt (69.6% with debt below their quarterly incomes) acquired in the banking sector (100%) and extremely rarely elsewhere – similarly to households from the latent classes 4 and 5. Their debt is devoted to current consumption (61.3%) and, also current, fixed charges (30.5%). In this group there is a significant share of households taking credit for medical treatment (21.7%). They are also sometimes financing renovation of a flat (14.3%) and repayment of previous debts (11.6%). Due to the latter feature and mainly current consumption being the objective of taking credit in this group, these households can be perceived as being in a pre-overindebted state.

Class 7 – Households with low value of debt but always acquiring it in other financial institution (100%) and only sometimes in the banking sector (18.0%). They devote their loans to renovation of a flat (44.1%) and purchase of durables (38.1%). They also use credit/loan to finance other objectives including: current consumption (19.3%), fixed charges (9.1%), medical treatment (8.3%), education & training (8.1%) and vacations (7.9%).

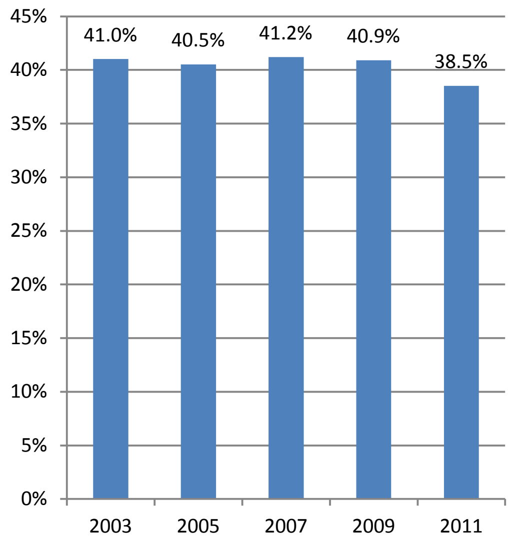
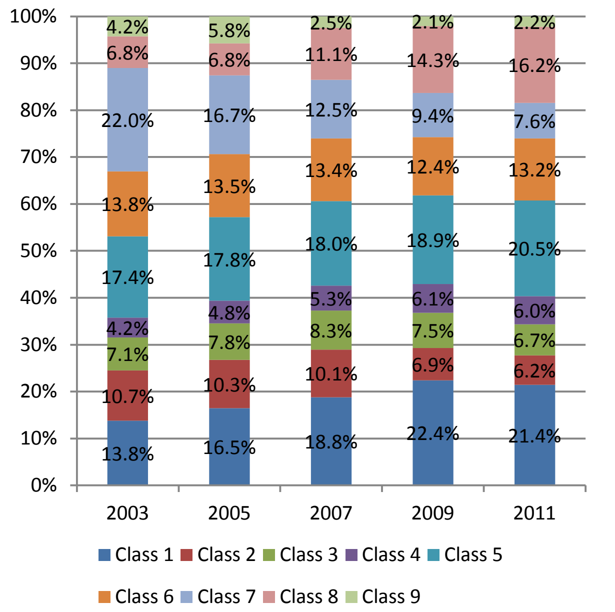
Class 8 – Extremely highly indebted households (65.5% possess debt exceeding their yearly incomes). Their source of credit are banks (100%) and rarely some other institutions. The main objective (100%) is to finance purchase of house or flat. Rarely they finance also renovation of house or flat (12.6%) or a purchase of durables (12.0%).

Class 9 – The group of households that acquire loans from friends and family (100%) sometimes supporting it by a loan from bank (16.2%) or other institution (10.0%). The value of debt is the lowest among all the groups (71.9% with debt below their quarterly incomes). Similarly to households in class 6, they finance their current consumption (57.8%) and/or fixed charges (38.6%). In this group there is also an above average exposure to credit for medical treatment (17.9%) or previous debt repayment (17.8%). The most popular credit objectives (renovation of a flat and purchase of durables) are less likely to occur in this group (14.5% and 15.5% respectively). Similarly to the households in latent class 6, these can also be considered as pre-overindebted.

The segmentation of the Polish credit market from the perspective of households' behavior provides an insight into the key groups of households present on the market. With latent-class based segmentation one can additionally trace an evolution of the composition of the market in the past decade (Figure 2).

Figure 2

Households' activity on the credit market in Poland between 2003 and 2011

Percentage of households active on the credit market	Evolution of latent structure of the credit market in Poland
	

Source: Own calculations.

In Poland the share of households participating in the credit market had dropped between 2009 and 2011 – after the period of stability between 2003 and 2009. However, more fundamental changes were visible with respect to the evolution of the composition of the market. In 2003 class 7 was the most represented one. It indicates that a very important role played by other financial institutions at that time had diminished in the following years. The declining role of non-banking forms of borrowing was confirmed by gradual vanishing of the group of households that borrow from private persons (class 9). At the same time, the more goal-oriented approach to credit taking adopted by Polish households resulted in a decline in the share of households classified as overindebted (class 2).

An inverse situation was observed with respect to class 8, comprising households indebted for purchase of an apartment/house. Share of these households increased from merely 6.8% to 16.2% in the period of analysis. A significant upswing was also reported for class 1 (households with credit for renovation of their apartment), which in 2011 accounted for 21.4% credit market share and eight years earlier constituted only 13.8%.

In the multi-group latent class approach without covariates the total change in the market structure is attributed to the time evolution of the market, which however does not allow to account for the socio-economic factors influencing the participation in credit market. These factors usually comprise incomes and life-cycle stage of the household. In order to evaluate the influence of both transition of the credit market and socio-economic characteristics, the final model with final set of covariates is presented in Table 7.

Table 7

Parameter estimates for latent class model with covariates

		c.1	c.2	c.3	c.4	c.5	c.6	c.7	c.8	c.9	c.10
Time evolution	2003	-.242	.438	.414	-.223	.000[f]	.000[f]	1.221	-.303	.512	ref.
	2005	-.121	.438	.414	-.112	.000[f]	.000[f]	.916	-.303	.897	ref.
	2007	.000[f]	.438	.414	.000[f]	.000[f]	.000[f]	.611	.000[f]	.000[f]	ref.
	2009	.121	.146	.207	.112	.000[f]	.000[f]	.305	.000[f]	.000[f]	ref.
	2011	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
No. of people in household	1	-.900	-1.321	-1.507	-.405	-.902	.000[f]	-.425	-1.095	.000[f]	ref.
	2	-.368	-.363	-.564	.000[f]	-.396	.000[f]	-.227	-.530	.000[f]	ref.
	3	.000[f]	.000[f]	-.310	.000[f]	-.227	.000[f]	.000[f]	.000[f]	.000[f]	ref.
	4	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	5 or more	.198	.000[f]	.499	.000[f]	.000[f]	.338	.000[f]	.000[f]	.000[f]	ref.
real income per equivalent unit	up to 500 PLN	-1.130	.564	-.463	.000[f]	-.760	.277	-.201	-1.410	2.119	ref.
	above 500 PLN up to 1000 PLN	-.221	.447	-.262	.000[f]	-.184	.277	-.201	-.535	.891	ref.
	above 1000 PLN up to 1500 PLN	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	above 1500 PLN up to 2000 PLN	.000[f]	-.450	.000[f]	.000[f]	.000[f]	-.402	.000[f]	.385	.000[f]	ref.
	above 2000 PLN up to 3000 PLN	.000[f]	-.559	.401	.000[f]	.000[f]	-.725	-.201	.937	.000[f]	ref.
	above 3000 PLN	-.374	-.626	.849	.000[f]	.000[f]	-1.103	-.876	1.727	.000[f]	ref.
labour market status	Employed	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	Unemployed	-.502	.000[f]	-1.746	-.873	.000[f]	.000[f]	-.966	-1.085	.000[f]	ref.
	not active	.000[f]	.000[f]	-1.929	.000[f]	.000[f]	.000[f]	-.812	-.353	.000[f]	ref.
age of the household's head	up to 24 years	.000[f]	.000[f]	.000[f]	-1.614	.000[f]	.000[f]	-1.081	.000[f]	1.129	ref.
	25 – 34 years	.255	.000[f]	.000[f]	.000[f]	.355	.000[f]	-.396	1.593	.376	ref.
	35 – 44 years	.309	.000[f]	.000[f]	.000[f]	.310	.000[f]	.000[f]	1.321	.000[f]	ref.
	45 – 54 years	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	55 – 64 years	.000[f]	-.297	.000[f]	.000[f]	.000[f]	.000[f]	-.333	.000[f]	-.376	ref.
	65 and more years	-.666	-1.527	-.618	-.788	-.484	-.526	-.770	-.932	-1.129	ref.
Place	cities with 100.000 inhabitants or more	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
	cities with 20.000 – 100.000 inhabitants	.000[f]	-.441	.000[f]	.000[f]	.000[f]	.000[f]	.000[f]	.000[f]	.000[f]	ref.
	towns up to 20.000 inhabitants	.208	-.787	.524	.000[f]	-.151	.000[f]	-.200	-.497	.000[f]	ref.
	rural areas	.231	-.984	1.069	.000[f]	-.268	-.615	-.499	-.709	-.426	ref.

Source: Own calculations in MPlus based on data from The Social Diagnosis. f –fixed parameters.

The results presented in Table 7 served as the prerequisite for calculating an expected evolution of the share of each of the credit market segment after accounting for the influence of the socio-economic characteristics of households (state what in Appendix 3 is). The most visible change was observed with respect to the class 7, which consists of households indebted at other financial institutions. Households with the same socio-economic characteristics tended to move to banks (always perceived as more transparent and reliable) when the product offer was widened (richer/enriched). From the theoretical evolution of class 7 (see Appendix 3) it can be noticed that over 99% of change in the relative importance of the group on the credit market was due to the transition process of the credit market and less than 1% was due to the evolution of the socio-economic characteristics of households present in that group.

Till 2007 extremely large momentum of the market for mortgages (Figure 1) was mostly driven by the transition process of the Polish market associated with better accessibility of credit for housing purposes. From 2007, although there was an over twofold increase in the value of mortgages, it was mostly driven by growth of incomes and new waves of young adults (with their families) entering the market. In the case of this group (class 8), the relation between incomes and class membership is the strongest one. In terms of the odds for being in the latent class 8, households with incomes above 3000 PLN are 23 times more likely to be in that class than those with incomes below 500 PLN. In the case of households indebted for purchase of an apartment, also the influence of age is the strongest in all groups. For the whole period 2003 – 2011 almost 65% of the change in the share of households in the class 8 can be explained by the change in the socio-economic characteristics of households and only 35% resulted from the transition of the credit market in Poland.

In the case of class 5 and class 6 the transition component was not significant and fixed to zero in the estimation process. It implies that it was a change in relative importance of class 10 and change in the households' characteristics that were influencing acquisition of credit for durables and credit for current expenditures.[7] In the case of credit for durables, mainly households with low incomes suffered from reduced access to the market. It was also visible that households with head in the age 25 – 44 years turned to this source of credit the most often, while those with head aged over 65 used this kind of credit rarely. Additionally, households from rural areas and small towns used such a credit rarely, which was probably a consequence of reduced access to it there. In the case of households taking credit mainly for current expenditures (class 6), the level of incomes acted strongly against acquisition of such products, while the number of people in the household exceeding 5 was a stimulus for acquiring loan for current expenditures. Like in all other classes, also in class 6, households with head aged 65 or more used credit for current consumption much more rarely. Nevertheless, in the case of credit for durables and credit for current consumption the influence of the age (being 65+) was the lowest among groups. An interesting observation is that the credit for current consumption is much less often used in rural areas, which is probably caused by lower accessibility of banks there and also higher self-sustainability of households.

With respect to class 1 and class 4, the transition of the Polish credit market, associated with higher accessibility of credit for the purposes of durable goods purchases and financing of other purposes, was stopped in 2009. Afterwards, the conditions for granting a credit were significantly strengthened due to both the financial crisis and the regulations of the Polish Financial Supervisory Committee. Households started to reduce their demand for house/flat renovation but also tended to less likely finance their additional objectives accordingly. Renovation of a flat/house was the most often objective among households with middle incomes. Demand for this type of credit significantly dropped for households with average per capita income exceeding 3000 PLN. Nevertheless, in both of these groups the major role in the change of overall share of households was attributed to the transition process

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[7] It should be remembered that the transition component is set relatively to class 10 (reference class), which makes the expected share of households in class 5 and 6 dependent on the relative change in the share of respondents in class 10.

(69% and 88% respectively) and not to the change in the socio-economic characteristics of households.

One of the most specific segments of households on the credit market is the group oriented towards financing their entrepreneurial activity with credit (class 3). Evolution of accessibility of such credit was negative and for households with given characteristics better accessibility was observed in 2003 – 2007, while later it has gradually declined. On the other hand, membership in this group is very strongly related to incomes and (obviously) to the labour market status. Age of the household's head becomes an important factor influencing negatively this type of credit demand only for households with head above the age of 64. Contrary to other classes, only in this group of households rural location is the stimulus for credit demand. The odds for being a member of this group are almost three times higher in rural areas than in major cities. It is also important to notice (see Appendix 3) that in this group the transition of credit market acted in the direction of reduction of credit accessibility, which probably corresponds to harsher conditions for credit applicants. However, changes in the characteristics of households strongly pushed it upwards.

One of the most interesting groups comprises households that borrow a lot, finance a lot of goals and very often do not manage to cope with their obligations – the over-indebted ones (class 2). In the past years this group has been gradually vanishing, which was partially a consequence of the transition of Polish credit market – banks were less willing to provide credit products to the group of over-indebted (around 65% of the change is due to the transition process). On the other hand, gradually increasing income level, which strongly affected membership in the latent classes of over-indebted, stimulated even more rapid decrease in the share of such households in Poland. The problem of over-indebtedness is less visible in a group of households with head in an older age but also for households with only one or two members. The problem of over-indebtedness is to a large extent a problem of urban areas. In small towns the odds for being a member of the group are two times lower than in the group of inhabitants of large cities and in rural areas the odds for membership in the class are almost three times lower.

5. Conclusions

This paper provides an analysis of Polish credit market from the perspective of credit product acquisition by households. In the scope of analysis, at least nine distinct approaches to credit product acquisition in Poland were identified. It was also shown that models in which the understanding of groups (in terms of the indicators) remains constant in all periods of analysis, are superior to the models in which the rules of segmentation of the market are allowed to change over time.

The most fundamental development of the paper is the delimitation between the changes observed on the Polish credit market for households that were the consequence of the transition process of the credit market and those that can be attributed to changes in the socio-economic characteristics of Polish households. It was observed that around 85% of all changes that occurred in the structure of Polish credit market for households between 2003 and 2011 were due to the factors associated with transition of the Polish credit market. Households started to use differently the products accessible on the credit market, which was also to a large extent driven by changes in the product offer accessible to them. The most striking example is the market for loans from other financial institutions. A very significant decline in the share of households with such a loan can be in 99% explained by the transition process of the credit market in Poland. On the other hand in the group of households taking mortgages the transition process is able to explain merely 35% of the huge gain in importance of the group. The transition process of the Polish credit market was also able to only partially explain the changes in the share of over-indebted. With respect to the share of households with credit for development of their own businesses, the transition of the market acted in the opposite direction than attitudes associated with households characteristics.

Appendix 1:
Latent class model BIC's for the periods of analysis

No. of latent classes	BIC for unrestricted model				
	2003	2005	2007	2009	2011
2 classes	29349.776	28316.920	39128.532	81579.451	76549.666
3 classes	28760.524	27563.485	38152.615	79706.263	74588.002
4 classes	28191.615	27122.462	37599.420	78290.421	73199.089
5 classes	28120.525	27021.176	37111.750	77354.982	72343.302
6 classes	28109.434	26926.512	37010.231	76785.171	71686.767
7 classes	28107.718	26918.971	36938.402	76263.461	71205.349
8 classes	28132.096	26939.353	36855.417	75914.120	70948.634
9 classes	---	---	36872.248	75557.279	70692.260
10 classes	---	---	---	75331.111	70471.353
11 classes	---	---	---	75366.834	70474.126

Source: Own calculations in MPlus based on data from The Social Diagnosis.

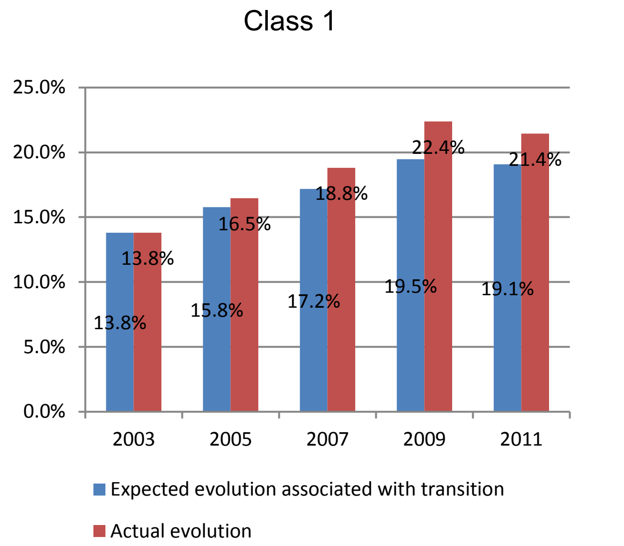
Różne czcionki w tabelce.

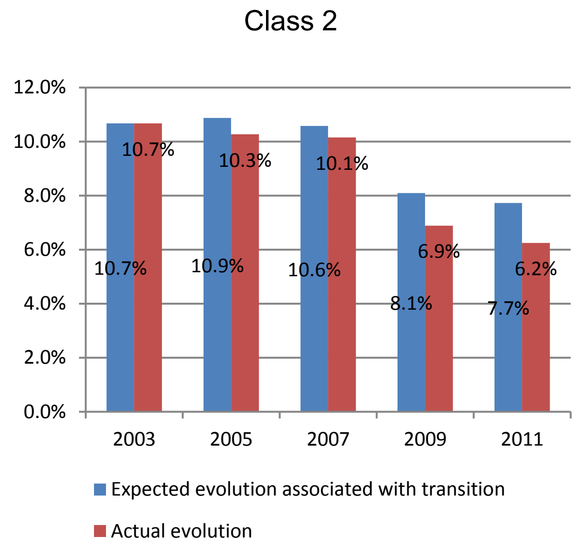
Appendix 2:
Latent classes – item answer probabilities for a model without covariates

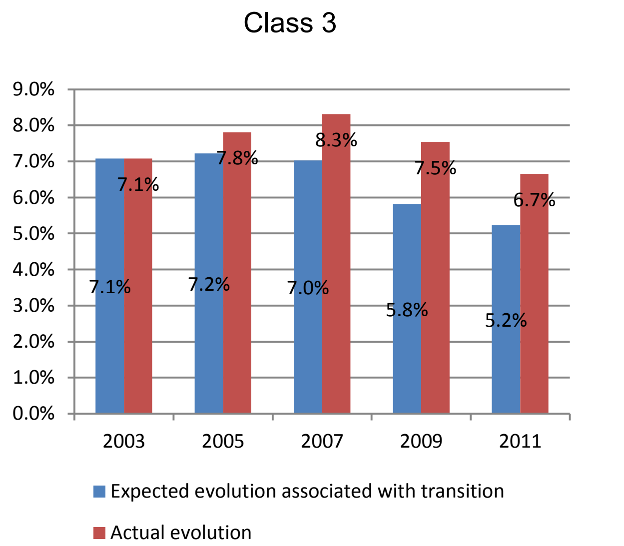
		Results in probability scale									
		c.1	c.2	c.3	c.4	c.5	c.6	c.7	c.8	c.9	c.10
	credit ownership	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.000
credit value (in the value of monthly incomes)	Zero	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000
	< 1	0.198	0.059	0.101	0.240	0.376	0.342	0.309	0.050	0.428	0.000
	1 – 3	0.266	0.183	0.184	0.290	0.294	0.359	0.364	0.069	0.308	0.000
	3 – 6	0.230	0.237	0.225	0.202	0.162	0.166	0.191	0.087	0.142	0.000
	6 – 12	0.174	0.242	0.253	0.143	0.101	0.080	0.077	0.147	0.070	0.000
	above 12	0.132	0.279	0.237	0.125	0.068	0.053	0.059	0.647	0.052	0.000
credit source	Banks	1.000	0.970	0.996	1.000	1.000	1.000	0.146	1.000	0.076	0.000
	other financial institution	0.056	0.265	0.025	0.042	0.018	0.010	1.000	0.042	0.102	0.000
	family/friends	0.015	0.257	0.043	0.012	0.006	0.019	0.015	0.023	1.000	0.000
credit target	current consumption expenditures (e.g. food, clothing)	0.056	0.572	0.016	0.041	0.046	0.625	0.193	0.019	0.555	0.000
	fixed charges (e.g. house maintenance)	0.008	0.477	0.009	0.012	0.008	0.306	0.092	0.007	0.370	0.000
	purchase of durable goods	0.283	0.431	0.248	0.146	1.000	0.039	0.374	0.116	0.151	0.000
	purchase of a house/flat	0.016	0.088	0.049	0.003	0.007	0.012	0.093	1.000	0.049	0.000
	renovation of a house/flat	1.000	0.458	0.141	0.000	0.000	0.107	0.438	0.131	0.140	0.000
	medical treatment	0.043	0.351	0.014	0.031	0.022	0.207	0.082	0.004	0.169	0.000
	purchase/rent of working equipment	0.004	0.047	0.329	0.004	0.006	0.007	0.005	0.002	0.003	0.000
	Vacations	0.022	0.103	0.012	0.007	0.016	0.026	0.078	0.010	0.006	0.000
	repayment of previous debts	0.036	0.540	0.050	0.032	0.015	0.119	0.061	0.010	0.158	0.000
	development of own business	0.000	0.070	0.772	0.002	0.000	0.003	0.013	0.009	0.019	0.000
	education/training	0.026	0.228	0.033	0.027	0.012	0.108	0.080	0.010	0.029	0.000
	other purposes	0.061	0.260	0.062	1.000	0.000	0.035	0.137	0.022	0.098	0.000
No. of credit purposes		1.555	3.625	1.735	1.305	1.132	1.594	1.646	1.340	1.747	0.000

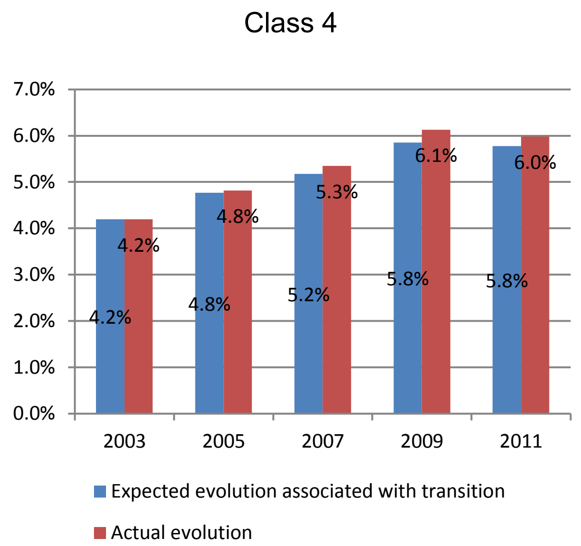
Source: Own calculations in MPlus based on data from The Social Diagnosis.

Appendix 3:
Decomposition of changes associated with transition of the Polish credit market for households

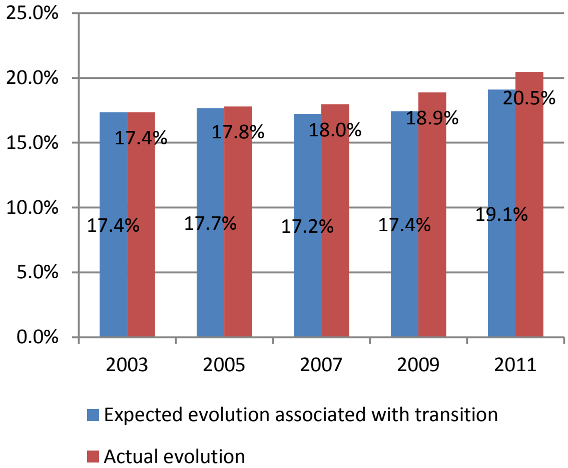




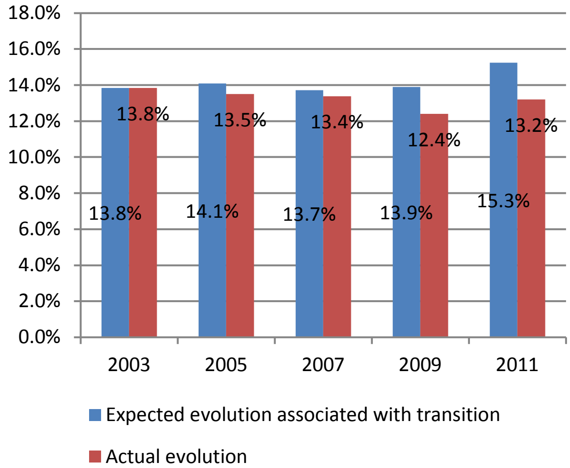




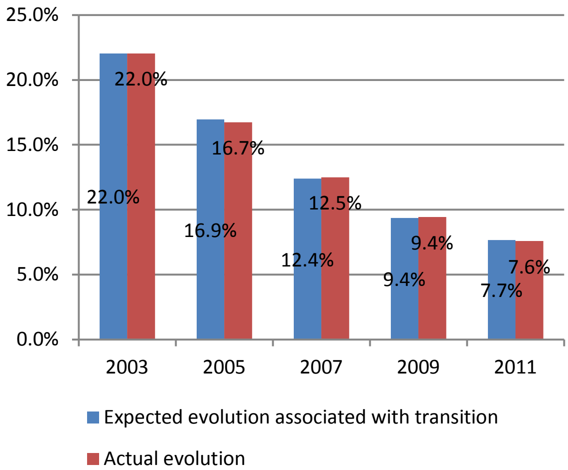
Class 5



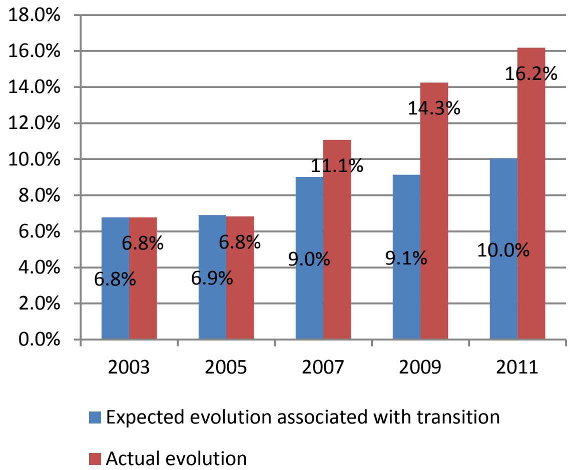
Class 6



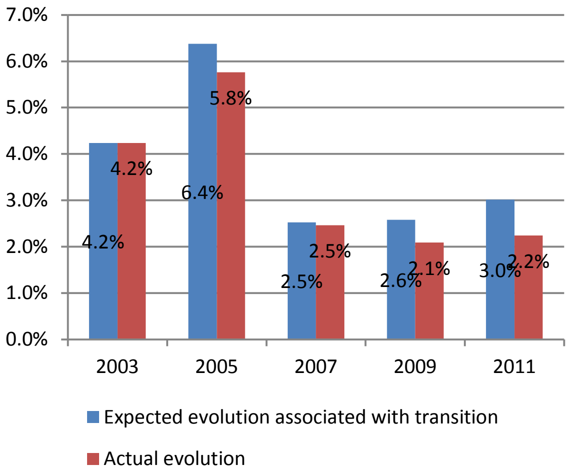
Class 7



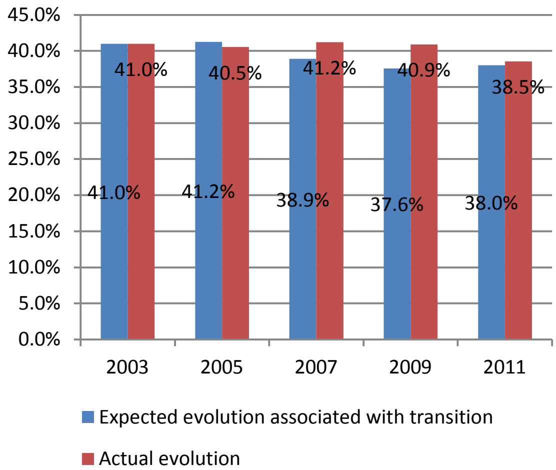
Class 8



Class 9



Class 10 (inverse of class 10)



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The wealth and debt of Danish families

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1. Introduction and summary

Compared with other countries, Danish households have a very high debt-to-income ratio. This has attracted considerable attention from the International Monetary Fund, IMF, and the credit rating agencies, among others. The European Commission (2012) recently pointed out the households' high gross debt as a danger signal, while also acknowledging that it partly reflects very substantial pension savings and an extensive social safety net.

At the aggregate level, these issues have recently been discussed in the Monetary Review by Isaksen et al. (2011) and Kramp et al. (2012). Overall, the high gross debt is offset by large assets, e.g. via the widespread use of labour-market pensions, but whether this also holds true at the level of the individual family cannot be determined using aggregate data for the whole economy. If this is the case, the development is less of a concern than if debt and assets are held by different persons.

In this article, we look into – at family level – the composition of gross debt for families in different income and age groups and the degree to which the debt is offset by various types of assets. Relative to other studies, e.g. Danish Economic Councils (2008) and the Ministry of Economic and Business Affairs (2010), we focus more on the distribution of the debt.

The high gross debt of Danish families, viewed in an international perspective, is concentrated in the families with the highest incomes. In 2010, the 20 per cent of the families with the highest incomes after tax thus accounted for 53 per cent of total family gross debt. The half with the lowest incomes accounted for 14 per cent in total of the gross debt.

Among the families with the highest incomes, the ratio of gross debt to income after tax, i.e. the gross debt ratio, is highest for families whose oldest member is in his or her thirties, and the gross debt ratio generally decreases as the age increases.

Within the various age groups, the gross debt ratio is generally higher for high-income families than for families with lower incomes. This indicates that the debt is often raised in order to finance purchases of luxury goods, including a larger home.

The overall impression is that families with debt also have the income required to service the debt.

The percentage change in gross debt from 2002 to 2010 is most pronounced for the oldest age groups in the study. The families in the lowest income groups have also shown relatively high percentage increases. Measured in kroner, however, high-income families and families in the middle of the age distribution interval have clearly accounted for the strongest growth.

At end-2010, the assets of the families in this analysis totalled almost kr. 3,400 billion, excluding pension wealth. This value is around twice the value of the gross debt, and real property in Denmark worth around kr. 2,600 billion is the dominant asset type. Besides

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[1] All authors are employed at the central bank of Denmark, Danmarks Nationalbank. The article has earlier been published in Monetary review 2012 2nd Quarter – Part 2, Danmarks Nationalbank (ISSN 0011-6149). Monetary Review is available on Danmarks Nationalbank's website: www.nationalbanken.dk under publications.

pension wealth, this analysis also excludes a number of other assets due to insufficient data. Such assets are, *inter alia*, cash holdings and the value of the family's durable consumer goods, e.g. cars, boats, household effects, etc. The value of private cooperative housing is also excluded.

Like the distribution of gross debt, the distribution of assets is very uneven. Large assets are predominantly held by families with substantial gross debt. However, the group of families with no gross debt at all also includes a number of families with considerable assets.

Although the value of the assets is almost twice as high as the gross debt, more than one out of three families still had net debt in 2010.

Net debt is not prevalent in the oldest age groups. But more than half of the families in the 25–34 age group have net debt, irrespective of the size of their income, which should be attributed to education-related debt, among other factors.

Most families with current or previous affiliation with the labour market will have assets in the form of pension savings. The savings-based pension system is still under expansion, entailing considerably stronger growth in pension wealth than in incomes over the last decades.

A family's pension wealth is generally less liquid than its other assets, but knowledge of active pension saving should be expected to be incorporated in the family's other decisions. Families of retirement age will thus increasingly be able to service their debt without compromising on lifestyle. Consequently, for persons reaching retirement age gross debt of a certain size will be less of a problem than previously.

As opposed to most other assets, pension wealth is taxed when released. After estimated taxation, families' pension wealth, excluding the value of public service pensions, amounted to approximately kr. 1,500 billion at end-2010. For one third of the families, pension wealth after tax exceeded kr. 1 million.

Taking pension wealth into account, less than one out of four families has net debt. Net wealth increases strongly with age. Half of the families in the 60–64 age group have net wealth of more than five times their annual income after tax, and for one out of four of the families in this age group net wealth is more than eight times the family's annual income.

The large gross debt of Danish families indicates that they are frequent users of the financial system, for many reasons, since gross debt is generally offset by even more substantial assets. The balance between gross debt and assets can be explained especially in terms of family income, age, house prices and the structure of the pension system.

The families predominantly use the financial system, they do not abuse it. However, some families are so heavily indebted that they are assessed to find it difficult to manage their debt using their own income. The debt problems of families with net debt have grown in the period under review, but the drop in the general level of interest rates and the increased use of adjustable-rate loans have reduced the interest burden. Given the current economic outlook, the extent of the indebted families cannot, however, be assumed to pose a threat to the household sector or the financial sector.

As regards the soundness of the financial sector, the results support the conclusion that the most pronounced threats to financial stability do not come from families' debt-to-income ratios. So far, the financial sector's losses on household exposures have been modest despite rising gross debt and a number of years of rising unemployment. But, as expected, it is also clear that families who experience prolonged periods of unemployment are more vulnerable than other families. Should unemployment become more widespread than the current level, losses on private customers should therefore be expected to increase.

Finally, it should be pointed out that we are far from having performed all possible analyses of these register data. Thus, we have not performed econometric analyses following the individual families over time. Further analyses will no doubt provide new knowledge, including modification of some conclusions and strengthening of others.

2. Data

The analyses are primarily based on anonymised register data from Statistics Denmark for the years 2002–10, although not all registers are updated to end-2010. The information on families' pension wealth is based on results from work performed for the Welfare Commission relating to 2003. The data is formed with the family as the economic unit. Box 1 contains a statistical definition of a family.

A review of the data revealed that quite a few families had zero or negative income after tax. Since the ratio of debt to income after tax is used in several of the analyses below, only families whose annual income after tax exceeds kr. 25,000 are included. The families thus excluded are dominated by the very young. Families with self-employed persons are also excluded, and all adults in the family must be fully liable to income tax in Denmark in order for the family to be included in the analysis. The significance of these exclusions appears from Table 1.

The analysis for 2010 thus concerns 91 per cent of the families accounting for 89 per cent of total income after tax, 74 per cent of gross debt and 77 per cent of registered assets.

All income data and most wealth data are based on the annual tax reports for the individual family members. This excludes unregistered incomes, private debts, cash holdings, the value of the family's durable consumer goods (such as cars, boats, household effects and art) and the value of private cooperative housing, whereas any debt raised in order to acquire these assets is included.

Real property in Denmark (excluding cooperative housing) is included in wealth at approximated market prices. For each county/region, the relationship between cash sales prices for properties sold in the market and the property valuation is used for adjustment of the property valuation from the annual tax report.

Definition of a family Box 1

The analysis unit used in this article is the *family*. The decomposition of the population into families is made on the basis of Statistics Denmark's definition of "E-families". According to this definition, a family consists of one or two adults and any children living at home. Two adults are counted as members of the same family if they live together and meet at least one of the criteria below:

- They are spouses or registered partners
- They have at least one joint child registered in the Civil Register (CPR)
- They are of opposite sex with an age difference of less than 15 years, are not close relatives and live in a household with no other adults.

Adults living at the same address who do not meet at least one of the above criteria are counted as members of different families.

Children living at home are counted as members of their parents' family if they are under the age of 25, live at the same address as at least one of the parents, have never been married or in registered partnership and have no children registered in CPR.

Given these criteria, a family may consist of two generations only. If more than two generations are living at the same address, the family consists of the two youngest generations together.

Aggregated data for selected groups of families, 2010 Table 1

	Number of families	Income after tax, kr. billion	Liabilities, kr. billion	Share of liabilities for all families, per cent	Assets, kr. billion	Share of assets for all families, per cent
All families	2,836,759	882.4	2,371.2	100.0	4,387.9	100.0
Families with self-employed	166,713	88.0	582.1	24.6	974.2	22.2
Families without full tax liability	54,288	6.3	10.5	0.4	16.5	0.4
Families with income after tax of less than kr. 25,000	74,225	–2.9	56.5	2.4	74.6	1.7
Families with income after tax of exactly zero	36,152	0.0	1.3	0.1	0.4	0.0
Families with negative income after tax..........	8,900	–3.2	49.3	2.1	65.4	1.5
Families without self-employed, with full tax liability and income after tax of at least kr. 25,000	2,570,518	789.2	1,762.5	74.3	3,371.6	76.8

Note: Families with self-employed are defined as families in which at least one of the adult members can be classified as self-employed or assisting spouse. The classification is based on information on the person's most important source of income. Families without full tax liability are defined as families in which at least one of the adult members has less than full tax liability in Denmark. Pension wealth is not included.

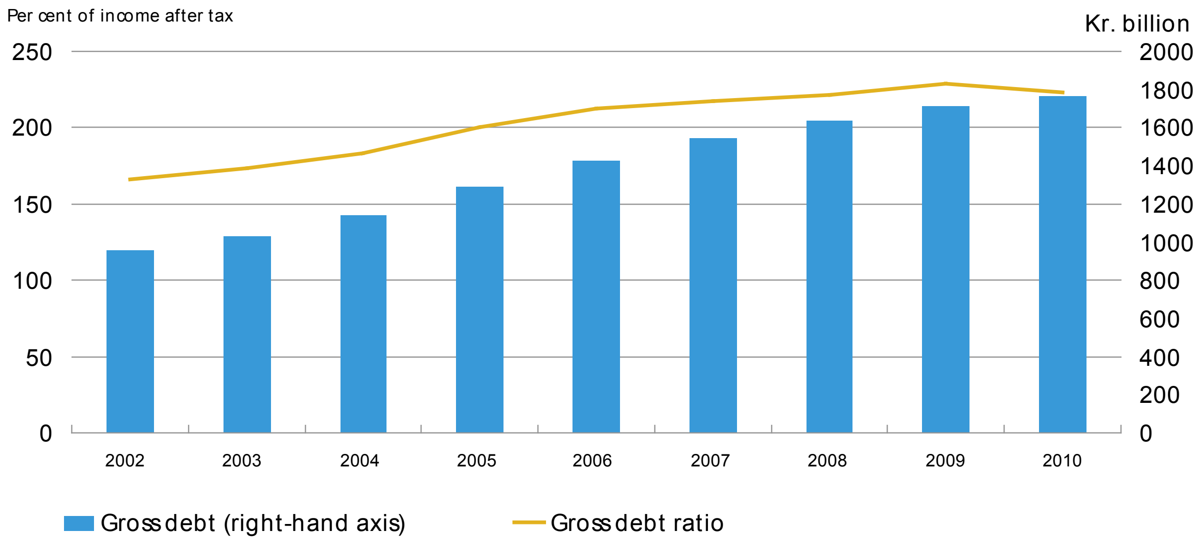
Source: Own calculations on the basis of register data from Statistics Denmark.

Compared with the Danish data for household income and debt analysed in Isaksen et al. in the Monetary Review, 4th Quarter 2011, there are some differences, particularly reflecting different data sources. Isaksen et al. use national accounts data including income, assets and debt for non-profit organisations serving households. Naturally, these organisations are not considered in this study, which is structured around the family. Another important difference is that debt in the form of arrears to the public sector is included in the financial accounts of the national accounts, but not in the family data set. Moreover, the income concepts applied differ slightly. In this analysis, family income after tax has been calculated excluding rental value and contributions to pension schemes administered by employers. Interest expenditure is not deducted from family income.

3. Family gross debt

Aggregating the gross debts of the more than 2.5 million families included in the analysis shows the well-known picture of strongly rising gross debt in the years 2002–10, cf. Chart 1. Furthermore, since gross debt has shown much stronger growth than annual income after tax, the relationship between the two, i.e. the gross debt ratio, has increased from 1.7 to 2.2. In 2010, however, the rate of growth in income after tax was slightly higher than that of gross debt, resulting in a slight decrease in the aggregate gross debt ratio relative to 2009.

Aggregate gross debt and aggregate gross debt ratio Chart 1



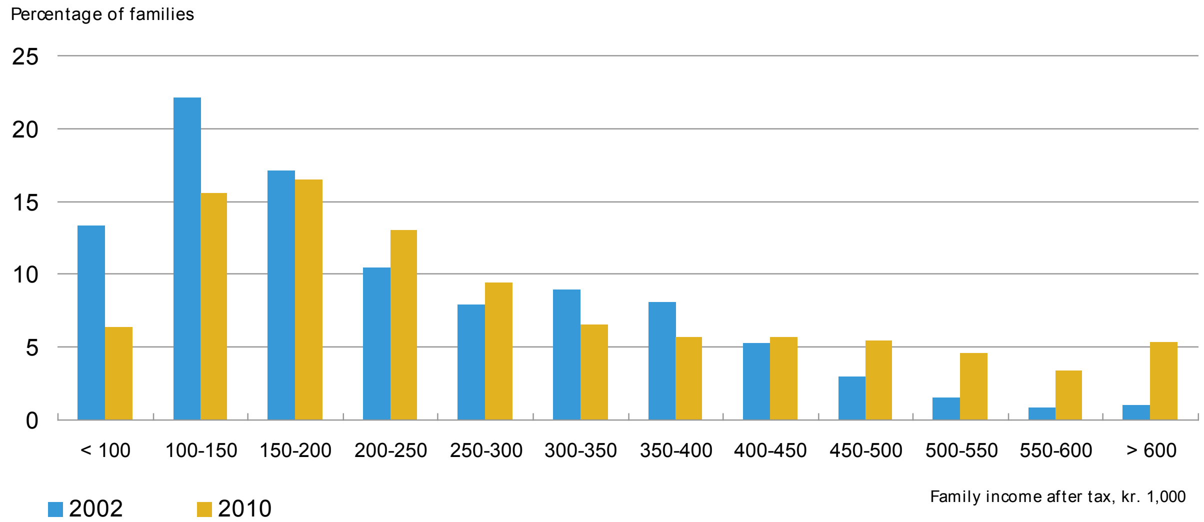
Note: The aggregate gross debt ratio is calculated as aggregate gross debt divided by aggregate income after tax for all families in the population.

Source: Own calculations on the basis of register data from Statistics Denmark.

Chart 2 shows the distribution of family income after tax in 2010. The well-known phenomenon that the income distribution is skewed to the right clearly appears from the Chart. This reflects partly income differences at individual level, partly variations in family size. Moreover, the Chart also reflects the generally higher nominal incomes in 2010 compared with 2002.

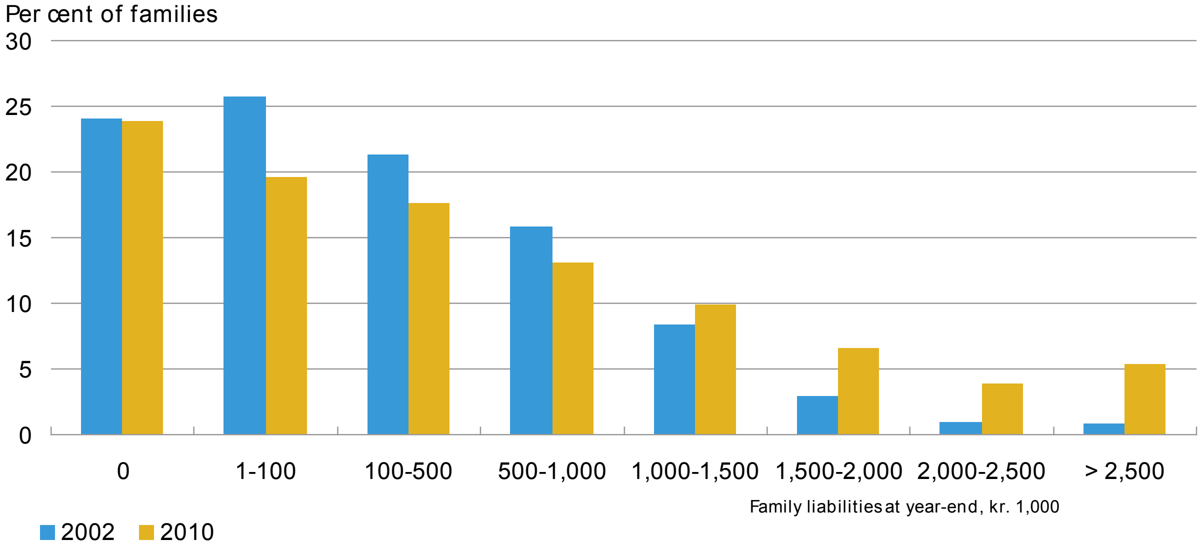
Chart 3 shows the distribution of family gross debt. Almost one fourth of all the families did not have any debt at all in 2010, half of the families had debt of less than kr. 1 million, while the last fourth had gross debt exceeding kr. 1 million. Slightly more than 5 per cent of the families had gross debt exceeding kr. 2.5 million. The share of families with high debt has risen strongly relative to 2002.

Distribution of family income after tax Chart 2



Source: Own calculations on the basis of register data from Statistics Denmark.

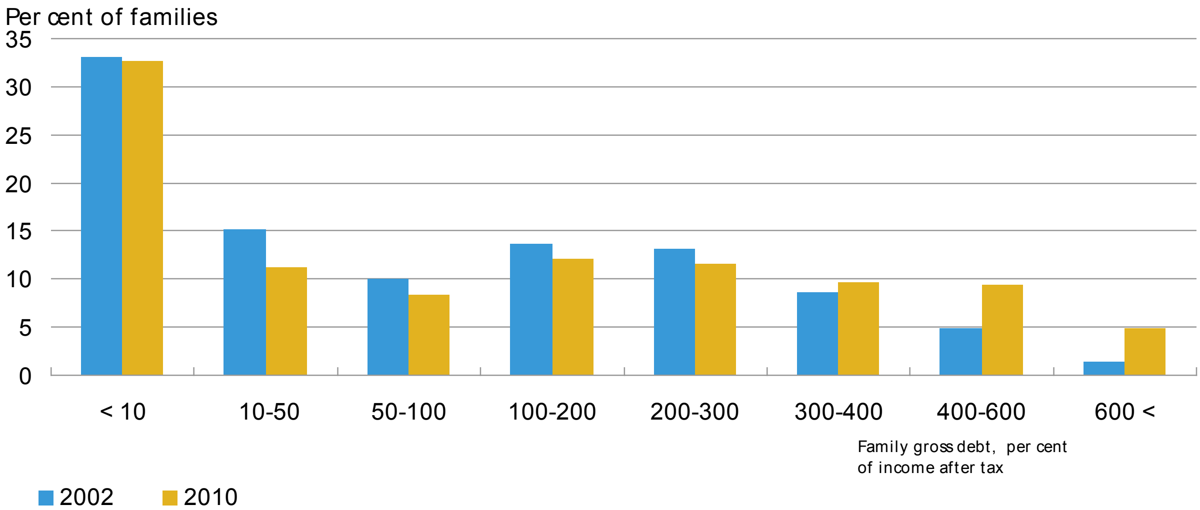
Distribution of family liabilities Chart 3



Source: Own calculations on the basis of register data from Statistics Denmark.

Chart 4 shows the ratio of gross debt to income after tax, i.e. the gross debt ratio. As a result, data for 2002 and 2010 become immediately comparable in view of the automatic adjustment for general income growth in the period. For half of the families, their gross debt in 2010 was smaller than their income after tax. At the opposite end of the scale, nearly 15 per cent of the families had gross debt of at least four times their income after tax. The debt-to-income ratio gives an indication of the debt burden on the individual family. However, it is not possible to state exact thresholds for when debt should be considered to be problematically large. This would depend on the income and income prospects. It would also depend on the capacity of the family's finances to sustain a general increase in interest rates in the future, on the family's lifestyle, the extent of its marketable assets and its possibilities of receiving financial support from e.g. a broader group of relatives. It has not been possible to break down the gross debt at family level by loan type and interest-rate exposure, but such a breakdown is envisaged in a future analysis.

Distribution of family gross debt ratio Chart 4



Note: The gross debt ratio is calculated as the gross debt at year-end as a percentage of total family income after tax.

Source: Own calculations on the basis of register data from Statistics Denmark.

From 2002 to 2010 the share of families with gross debt of more than four times the size of their income after tax doubled, while the share with gross debt below the annual income fell considerably.

Gross debt ratio, income and age

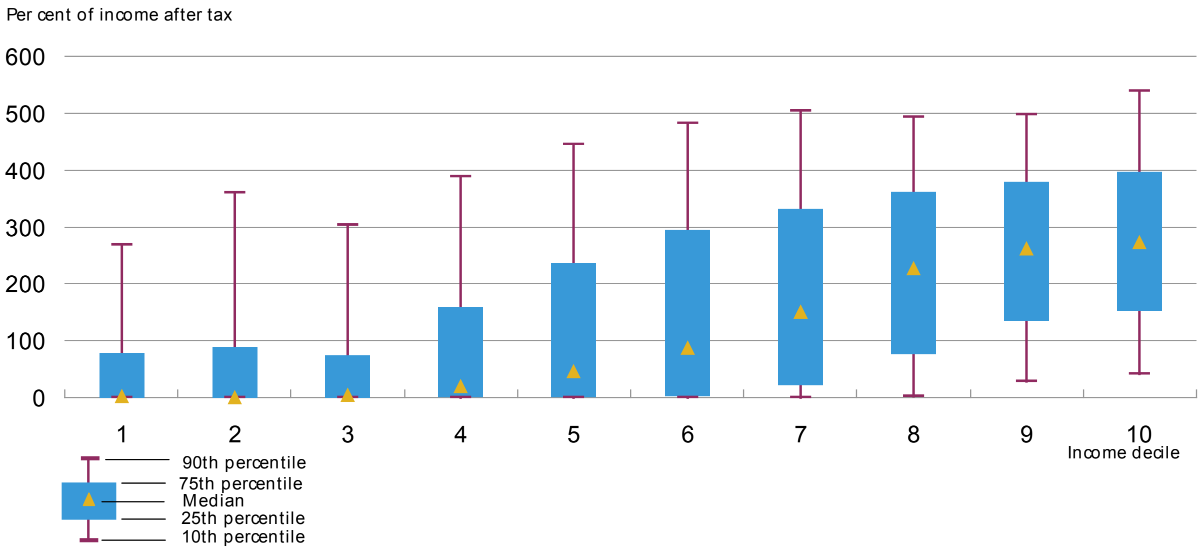
A high gross debt ratio will reflect either a high gross debt in absolute terms or modest income, or possibly both. Theoretically, there is good reason to expect a positive link between income and gross debt. Families who have experienced income growth and expect income growth in the future will be inclined to raise debt in order to acquire a good home, a good means of transport and otherwise support private consumption in line with the new, expected higher income. Financial institutions also have an interest in extending such loans, in so far as they can obtain a sufficient degree of certainty that the loan will be repaid, often via the borrower's pledging of real property or durable consumer goods as collateral. In this situation, the resultant gross debt will contribute to increasing the welfare of the families involved. Naturally, the flip side of the coin is that if the future income expectations are not fulfilled, the family will find it difficult to service the loan as agreed, and it will experience reduced welfare as a result of large and unmanageable debt. At the same time, the lender runs a risk of loss.

It is hardly possible to calculate theoretically well-founded values of the optimum ratio of gross debt to current income. For young families with expected permanent income growth of a certain size, raising considerable debt would be a rational thing to do if they can manage the risks associated with unfulfilled expectations – including the consequences of social events such as unemployment and divorce – and the possible dependence on future developments in interest rates unless they opt for a fixed-interest loan. For families closer to retirement age, income growth will often be of a more temporary nature, entailing less capacity to sustain indebtedness. The age of the family should therefore be expected to have considerable influence on the size of the gross debt.

Chart 5 shows the distribution of family gross debt ratios in various income groups in 2010. Families are divided into 10 groups, or deciles, according to income after tax. For each of the 10 groups of equal size the Chart shows the distribution of the gross debt ratio. The median shows the gross debt ratio for the middle family in each income decile after ranking the families according to gross debt ratio. Similarly, the 10th percentile indicates that 10 per cent of the families have a gross debt ratio below the marking. The 90th percentile indicates that 10 per cent of the families have a gross debt ratio exceeding the marking.

The pattern is very clear: the ratio of gross debt to income after tax increases strongly with income size. In each of the three lowest income deciles, the median family has no gross debt at all. In this decile, the family income after tax is up to kr. 173,000. In the next income deciles, the median for the gross debt-to-income ratio rises from decile to decile, whereby the median family in the top income decile has gross debt of just over 2½ times their annual income after tax. In 2010, the top income decile comprised families with income after tax exceeding kr. 565,000. The pattern of the median is generally reflected in the other percentiles. As from the fourth income decile, the 75th percentile rises as income increases. Thus, 25 per cent of the families in the highest income group have gross debt of more than four times the size of their annual income after tax. Among the families in the lowest income decile, the 10 per cent with the highest debt had gross debt of at least 2.8 times the size of their income after tax in 2010. The corresponding figure in the five highest income deciles was around five.

Distribution of family gross debt ratio across income deciles, 2010 Chart 5



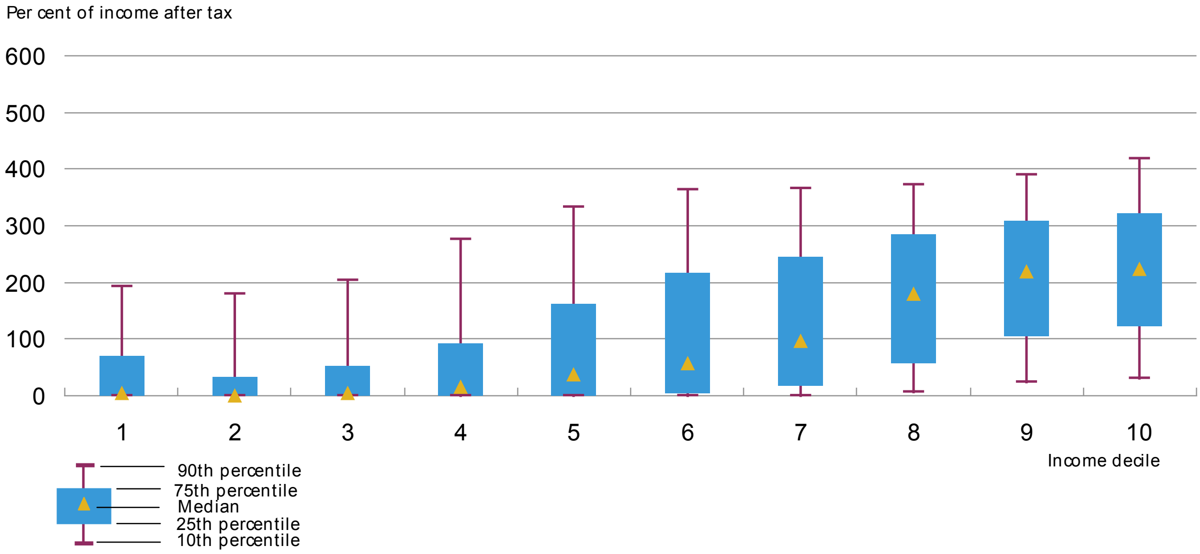
Note: The grouping of families into income deciles is based on income after tax.
Source: Own calculations on the basis of register data from Statistics Denmark.

The same pattern is reflected in 2002, but with lower gross debt ratios, cf. Chart 6. This applies across the distribution.

Despite the increase in gross debt ratios in practically all income deciles from 2002 to 2010, most families have seen a diminishing interest burden, defined as the family's interest expenses relative to income after tax, cf. Chart 7. In the highest income decile, the interest expenses for the median family in 2010 accounted for approximately 10 per cent of income after tax, against approximately 15 per cent in 2002.

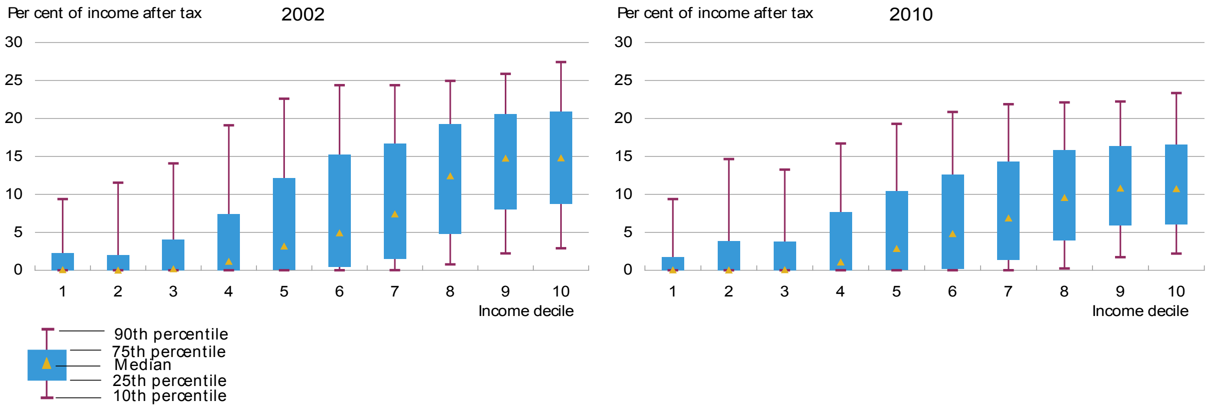
This can be attributed to the generally falling interest rates and the increasing popularity of adjustable-rate loans during the period.

Distribution of family gross debt ratio across income deciles, 2002 Chart 6



Note: The grouping of families into income deciles is based on income after tax.
Source: Own calculations on the basis of register data from Statistics Denmark.

Distribution of family interest burden across income deciles Chart 7



Note: The interest burden is calculated as the family's interest expenses as a percentage of income after tax.
Source: Own calculations on the basis of register data from Statistics Denmark.

The overall picture from Charts 5 and 6 is that the gross debt ratio is high primarily for high-income families. However, the link between income and gross debt ratio is complicated by both quantities being systematically related to the ages of the family members. As mentioned previously, younger families tend to have a higher gross debt ratio than older families, while income is expected to rise with age up to a certain point, after which it declines. In order to obtain a clearer picture of the link between gross debt ratio and income, we have therefore examined their covariation within given age groups. The positive link between gross debt ratio and income after tax is observed within all age groups, cf. Table 2.

In consumption theory, goods for which consumption rises more than proportionally as income increases are called luxury goods. The behaviour of gross debt is similar, which is a sign that debt is often incurred in order to finance purchases of luxury goods or for investment purposes, including buying a home.

Above we examined the covariation between gross debt ratio and income after tax, given the age of the oldest family member. Similarly, we can examine the link between gross debt ratio and age, given the family's income level. Below we will thus examine the covariation of the relationship between gross debt and income in 2010 and the age of the oldest family member for various income groups. It should be noted that the number of families varies in the different age groups in these income quartiles, as Table 3 clearly shows.

Median gross debt ratios by age and income, 2010 Table 2

Gross debt ratio, median, per cent	Income decile									
	1	2	3	4	5	6	7	8	9	10
Oldest family member										
15–24 years	0.0	3.8	9.8	16.8	22.2	28.4	44.9	146.0	187.2	61.5
25–29 years	45.8	33.1	31.9	39.6	53.2	67.1	101.2	262.6	315.7	274.7
30–34 years	65.6	46.1	40.0	46.8	65.7	97.2	157.2	293.2	340.4	355.5
35–39 years	59.5	43.2	32.8	41.5	60.4	89.7	171.2	286.4	324.0	344.8
40–44 years	50.1	39.3	29.3	35.0	56.7	80.1	150.2	256.1	287.3	305.0
45–49 years	50.5	39.3	27.4	34.9	56.8	79.6	142.7	227.8	253.1	265.0
50–54 years	41.8	36.1	25.0	33.3	59.1	96.7	164.9	209.2	229.3	242.8
55–59 years	26.3	31.8	19.4	28.6	58.4	105.3	168.8	189.2	206.7	230.3
60–64 years	17.8	16.1	12.1	19.2	51.4	126.7	165.1	178.8	190.1	214.0
65–69 years	0.5	5.9	3.4	20.5	99.8	154.4	174.6	183.6	189.3	187.5
70+ years	0.0	0.0	0.0	0.0	0.8	33.9	100.8	104.3	98.1	74.6

Note: The Table shows the median of the gross debt ratio for the group of families in the relevant cell. The families have been grouped into income deciles before the grouping into age groups. This means that the figures are comparable both horizontally and vertically, but the figures in certain cells are based on a limited number of families. For example, in 2010 the top income decile included only 61 families whose oldest member was 15–24 years old.
Source: Own calculations on the basis of register data from Statistics Denmark.

Number of families by age and income quartile Table 3

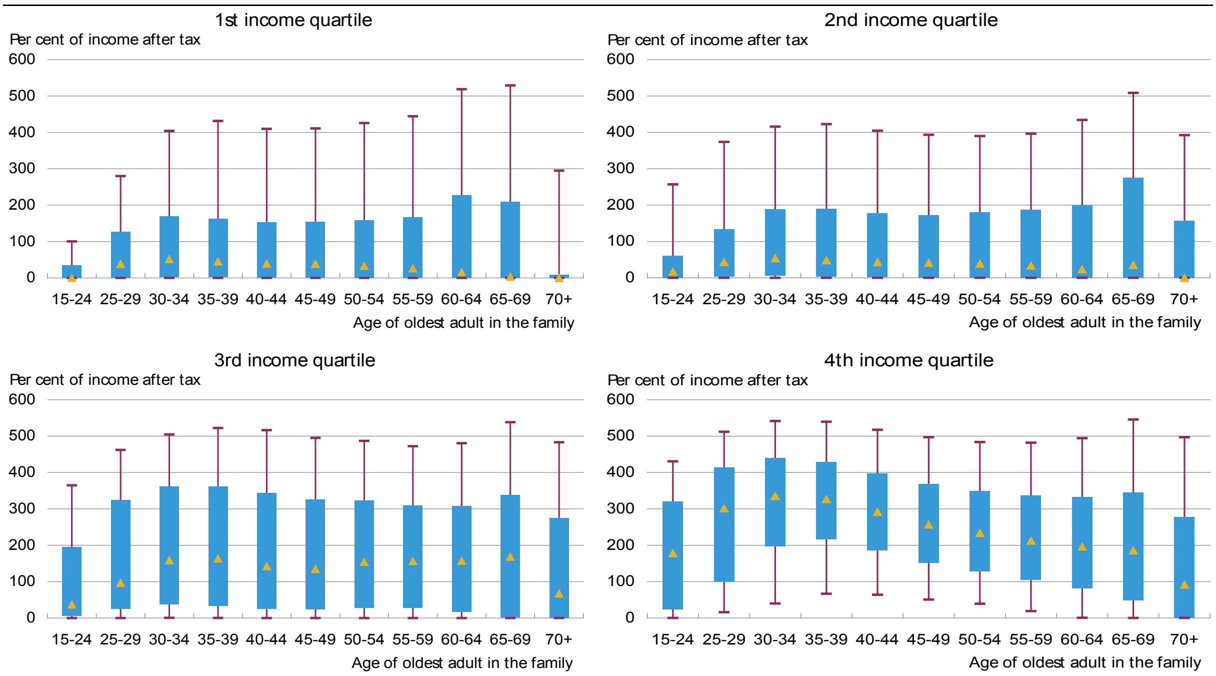
Number of families	Income quartile 1	2	3	4
Oldest family member 15–24 years	150,475	33,537	14,609	812
25–29 years	65,846	57,879	48,343	14,698
30–34 years	26,973	46,562	59,070	54,690
35–39 years	20,380	43,905	61,152	89,424
40–44 years	19,590	42,387	63,818	100,581
45–49 years	20,947	44,426	63,676	107,791
50–54 years	20,635	42,484	55,691	93,167
55–59 years	20,412	43,673	57,078	80,491
60–64 years	32,397	44,640	75,209	60,357
65–69 years	50,068	61,096	68,781	25,271
70+ years	214,911	182,036	75,203	15,347
Total	642,634	642,625	642,630	642,629

Source: Own calculations on the basis of register data from Statistics Denmark.

The lowest income quartile has a relatively high number of families from the youngest and oldest age groups. In contrast, the top income quartile is dominated by families whose oldest member is 35–54 years old.

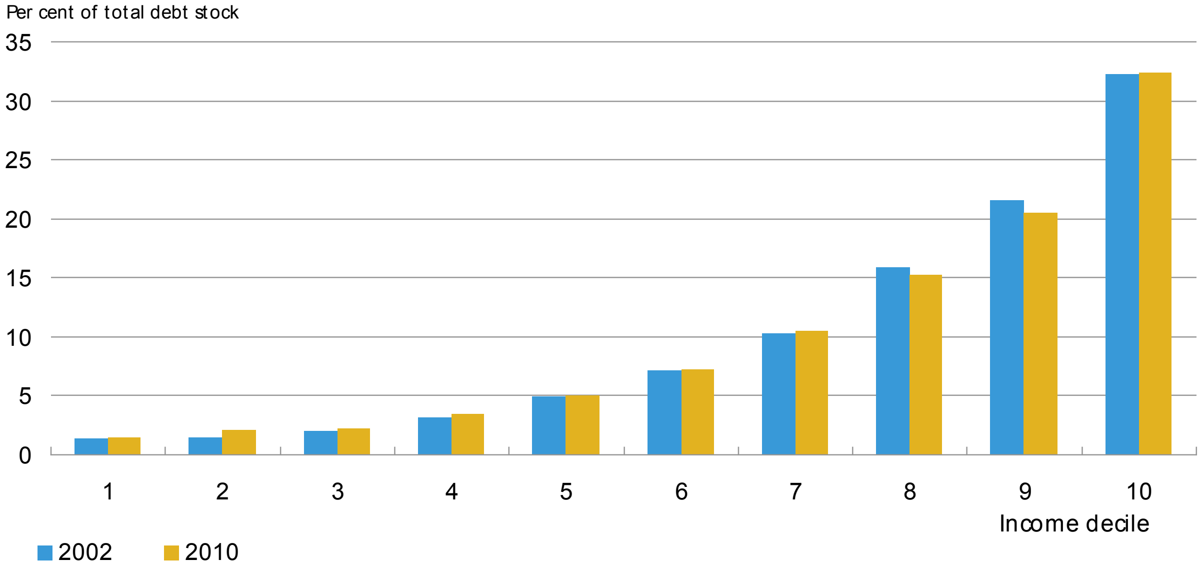
In the lowest income intervals, i.e. the 1st and 2nd income quartiles, there is no clear link between gross debt ratio and age, which is hardly surprising given the very low level of debt for the median families. Measured by the median, families in the age groups between 25 and 44 years have slightly higher debt than the very young and the older families. The relationship outlined above clearly appears in the highest income quartile, i.e. with family income after tax exceeding kr. 417,000 in 2010. In this group gross debt is high particularly for families whose oldest member is 30–39 years, after which gross debt gradually declines with age. However, in almost all income and age groups, around 10 per cent of the families, i.e. the 90th percentile, have gross debt of at least 4–5 times the size of income after tax. The gross debt ratios are particularly high for the 10 per cent of the families with the highest debt in the 65–69 age group. Presumably, this reflects lower income in connection with retirement.

Gross debt ratio by age and income quartile, 2010 Chart 8



Source: Own calculations on the basis of register data from Statistics Denmark.

Gross debt stock by income decile Chart 9



Source: Own calculations on the basis of register data from Statistics Denmark.

A consequence of the gross debt-to-income ratio rising with income is that the highest income groups account for the largest share of the families' total gross debt, cf. Chart 9. Thus, the 30 per cent of the families with the highest incomes accounted for almost 70 per cent of total gross debt in 2010. Among these families, relatively few are immediately facing retirement and consequently a decrease in income in the near future. The half of the families with the lowest incomes together accounted for 14 per cent of total gross debt.

Development in gross debt since 2002

Table 4 throws light on the development in average gross debt since 2002 for various subgroups of the population. It appears that gross debt has increased for all income groups, all age groups, and for homeowners as well as tenants. The percentage increase since 2002 has been most pronounced for low-income families and especially for older families. Measured in kroner, high-income families and families in the middle of the age distribution interval have clearly accounted for the strongest increases.

The considerable increases in family gross debt have resulted in markedly stronger growth in aggregate gross debt relative to total family income after tax. Thus, the aggregate gross debt ratio rose from 166 per cent of income after tax in 2002 to 223 per cent in 2010, cf. also Chart 1, corresponding to an increase by 57 percentage points over the entire period.

The detailed data behind this article can be used to analyse how the development in the ratio of gross debt to income after tax in different population subgroups has contributed to the overall pattern. This can be done specifically by decomposing the change in the aggregate gross debt ratio into contributions from changes in the corresponding ratios for each subgroup, cf. Box 2.

A breakdown of families by income after tax shows that the families at the high end of the income scale have contributed most to the rise in the aggregate gross debt ratio, cf. Chart 10. Out of the total increase of 57 percentage points, just over 30 percentage points can thus be attributed to the higher gross debt ratio for the group of families in the three top income deciles in 2010 compared with 2002. As mentioned, the families in the lowest income deciles have seen the strongest relative increases in gross debt. Nevertheless, the rise in these families' gross debt ratio had only a modest effect on the aggregate gross debt ratio.

Average gross debt for various population groups Table 4

Kr. 1,000	2002	2010	Change 2002–10	Relative change, per cent
Income deciles				
1st income decile	51.1	100.9	49.8	97.5
2nd income decile	56.4	142.0	85.6	151.7
3rd income decile	78.5	150.1	71.5	91.1
4th income decile	120.7	237.1	116.5	96.5
5th income decile	190.8	346.3	155.5	81.5
6th income decile	277.9	497.5	219.6	79.0
7th income decile	400.1	717.1	317.0	79.2
8th income decile	613.8	1042.6	428.8	69.9
9th income decile	836.8	1406.8	570.0	68.1
10th income decile	1251.0	2216.3	965.3	77.2
Age groups				
15–24 years	79.7	82.3	2.7	3.4
25–29 years	279.7	379.9	100.3	35.9
30–34 years	510.5	831.0	320.5	62.8
35–39 years	621.3	1079.1	457.8	73.7
40–44 years	638.6	1098.9	460.3	72.1
45–49 years	609.5	1058.2	448.7	73.6
50–54 years	573.7	988.9	415.2	72.4
55–59 years	498.2	879.1	380.9	76.5
60–64 years	360.5	746.8	386.3	107.2
65–69 years	226.6	589.1	362.5	160.0
70+ years	86.0	249.6	163.7	190.4
Type of housing				
Families in owner-occupied housing	717.0	1268.3	551.3	76.9
Families in rental housing	120.4	187.2	66.8	55.5

Note: All averages are calculated for families belonging to the relevant population group in the year in question. For example, the average gross debt in 2002 for families in the 30–34 age group has been calculated for families whose oldest member was 30–34 years old in 2002. The corresponding figure for 2010 has been calculated for families whose oldest member was 30–34 years in 2010. The grouping into income deciles is based on family income after tax.

Source: Own calculations on the basis of register data from Statistics Denmark.

Decomposition of change in the aggregate gross debt ratio Box 2

The aggregate gross debt ratio is defined as the sum of family gross debt divided by the sum of family income after tax. The change in the aggregate ratio can be decomposed into contributions from changes in the corresponding gross debt ratios for various subgroups of families and contributions from changes in the income distribution between these subgroups.

The relationship between the aggregate gross debt ratios in year *t*, BGK_t, and the gross debt ratios in each subgroup of families can be expressed as follows:

$$BGK_t = \frac{BG_t}{DI_t} = \frac{\sum_j BG_t^j}{\sum_j DI_t^j} = \sum_j s_t^j BGK_t^j ,$$

where BG_t^j and DI_t^j are total gross debt and total income after tax, respectively, for the families in subgroup *j* in year *t*, while BG_t and DI_t are the corresponding aggregates. $s_t^j \equiv DI_t^j / DI_t$ denotes subgroup *j*'s share of aggregate income after tax in year *t*, while $BGK_t^j \equiv BG_t^j / DI_t^j$ is the total gross debt ratio for subgroup *j* in year *t*. The aggregate gross debt ratio can then be written as the weighted sum of gross debt ratios in the individual subgroups where each subgroup is weighted by its share of total income after tax.

CONTINUED Box 2

The change in the aggregate gross debt ratio from year *t-h* to year *t* can thus be decomposed as:

$$\Delta BGK_{t-h,t} = \sum_j s_t^j \cdot BGK_t^j - \sum_j s_{t-h}^j \cdot BGK_{t-h}^j$$
$$= \sum_j s_{t-h}^j \cdot \Delta BGK_{t-h,t}^j + \sum_j \Delta s_{t-h,t}^j \cdot BGK_t^j$$

The expression on the right-hand side of the above equation consists of two sums, each of which can be given an economic interpretation. The first sum denotes the contribution from changes in the gross debt ratios within each subgroup, given the income distribution between the groups. This expresses how large the change in the aggregate gross debt ratio would have been, given an unchanged income distribution between the subgroups relative to year *t-h*. The total effect of this is calculated as the sum of contributions from the individual subgroups. The contribution from each subgroup is calculated as the change in the subgroup's gross debt ratio weighted by its income share in the starting year.

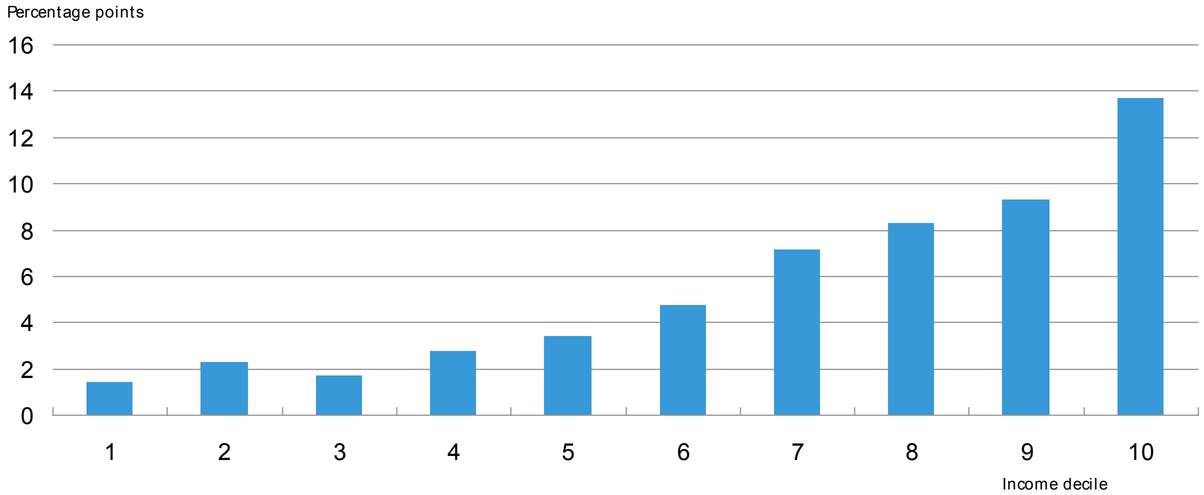
The other sum on the equation's right-hand side captures the effect of changes in the income distribution between the subgroups, given their gross debt ratios. The size of the sum can be seen as a counterfactual expression of how much the aggregate gross debt ratio would have changed if the gross debt ratios of the individual subgroups had been the same in year *t-h* as they are today. This contribution becomes positive if it is generally the case that the income shares for subgroups with large gross debt ratios have increased, while they have diminished for subgroups with small gross debt ratios.

The decomposition can be made for any division into subgroups. For example, the families may be grouped by income or age. For all the groupings we have made, the groups' shares of total income after tax are almost unchanged over the period under review. The contribution from changes in the income distribution between the groups is thus negligible relative to the contribution from changes in the subgroups' gross debt ratios.

The reason is that both income and gross debt are lower in absolute terms for this group of families than for families in higher income deciles. Their overall economic impact is therefore limited.

The previously mentioned modest drop in the gross debt ratio from 2009 to 2010 is primarily attributable to families in the top income decile reducing their gross debt ratio.

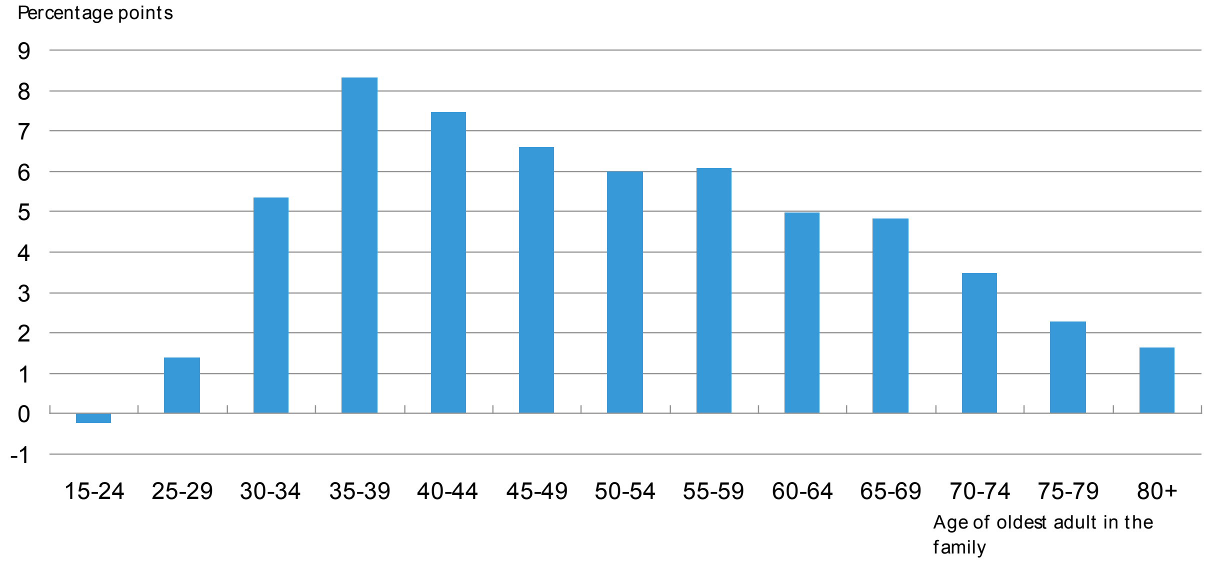
Contributions to change in aggregate gross debt ratio, 2002–10, by income decile Chart 10



Note: The contribution from each income decile has been calculated as the change in the gross debt ratio since 2002, weighted by the share of total income after tax in 2002, cf. Box 2. The grouping of families into income deciles has been made for each year. This results in dynamic grouping, i.e. the same family does not necessarily appear in the same decile in different years.
Source: Own calculations on the basis of register data from Statistics Denmark.

Contributions to change in aggregate gross debt ratio, 2002–10, by age group

Chart 11



Note: The contribution from each age group has been calculated as the change in the gross debt ratio since 2002, weighted by the group's share of total income after tax in 2002, cf. Box 2. The grouping of families into age groups has been made for each year. Consequently, a family will move upwards through the age groups as its members age.

Source: Own calculations on the basis of register data from Statistics Denmark.

In Chart 11, families are instead distributed by age. The picture from this breakdown is less clear than that emerging from a breakdown by income. The Chart shows that the largest contribution to the increase in the aggregate gross debt ratio is the result of families in the 35–39 age group having larger gross debt relative to income in 2010 than in 2002. From here, the size of the contributions diminishes with age. It is notable, however, that even the highest age groups have accounted for contributions of non-negligible size. Out of the total increase by 57 percentage points in the aggregate gross debt ratio, 12.5 percentage points can thus be attributed to an increase in the ratio of gross debt to income after tax for families with members over 64 years.

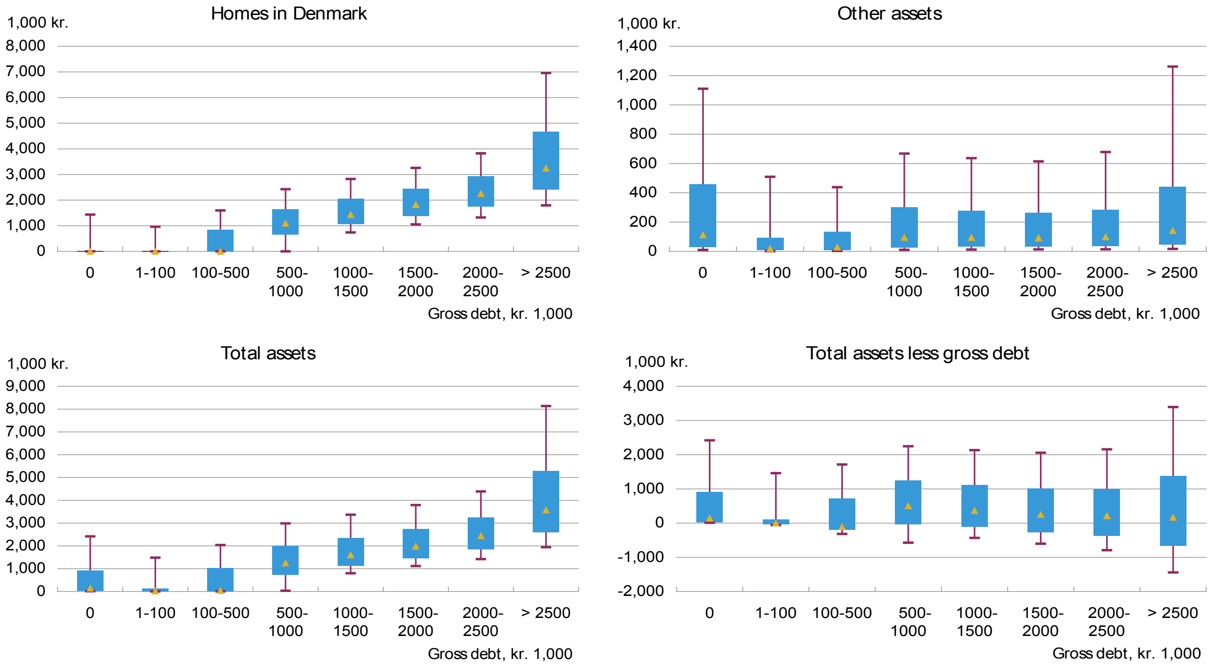
4. Family assets

When assessing family finances, it is not enough only to look at income and gross debt. As a result of the tax system, the costs of simultaneously holding debt and assets may be modest. As regards pension savings and owner-occupied housing, the tax system is designed with certain incentives to acquire such assets for borrowed funds. This means that most families have both gross debt and assets, some of which are easy to realise. However, in this study it is only possible to include owner-occupied housing in Denmark, real property abroad, financial assets and pension wealth. Cash and durable consumer goods such as cars, boats, household effects and art are not included in the registers used.

The value of the excluded assets is not inconsiderable. According to the national accounts, the value of consumer vehicles at end-2010 was approximately kr. 280 billion. Whereas the value of these vehicles is not included on the assets side, debt incurred in connection with the purchase of the vehicles is included in families' gross debt.

The calculation of the value of families' real property in Denmark, excluding the value of private cooperative housing, is described in Box 3. 204,000 families live in private cooperative housing.

Distribution of family assets, excluding pension wealth, across gross debt intervals, 2010 Chart 12



Source: Own calculations on the basis of register data from Statistics Denmark.

Chart 12 shows the value of some of the most important assets, but not pension wealth, in various gross debt intervals. It is not surprising that the approximated market price for family housing in Denmark is higher, the larger the gross debt, cf. the top left-hand part of the Chart. This can be seen as a counterpart of the fact that the predominant part of the families' gross debt is debt to mortgage banks.

Calculation of approximated market values of family housing wealth (excluding private cooperative housing) Box 3

In register data from Statistics Denmark, each family's housing wealth is calculated on the basis of the official property valuation made by SKAT (Danish tax authority). But the official property valuation does not always show a true picture of the market value of a home. An approximated market value needs to be calculated in order to get a more accurate measure.

Statistics Denmark publishes quarterly statistics for average cash prices for sold properties relative to the average official property valuation. These statistics are compiled on the basis of property sales statistics from SKAT and are broken down by geography and property category. This relationship between sales prices and appurtenant property valuations can be used for calculation of an approximated market value using the following formula:

$$\tilde{M}_t^{ij} = EV_t^{ij} \cdot \left(\frac{\overline{KS}_t^{j}}{\overline{EV}_t^{j}} \right) \quad (1)$$

Here $\tilde{M}_t^{ij}$ denotes the approximated market value and EV_t^{ij} the official property valuation of property i, subgroup j, year t. $\overline{KS}_t^{j}$ denotes the average sales price and $\overline{EV}_t^{j}$ the average property valuation, both for subgroup j year t. Each subgroup represents a certain combination of geography and property category. So the approximated market value is calculated by adjusting the official valuation of the individual property by a common factor for the subgroup to which the property belongs. This factor is published by Statistics Denmark.

CONTINUED	Box 3

An assumption in the above formula is that the factor published by Statistics Denmark reflects the ratio between average sales prices and average valuations in the same year. That is not always the case, however. For example, Statistics Denmark calculates the average sales price from property transactions in 2005 relative to the average official property valuation from 2004. In the years when the purchase price is compared to the property valuation in the previous year, it is exploited that the market value in year t can be written as:

$$M_t^{ij} = EV_t^{ij} \cdot \frac{M_t^{ij}}{EV_t^{ij}} = EV_t^{ij} \cdot \frac{M_t^{ij}}{EV_{t-1}^{ij}} \cdot \left(\frac{EV_t^{ij}}{EV_{t-1}^{ij}} \right)^{-1}$$

In such years, the approximated market value is thus calculated as:

$$\tilde{M}_t^{ij} = EV_t^{ij} \cdot \left(\frac{\overline{KS}_t^j}{\overline{EV}_{t-1}^j} \right) \cdot \left(\frac{\overline{EV_t^j}}{EV_{t-1}^j} \right)^{-1} \qquad (2)$$

In contrast to formula (1), in formula (2) we adjust for the average increase in property valuations in each subgroup relative to the previous year.

As regards other assets, i.e. financial assets and real property abroad, the correlation between assets and gross debt is U-shaped, cf. the top right-hand part of the Chart. As mentioned previously, almost 25 per cent of the families have no debt at all. These families are distributed as a very large group that does not have substantial financial assets either, cf. that the median value is around kr. 112,000, and another group with actual wealth, since 10 per cent of the debt-free families have financial assets of kr. 1.1 million or more. It should be emphasised that pension wealth is not included in these figures. In all gross debt groups, the median family has relatively modest financial assets, etc. This probably reflects that, for most families, having both gross debt and financial assets over a relatively limited size involves costs.

All in all, the relationship between gross debt and the assets under review is dominated by the value of real property in Denmark, cf. the left-hand part of Chart 12.

The bottom right-hand part of Chart 12 shows the size of assets, excluding pension savings, less gross debt. The median value of this net wealth peaks for gross debt of between kr. 500,000 and kr. 1 million. The dispersion of net wealth is strongest for families whose gross debt exceeded kr. 2.5 million. This is illustrated by both the 75th and the 90th percentiles being higher in this group than in the other groups, while both the 10th and the 25th percentiles are lower than in the other groups. This indicates that both the most affluent families and the families with the highest gross debt are to be found in the group of families with gross debt exceeding kr. 2.5 million. In 2010, around 5 per cent of the families had gross debt exceeding kr. 2.5 million, cf. Chart 3, so the 10th and 90th percentiles in this group will delimit approximately 0.5 per cent of the families. This corresponds to around 12,500 families having net wealth of at least kr. 3.4 million despite gross debt in excess of kr. 2.5 million. A corresponding number of families with such gross debt have so few assets that their net debt exceeds kr. 1.4 million.

Pension savings

Most Danish families have assets in the form of pension savings. In most cases, pension wealth is illiquid in the sense that there may be legislative barriers or large costs associated with realising it before retirement age, and pension savings are not normally included as assets in the case of bankruptcy or enforced sale.

Calculation of family pension wealth, 2003–10	Box 4

In this article family pension wealth is the result of own calculations, because Danes' pension wealth is not compiled in existing registers. Pension wealth excluding civil servants' public service pensions is calculated on the basis of extraordinary reported data on Danes' pension wealth and register-based data on contributions to and disbursements from pension schemes. We have endeavoured to calculate our statistics in the same way as in previous analyses (including Jørgensen (2007), Welfare Commission (2006) and Danish Economic Councils (2008)).

The method for calculation of Danes' pension wealth in company pension schemes and individual personal schemes is based on a data set with pension wealth at individual level in 2003 collected in connection with the Welfare Commission's work (Welfare Commission, 2006). We have thus been given access to individual data for wealth in safe custody at end-2003 in a number of life insurance companies, pension funds and banks.[1] Together with Statistics Denmark's register data for contributions and disbursements, Danes' individual pension wealth in company pension schemes and individual personal schemes has been projected each year from 2003 up to and including 2010.

An individual's pension wealth in a pension company in year *t* equals the sum of the pension wealth in the previous year *t-1*, net contributions to the company in year *t* adjusted for estimated operating costs and return and capital gains on the individual's pension custody account in year *t*. This corresponds to the following identity for individual *i* in year *t*:

$$wealth_{i,t} = wealth_{i,t-1} + net\ contributions_{i,t} + return_{i,t}$$

Starting in 2004, individual pension wealth in the preceding year is known from the Welfare Commission's 2003 data and net contributions are known from Statistics Denmark's register data. On the other hand, return and capital gains on individual pension wealth are unknown. Instead, the return and capital gains are calculated residually at company level as the difference between total provisions in a given company and the sum of individuals' wealth excluding return and capital gains in the same company:

$$return_{s,t} = wealth_{s,t} - \left(\sum_{i=1}^{N_S} wealth_{i,t-1} + \sum_{i=1}^{N_S} net\ contributions_{i,t} \right)$$

where $wealth_{s,t}$ denotes the total pension provisions of company S, and N_S indicates the number of persons in the company. Total pension provisions in year *t* have been found on the basis of the company's financial statements. Thus, the weighted average rate of return has been calculated for each company, and this rate is applied to all persons with wealth in safe custody in a given company. Hence, the projection does not take into account that different schemes in the same company may have different rates of return – e.g. guaranteed interest rates and unit link schemes. Moreover, in the projection, the companies' unallocated reserves are distributed proportionally on all persons independently of age.

The amounts allocated to pensioners with life annuities are thus too small if the reserves have contributed especially to ensuring guaranteed benefits in a period of steady longevity increases. In addition, we use data on Danes' pension rights at ATP in the years 2003–10 in the form of data on annual disbursements to which an ATP pension right holder would be entitled at the age of 65, given that no further contributions are made to the scheme. These entitlements are converted to corresponding wealth at the age of 65 as follows:

$$wealth_{i,t}^{65} = \sum_{t=1}^{T_i-65} \frac{entitlement_i}{(1+r)^t}$$

where $T_i - 65$ is the remaining life expectancy after age 65, $rettighed_i$ is the person's annual pension right, and r is the annual return, which is assumed to be 6 per cent. For persons under 65 the wealth at age 65 is discounted to their current age.

Finally, we also use information on individuals' wealth in safe custody at the Employees' Capital Pension Fund, the Special Pension Savings Scheme (SP) and the supplementary labour-market pension scheme for the years 2003–10. Projected pension wealth in company pension schemes and individual personal schemes is added to the wealth in custody under these schemes, and finally a macro revaluation is made for total pension wealth excluding public service pensions, where the

CONTINUED	Box 4

sum of individuals' wealth is compared with macro figures for household pension wealth excluding public service pensions each year in the period according to the quarterly national accounts for Denmark. The difference between the macro figure and the summed wealth in safe custody is distributed proportionally on all persons in the population.

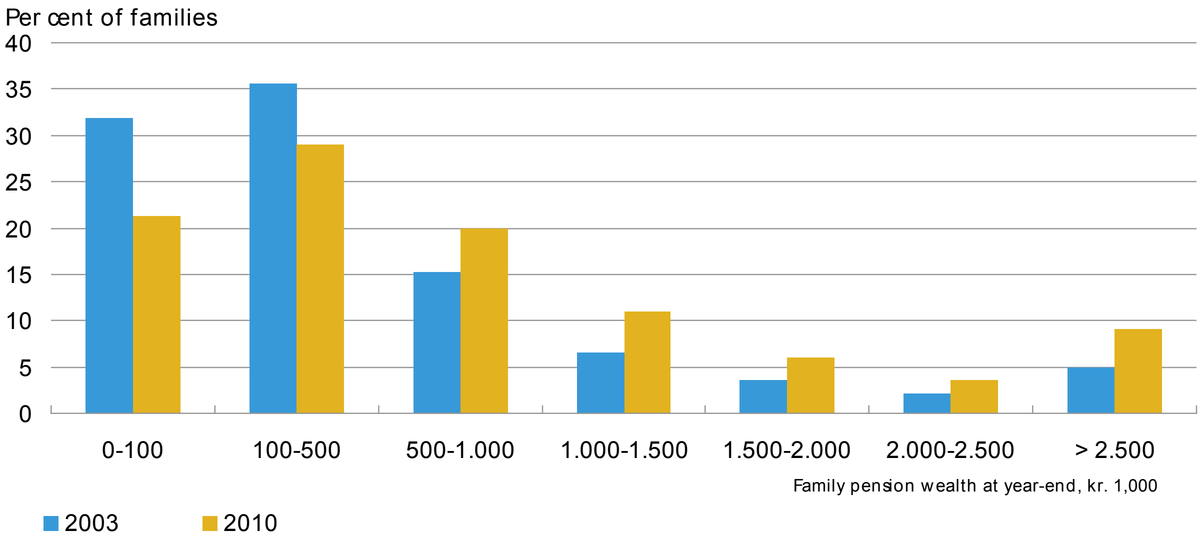
[1] The data set from the Welfare Commission is not exhaustive, so it has been necessary to make certain imputations, which generally follow the description in Jørgensen (2007). The imputations concern disability pensioners and disbursement of unallocated reserves. In addition, we have sought to impute reporting gaps by means of contribution and disbursement flows to company pension schemes and individual personal schemes. In this connection, the authors would like to thank Michael Andersen (DREAM) and Frederik Hansen (Ministry of Economic Affairs and the Interior).

If the purpose of the analysis is to examine how family finances influence financial stability, these factors seem to support that pension wealth should not be included on the families' assets side. On the other hand, it is clear that pension wealth, by its sheer size, plays a key role in many families' financial decisions. It is therefore highly relevant to include pension wealth as an asset for the family when analysing these decisions.

The calculation of the value of family pension wealth is described in Box 4. The value of civil servants' public service pensions is not included in the calculation. According to the calculations of the Agency for the Modernisation of Public Administration, the value of civil servants' public service pensions totalled approximately kr. 430 billion at end-2009.

The current expansion of labour-market pensions has led to a substantial shift towards rising pension wealth, cf. Chart 13. In 2003, around one out of three families had pension wealth exceeding kr. 500,000. In 2010, this figure had increased to around one out of two, and 30 per cent of the families had pension wealth exceeding kr. 1 million, of which almost 10 per cent had more than kr. 2.5 million. However, the development from 2003 to 2010 also reflects that the general price level was approximately 15 per cent higher at end-2010 than at end-2003.

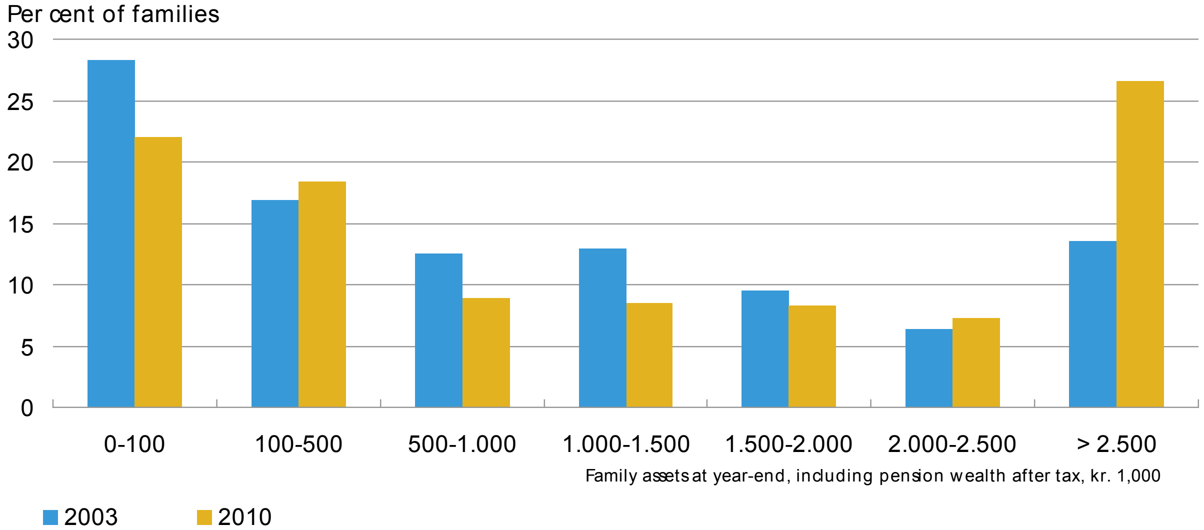
Distribution of total family pension wealth Chart 13



Note: Pension wealth has been calculated before tax.

Source: Own calculations on the basis of register data from various institutions, cf. Box 4.

Distribution of family assets including pension wealth after tax Chart 14



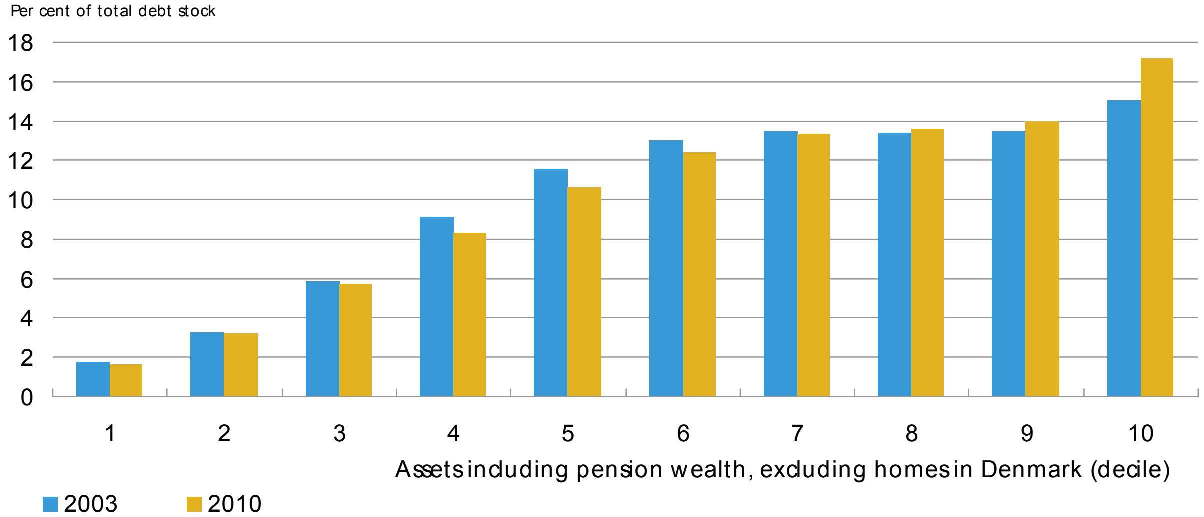
Note: Pension wealth has been calculated after tax, i.e. with deduction of estimated future income tax on disbursements. The value of family pension wealth thus becomes comparable with other financial savings, which are not deductible and thus not taxable.

Source: Own calculations on the basis of register data from Statistics Denmark and other institutions, cf. Box 4.

Since almost all pension wealth is taxed on disbursement, the figures are not comparable with other assets, which are generally not taxed. This is partly taken into account in Chart 14, where 60 per cent of the pension wealth is added to the value of other assets, corresponding to a tax rate of 40 per cent on disbursement. According to this calculation, more than one out of four families had assets exceeding kr. 2.5 million in 2010.

Chart 15 shows that gross debt is primarily found among the families with most financial assets, including pension wealth after tax. This trend was somewhat more pronounced in 2010 than in 2003. This picture differs from the picture emerging after exclusion of pension wealth, cf. the top right-hand part of Chart 12. But the overall impression that debt is generally concentrated in families who have the funds to meet the related obligations is reinforced.

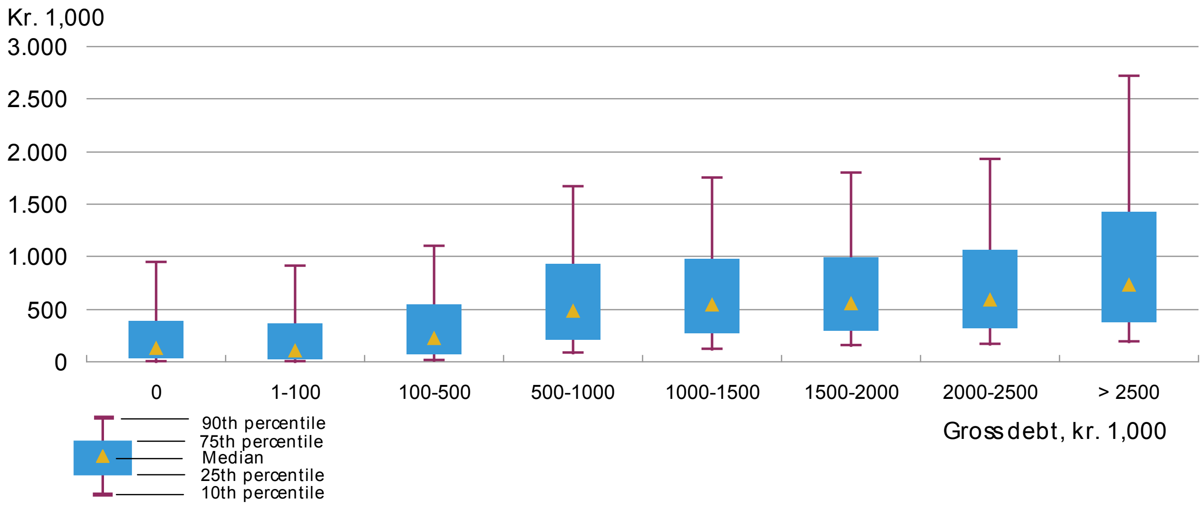
Gross debt stock by size of family assets, including pension wealth, excluding homes in Denmark Chart 15



Note: Pension wealth has been calculated after tax, i.e. with deduction of estimated future income tax on disbursements. The value of family pension wealth thus becomes comparable with other financial savings, which are not deductible and thus not taxable.

Source: Own calculations on the basis of register data from Statistics Denmark and other institutions, cf. Box 4.

Distribution of family pension wealth after tax across gross debt intervals, 2010 Chart 16



Note: Pension wealth has been calculated after tax, i.e. with deduction of estimated future income tax on disbursements. The value of family pension wealth thus becomes comparable with other financial savings, which are not deductible and thus not taxable.

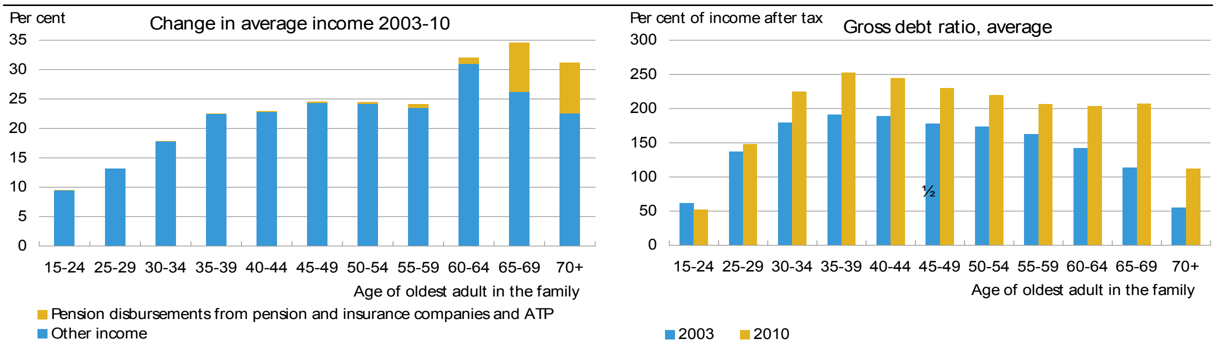
Source Own calculations on the basis of register data from Statistics Denmark and other institutions, cf. Box 4.

Below we take a closer look at the link between pension wealth and gross debt. Pension wealth tends to be higher, the larger the family's gross debt, cf. Chart 16. But this relationship is weaker than that for the other assets, as illustrated in Chart 12. The positive correlation between gross debt and pension wealth first and foremost reflects that pension schemes are predominantly mandatory, in that a certain percentage of income has to be contributed to the scheme, and at the same time high gross debt is found particularly among high-income families.

However, it cannot be ruled out that there is also a direct causal link between the size of pension wealth and gross debt, particularly for families around retirement age. Large pension wealth thus ensures higher current income after retirement than if no pension scheme had applied. This will enable many families to service the debt far into their retirement.

Chart 17 compares the changes since 2003 in gross debt and income, respectively, for different age groups. The families in the top age groups are the ones accounting for the strongest increase in the debt-to-income ratio relative to 2003, cf. the right-hand part of the Chart. At the same time, the growth in income from 2003 to 2010 was highest for this group of families, which can be attributed especially to higher pension disbursements, cf. the left-hand part of the Chart. However, this does not immediately provide for concluding that the rise in gross debt for this group of families was caused by expansion of pension wealth. Many other factors influencing gross debt have changed since 2003, including in particular house prices.

Change in Income and gross debt ratio, 2003–10, by age group Chart 17



Source: Own calculations on the basis of register data from Statistics Denmark.

Relationship between gross debt ratio and pension wealth ratio among families in the same income and age groups Table 5

Gross debt ratio, per cent of income after tax, median	Pension wealth ratio (quartile) 1	2	3	4
Family's oldest adult 60–61 years				
1st income quartile	13.5	44.4	41.9	86.5
2nd income quartile	37.7	60.6	48.5	45.9
3rd income quartile	152.3	161.7	158.7	159.6
4th income quartile	209.4	197.6	194.1	184.7
Family's oldest adult 62–63 years				
1st income quartile	8.4	45.2	48.3	87.9
2nd income quartile	40.0	55.2	52.3	65.1
3rd income quartile	154.7	163.6	153.7	161.1
4th income quartile	209.6	197.5	195.9	177.0
Family's oldest adult 64–65 years				
1st income quartile	7.0	34.1	38.3	104.8
2nd income quartile	35.1	49.9	48.4	77.0
3rd income quartile	157.8	157.3	162.7	158.2
4th income quartile	206.6	195.2	183.6	180.5

Note: The Table shows the median for the gross debt ratio for various combinations of age, income, and pension wealth ratio (pension wealth as a percentage of income after tax). Families have been grouped according to pension wealth ratio on a quartile basis. The quartiles have been established within each age and income group. Consequently, the limits between quartile groups vary across age and income groups, so it is not immediately possible to make comparisons in the vertical dimension of the Table. A criterion for the selection of families is that at least one adult member of the family has a job.

Source: Own calculations on the basis of register data from Statistics Denmark and other institutions, cf. Box 4.

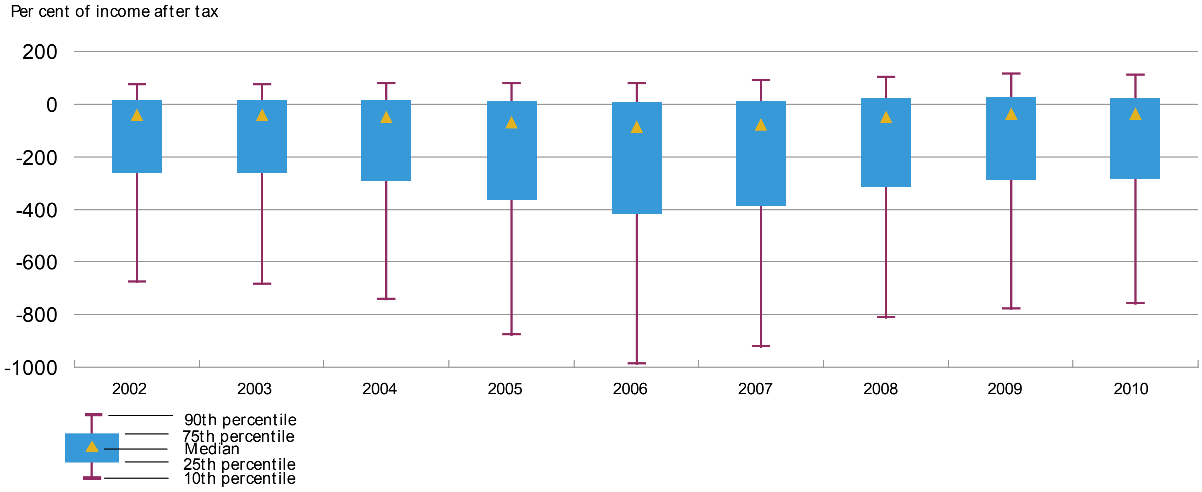
Table 5 examines the link between pension wealth and gross debt in 2010 among families in the same age and income groups who are active in the labour market. Both pension wealth and gross debt are here seen as ratios of income after tax. If there is a direct causal effect from the size of pension wealth to gross debt, families with a large pension wealth ratio will, all else equal, have a higher gross debt ratio than other families in the same age and income groups. Among families in the bottom income quartiles, such a positive link is actually indicated since the gross debt ratio (measured by the median) increases with the ratio of pension wealth to income after tax in all age groups. This can be interpreted as an indication that the growing pension wealth has contributed to the rise in gross debt in this group of families. But the link is not very strong in the second income quartile and there are no signs of a link among the families in the upper income quartiles, no matter which age group is considered. All in all, there is no clear basis for concluding that direct causality exists between the accumulation of pension wealth and the increased gross debt. But the accumulation of pension wealth has enabled a reversal of Denmark's foreign debt to net foreign assets at the same time as the increase in family gross debt.

5. Family net debt

Net debt excluding pension wealth

Family net debt is the value of their gross debt less the value of their assets, excluding pension wealth. Chart 18 shows the development over time in the net debt ratio, i.e. net debt as a ratio of income after tax.

Distribution of family net debt ratio over time Chart 18



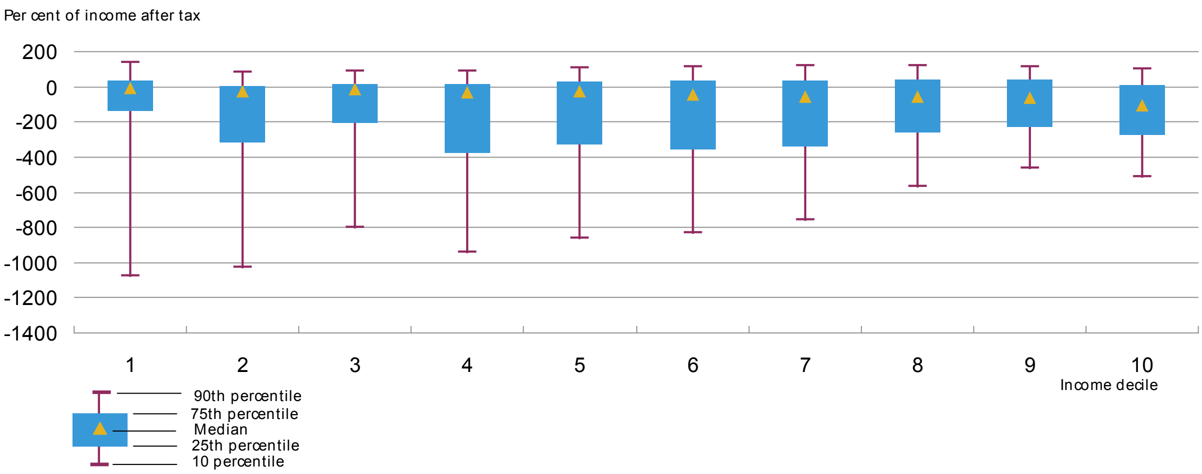
Source: Own calculations on the basis of register data from Statistics Denmark.

A clear pattern appears in that most families have net wealth, which is shown as negative net debt in the Chart. However, at least one out of three families has net debt, and for the 10 per cent most heavily indebted families, net debt has grown more than income in the period under review, so that in 2010 net debt amounted to more than 100 per cent of the annual income after tax. It should be emphasised that wealth does not include pension wealth or durable consumer goods such as cars. Among the 10 per cent of the families with the largest net wealth (smallest net debt), wealth increased from being at least 6.8 times the size of income in 2002 and 2003 to at least 9.9 times in 2006 and then it fell back to just under 8 times the size of income after tax in 2010. This particularly reflects property price developments in this period.

The net debt ratio is not strongly dependent on income, cf. Chart 19. The median families have a falling net debt ratio (rising net wealth ratio) with increasing income despite the fact that the gross debt ratio grows with income, as shown above. High-income families' large gross debt is thus generally offset by their acquisition of assets. Another observation is that the wealth-to-income ratio is very high for the 10 per cent most affluent in the lowest income decile, but this probably reflects that this group comprises a relatively high number of elderly with low income and some wealth, not necessarily large wealth in absolute terms.

At end-2010, more than one out of three families had net debt. Families with net debt deviate from families with net wealth in several respects, cf. Table 6.

Distribution of family net debt ratio across income deciles, 2010 Chart 19



Source: Own calculations on the basis of register data from Statistics Denmark.

Families with net debt include a relatively high number of young people and relatively few homeowners. At the same time, these families have been harder hit by prolonged periods of unemployment than other families. The average gross debt in this group was kr. 180,000 larger than that of other families, while assets were, on average, around kr. 1,200,000 lower, which can be attributed to the relatively small share of homeowners, among other factors. This is also reflected in the fact that the gross debt of families with net debt is primarily debt to banks, while the other families' gross debt is primarily debt to mortgage banks.

Only families with net debt are considered in Chart 20. Among these families, net debt increases with income after tax. This Chart does not show debt as a ratio of income after tax, but the absolute size of the debt.

In 2010, the net debt of families with net debt totalled just under kr. 265 billion. This net debt is concentrated in families with the highest incomes after tax, since families in the two top income deciles account for around kr. 100 billion of this amount, cf. Chart 21. The Chart shows for each income decile how much of this net debt is attributable to families with net debt living in cooperative housing, since these families' assets in the form of the value of the cooperative housing are not included in the calculation. As a result, families living in cooperative housing tend to have net debt in this calculation to a higher degree than other families. Almost exactly half of the families living in cooperative housing have net debt, compared with one third of all families.

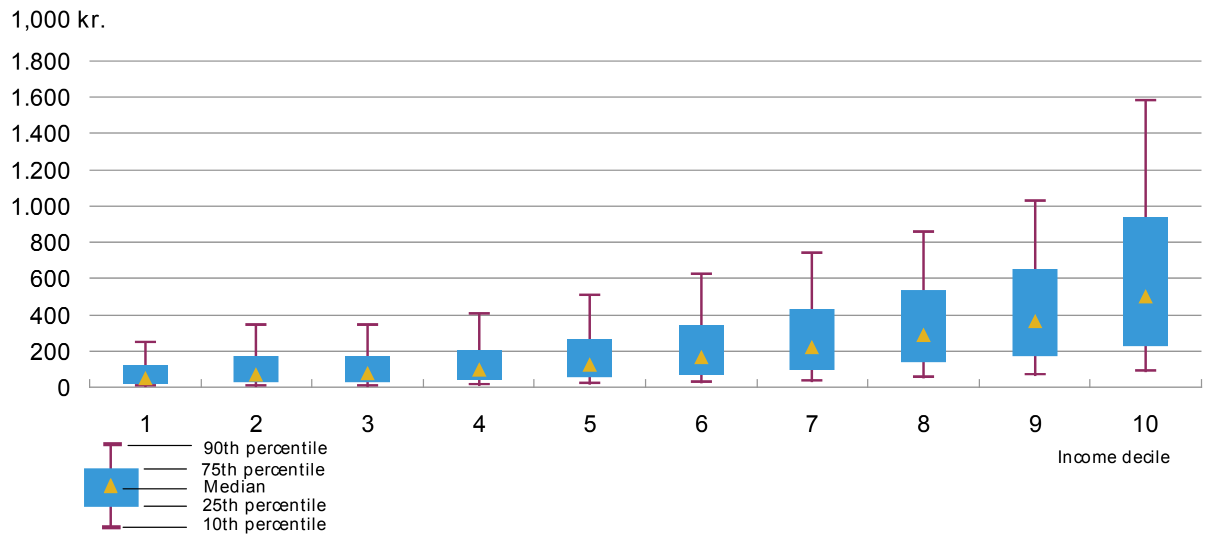
Descriptive statistics for families with net debt relative to other families, 2010 Table 6

	Families with net debt	Other families
Number of families	862,371	1,708,147
Age, family size and housing type		
Average age of oldest adult in family	41.5	56.3
Share of families with two adults, per cent	42.7	48.2
Average no. of children in family	0.6	0.4
Share of homeowners, per cent	27.5	55.5
Income, assets and liabilities, etc.		
Average income after tax, kr.	297,861	311,652
Share of total liabilities at year-end, per cent	39.5	60.5
Share of total assets at year-end, per cent	12.8	87.2
Average liabilities, kr.	806,392	624,735
Average assets, excl. pension wealth, kr.	500,827	1,720,979
Avg. assets, excl. pension wealth and housing in DK, kr.	48,183	147,120
Average net assets, kr.	–305,564	1,096,244
Gross debt ratio, median, per cent	117.6	27.0
Net debt ratio, median, per cent	61.6	–168.0
Average contributions to pension schemes, kr.	33,240	37,906
Average pension wealth after tax, kr.	318,685	712,015
Composition of liabilities		
Bank debt as share of total liabilities, aver. percentage	77.0	41.0
Bond debt as share of total liabilities, aver. percentage	22.2	58.6
Social and economic events		
Share of families affected by divorce or death of spouse within the last two years, per cent	3.6	3.2
Share of families affected by at least six months' unemployment within the last two years, per cent	5.7	2.6

Note: The calculation of average pension contributions includes all families in each group, including families who do not contribute to pension schemes. The calculations of the average shares of bond debt and bank debt, respectively, relative to the family's total debt do not include debt-free families. Unemployment figures at individual level are only available up to and including 2009. The share of families who have been affected by at least six months' unemployment within the last two years has therefore been calculated as at the end of that year. For example, the figure in the first column indicates the number of families affected by at least six months' unemployment in the years 2008–09, relative to the number of families with net debt at end-2009.

Source: Own calculations on the basis of register data from Statistics Denmark and other institutions, cf. Box 4.

Distribution of family net debt, only families with net debt, 2010 Chart 20



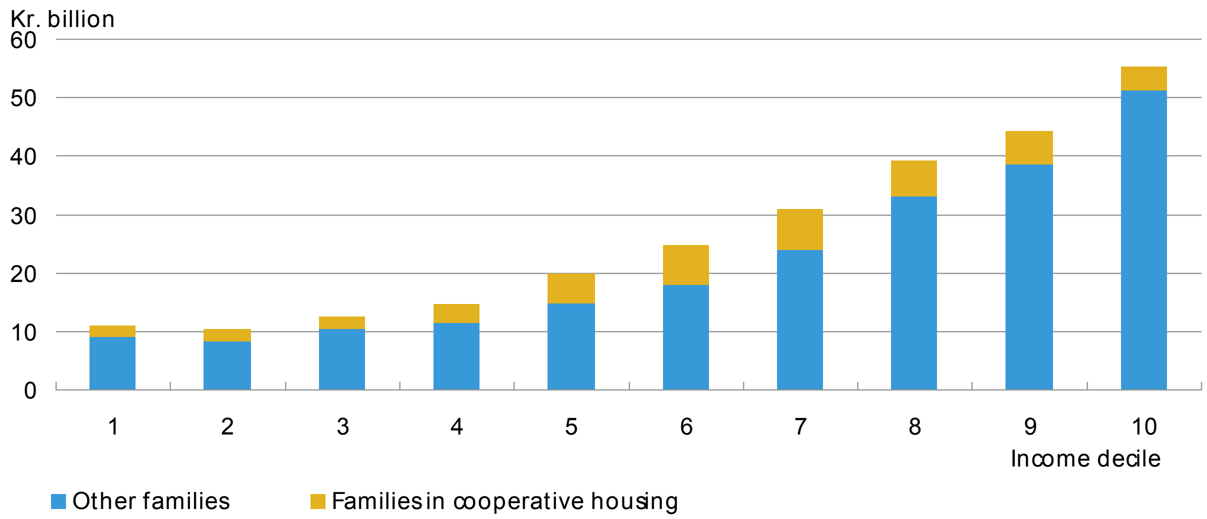
Source: Own calculations on the basis of register data from Statistics Denmark.

Table 7 shows a more detailed breakdown of the propensity to have net debt in various age and income intervals. There is generally a clear pattern.

Firstly: the higher the age of the family, the lower the frequency of net debt. This applies to all income deciles. However, the very young stand out in that fewer of these families have net debt compared with the 25–29 age group. Debt raised for education purposes is one of the explanations of the high prevalence of net debt among young families. To this should be added, of course, debt incurred in connection with purchases of durable consumer goods and cooperative housing. The general pattern should therefore be regarded as natural. This entails that households with net debt generally have a number of years in the labour market ahead of them.

Secondly: in almost all age groups, the frequency of net debt declines with income after tax. It is more difficult to have an opinion on this pattern beforehand. However, the share of families with net debt is rather high in all income deciles as long as the oldest member is below 50. This pattern is different from the one observed for gross debt.

Total net debt by income decile and ownership of family home, only families with net debt, 2010 Chart 21



Source: Own calculations on the basis of register data from Statistics Denmark.

Share of families with net debt by age and income decile										Table 7
Per cent of all families in same age group and income decile	Income decile									
	1	2	3	4	5	6	7	8	9	10
Oldest member										
15–24 years	37.6	43.2	49.0	53.1	53.0	55.5	59.9	64.2	55.2	32.8
25–29 years	61.5	61.0	60.8	61.5	62.2	62.6	64.8	66.7	62.8	51.8
30–34 years	67.3	66.1	60.6	60.9	62.3	62.1	62.1	62.3	58.0	49.6
35–39 years	65.7	63.7	56.5	55.6	56.6	56.4	55.3	53.0	48.9	40.2
40–44 years	63.1	60.8	54.1	50.8	51.6	51.5	49.1	45.8	41.0	33.8
45–49 years	61.1	57.9	52.6	48.2	46.4	46.3	43.1	39.6	34.6	28.5
50–54 years	57.0	50.9	48.8	42.6	40.5	39.6	37.3	32.3	27.8	22.8
55–59 years	46.4	41.1	42.8	36.4	32.0	31.8	29.6	23.6	20.2	17.2
60–64 years	30.8	22.9	32.8	28.1	21.6	20.1	16.8	14.5	13.4	12.5
65–69 years	14.3	18.0	24.2	14.6	12.7	12.3	10.4	9.4	8.5	8.8
70+ years	3.5	7.1	9.6	5.1	8.6	5.8	4.8	4.1	3.4	3.4

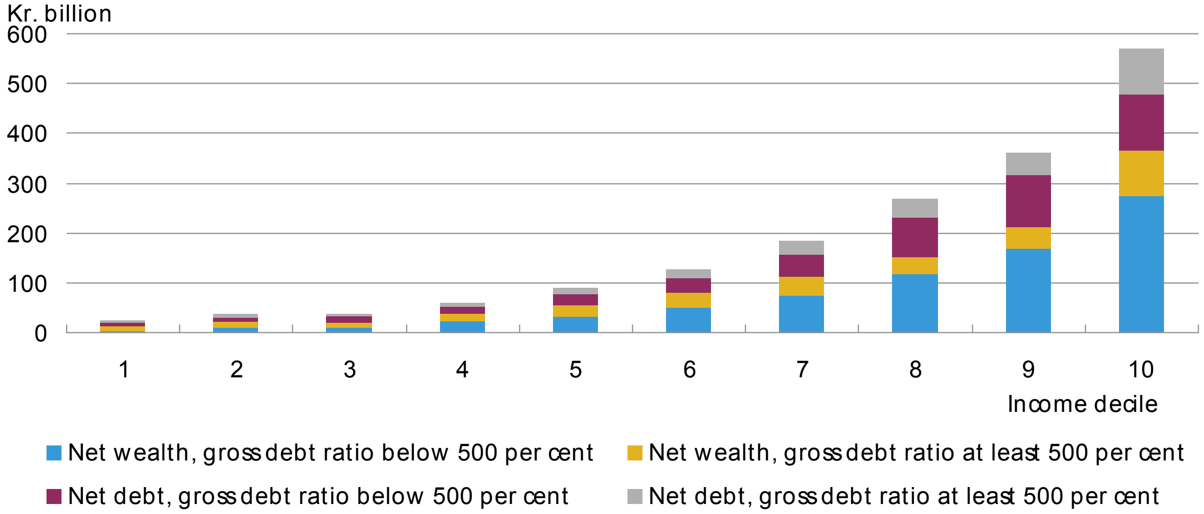
Source: Own calculations on the basis of register data from Statistics Denmark.

It should be emphasised that the number of families in each combination of age group and income decile varies. As appeared from Table 3, the youngest and oldest families are overrepresented in the low income deciles, while the 30–59-year-olds are overrepresented in the high income deciles.

Chart 22 shows the distribution of total gross debt on families in different income deciles, depending on whether or not the family has net debt and whether the gross debt is over or under five times the size of the family income after tax.

In an assessment of the financial sector's risk of losses, families with net debt play a key role, and within this group especially families with a high ratio of gross debt to income. As appeared from e.g. Chart 8, the gross debt of the 10 per cent of families with the largest gross debt tends to be more than around 5 times the size of income after tax in most age and income groups. A distinction is therefore made between families with gross debt of over or under five times the size of income after tax. In 2010, families with both net and gross debt of more than five times their income after tax accounted for a total of around kr. 260 billion of total family gross debt of kr. 1,763 billion. These families had net debt of around kr. 80 billion all in all. As the Chart clearly shows, gross debt is concentrated in the three top income deciles, and this is also the case for net debt.

Composition of gross debt stock by family characteristics, 2010 Chart 22



Source: Register data from Statistics Denmark and own calculations.

Descriptive statistics for families with net debt relative to other families, only homeowners, 2010 Table 8

	Homeowner families with net debt	Other homeowner families
Number of families	236,916	948,234
Age, family size and housing type		
Average age of oldest adult in family	43.1	57.9
Share of families with two adults, per cent	79.9	68.7
Average no. of children in family	1.1	0.6
Share of homeowners, per cent	100.0	100.0
Income, assets and liabilities, etc.		
Average income after tax, kr.	468,391	394,321
Share of total liabilities among homeowner families, per cent	33.2	66.8
Share of total assets among homeowner families, per cent	12.8	87.2
Average liabilities, kr.	2,107,081	1,058,754
Average assets, excl. pension wealth, kr.	1,609,762	2,742,954
Avg. assets, excl. pension wealth and housing in DK, kr.	91,730	220,347
Average net assets, kr.	–497,319	1,684,200
Gross debt ratio, median, per cent	402.9	235.5
Net debt ratio, median, per cent	76.7	–327.4
Aver. contributions to pension schemes, kr.	65,333	55,057
Aver. pension wealth after tax, kr.	574,859	983,327
Composition of liabilities		
Bank debt as share of total liabilities, aver. percentage	26.1	26.7
Bond debt as share of total liabilities, aver. percentage	72.5	72.9
Social and economic events		
Share of families affected by divorce or death of spouse within the last two years, per cent	3.1	2.7
Share of families affected by at least six months' unemployment within the last two years, per cent	4.4	2.6

Note: The calculation of average pension contributions includes all families in each group, including families who do not contribute to pension schemes. The calculations of the average shares of bond debt and bank debt, respectively, relative to the family's total debt do not include debt-free families. Unemployment figures at individual level are only available up to and including 2009. The share of families who have been affected by at least six months' unemployment within the last two years has therefore been calculated on the basis of data from that year.

Source: Own calculations on the basis of register data from Statistics Denmark and other institutions, cf. Box 4.

The drop in house prices from 2006–07 to 2010 has prompted special interest in homeowners' wealth and vulnerability. Table 8 shows some characteristics of homeowners broken down by families with net debt and other homeowners.

General characteristics of families who own their home while having net debt are that they are far younger than other homeowners, consist of two adults with children and that their incomes are considerably higher than those of other homeowners. Their average income after tax is in the second highest income decile.

The average net debt among homeowners with net debt is kr. 500,000 per family. Particularly in this group of high-income families many have bought a home in recent years, when house prices were higher than they are now, and have had expenses for renovation of their homes and for durable consumer goods, including cars. In the present macroeconomic climate, these families are not very likely to have problems servicing their loans, but at the same time, families in this group will be vulnerable in case of long periods of unemployment or rapidly increasing interest rates.

Descriptive statistics for families affected by at least six months' unemployment within the last two years relative to other families, 2009 Table 9

	Families affected by unemployment	Other families
Number of families	92,276	2,456.98
Age, family size and housing type		
Average age of oldest adult in family	43.2	51.5
Share of families with two adults, per cent	53.2	46.3
Average no. of children in family	0.7	0.5
Share of homeowners, per cent	37.8	46.1
Income, assets and liabilities, etc.		
Average income after tax, kr.	271,731	295,053
Share of total liabilities at year-end, per cent	3.3	96.7
Share of total assets at year-end, per cent	2.4	97.6
Average liabilities at year-end, kr.	621,777	674,564
Average assets at year-end, kr.	833,993	1,297.57
Average net assets at year-end, kr.	212,216	623,009
Gross debt ratio, median, per cent	109.0	85.4
Net debt ratio, median, per cent	6.4	–40.0
Average contributions to pension schemes, kr.	22,990	41,423
Composition of liabilities		
Bank debt as share of total liabilities, aver. percentage	66.1	56.6
Bond debt as share of total liabilities, aver. percentage	33.0	42.9
Social and economic events		
Share of families affected by divorce or death of spouse within the last two years, per cent	3.1	3.4

Note: The calculation of average pension contributions includes all families in each group, including families who do not contribute to pension schemes. The calculations of the average shares of bond debt and bank debt, respectively, relative to the family's total debt do not include debt-free families.

Source: Own calculations on the basis of register data from Statistics Denmark.

Significance of certain social events

Table 9 shows that families affected by long periods of unemployment deviate from other families in several respects. Incomes after tax are almost 10 per cent lower than those of other families despite the fact that many of these families include two adults. The average gross debt does not differ much, but the average asset value is almost kr. 500,000 lower. There are relatively fewer homeowners among families who are affected by long periods of unemployment, and the debt tends to be bank debt to a higher degree.

Table 10 shows corresponding conditions for families affected by divorce or the death of a spouse in 2009 and 2010. Naturally, far fewer of these families consisted of two adults at end-2010. Consequently, their family income is about half the income of other married couples and registered partners. Accounting for the difference in the number of adults, there is no clear systematic, negative development in wealth for families affected by divorce or the death of a spouse.

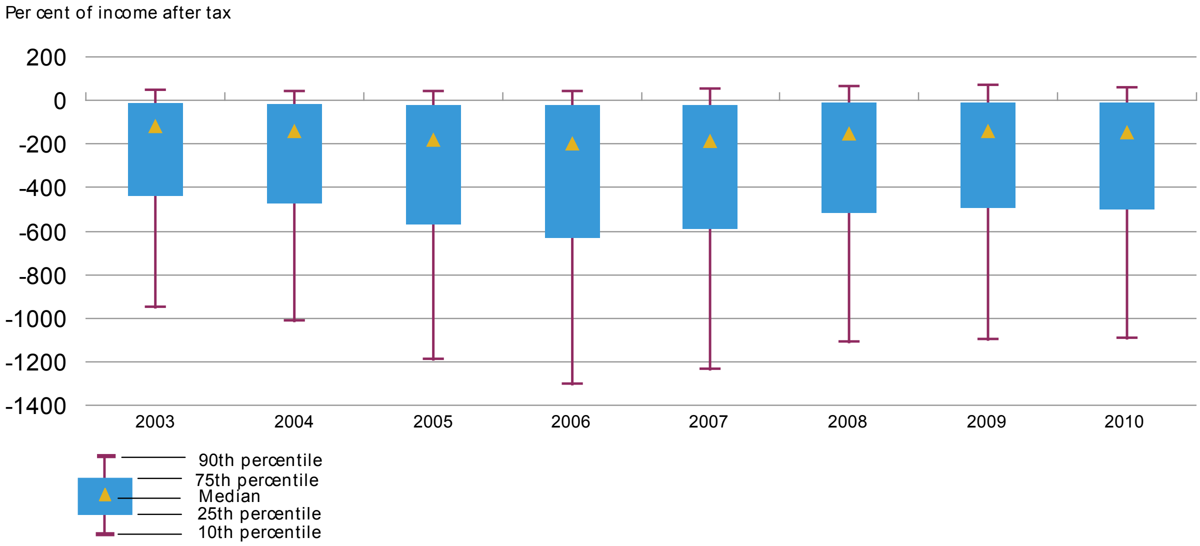
Descriptive statistics for families affected by divorce or death of spouse within the last two years relative to other families, 2010 Table 10

	Families affected by divorce or death of spouse	Other families, total	Other married couples or registered partners
Number of families	85,015	2,466,298	915,807
Age, family size and housing type			
Average age of oldest adult in family	55.7	51.3	55.5
Share of families with two adults, per cent	14.5	47.5	100.0
Average no. of children in family	0.5	0.5	0.9
Share of homeowners, per cent	38.6	46.6	77.4
Income, assets and liabilities, etc.			
Average income after tax, kr.	257,570	309,281	456,448
Share of total liabilities at year-end, per cent	3.1	96.9	64.8
Share of total assets at year-end, per cent	3.1	96.9	64.0
Average liabilities at year-end, kr.	637,396	690,327	1,204,917
Average assets at year-end, kr.	1,223,216	1,321,200	2,277,043
Average net assets at year-end, kr.	585,820	630,873	1,072,126
Gross debt ratio, median, per cent	90.9	85.4	216.4
Net debt ratio, median, per cent	–41.4	–37.9	–136.8
Average contributions to pension schemes, kr.	27,379	36,766	62,470
Composition of liabilities			
Bank debt as share of total liabilities, aver. percentage	58.1	56.7	37.8
Bond debt as share of total liabilities, aver. percentage	41.2	42.8	61.7
Social and economic events			
Share of families affected by at least six months' unemployment within the last two years, per cent	3.3	3.6	7.0

Note: The calculation of average pension contributions includes all families in each group, including families who do not contribute to pension schemes. The calculations of the average shares of bond debt and bank debt, respectively, relative to the family's total debt do not include debt-free families. Unemployment figures at individual level are only available up to and including 2009. The share of families who have been affected by at least six months' unemployment within the last two years has therefore been calculated on the basis of data from that year.

Source: Own calculations on the basis of register data from Statistics Denmark.

Distribution of family net debt ratio including pension wealth over time Chart 23



Note: Pension wealth has been calculated after tax, i.e. with deduction of estimated future income tax on disbursements. The value of family pension wealth thus becomes comparable with other financial savings, which are not deductible and thus not taxable.

Source: Own calculations on the basis of register data from Statistics Denmark and other institutions, cf. Box 4.

Net debt with pension wealth as an asset

If family pension wealth after deduction of deferred tax is included in the calculation, cf. Chart 23, less than one in four families had net debt in 2010. Excluding pension wealth, this is one out of three, as mentioned earlier. The median family had net wealth (negative net debt) of 1.5 times its income after tax, compared to 0.4 times its income if pension wealth is not included, which appeared from Chart 18. Whether or not it is relevant to include pension wealth depends on the purposes of the analysis, but pension savings are of such magnitude that they are likely to be considered in many families' consumption and debt decisions, so they cannot be disregarded with reference to their illiquid nature.

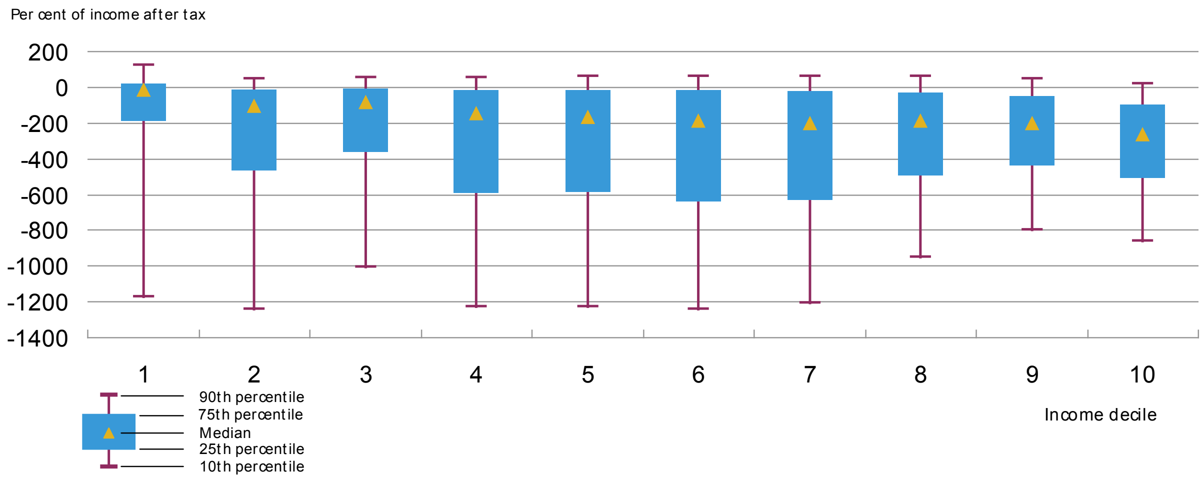
As appears from Chart 24, pension wealth entails that the net wealth ratios of median families tend to rise with increasing income (the negative net debt ratio becomes numerically larger). This is opposed to the pattern in Chart 19, which excludes pension wealth. In the five top income deciles, median families have net wealth of 2–3 times their annual income after tax.

Chart 25 clearly shows that the distribution of wealth becomes strongly dependent on age when including pension wealth on the assets side, which is also to be expected. However, this underlines that a considerable share of the families have assets of such value that they will easily be able to service their gross debt also after retirement.

Change in debt and wealth items since 2003

Table 11 shows that Danish families taken as one have increased their financial net assets since 2003.[2] Although gross debt has increased by kr. 734 billion, pension wealth after tax has risen by kr. 528 billion, and assets other than housing, i.e. predominantly financial assets, have grown by kr. 282 billion. This implies an improvement in the net financial position by approximately kr. 75 billion, and in addition the value of housing has increased by kr. 930 billion.

Distribution of family net debt ratio including pension wealth across income deciles, 2010 Chart 24

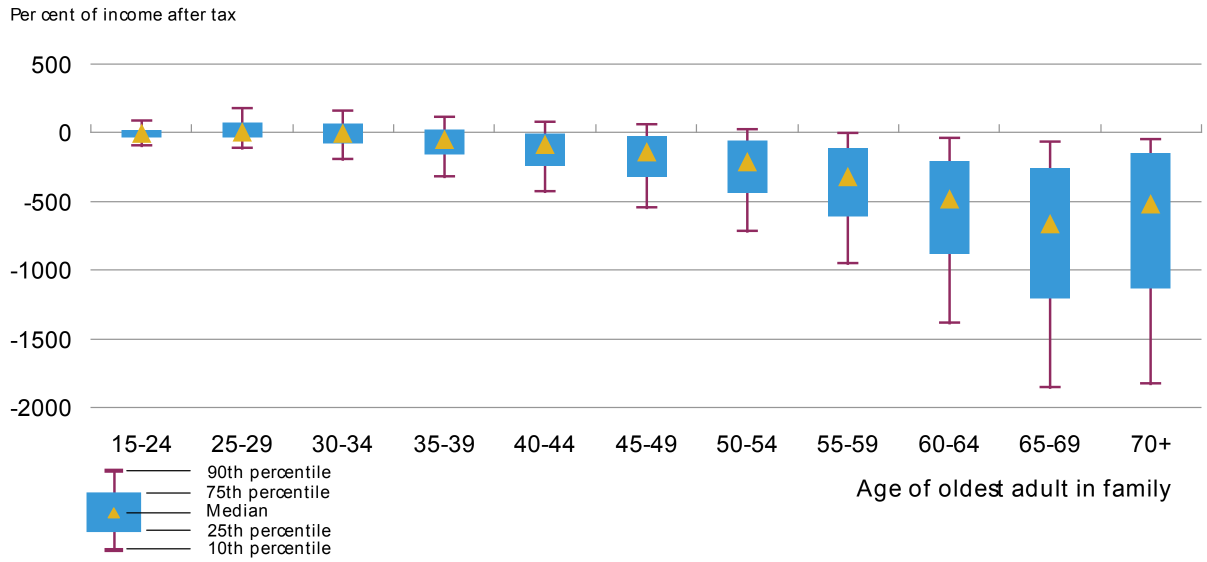


Note: Pension wealth has been calculated after tax, i.e. with deduction of estimated future income tax on disbursements. The value of family pension wealth thus becomes comparable with other financial savings, which are not deductible and thus not taxable.

Source: Own calculations on the basis of register data from Statistics Denmark and other institutions, cf. Box 4.

[2] Income and wealth data based on notices of assessment go back to 2002 in our data set, whereas pension wealth data is only available back to 2003. In this section we therefore consider the development since 2003.

Net debt ratio including pension wealth, by age, 2010 Chart 25



Note: Pension wealth has been calculated after tax, i.e. with deduction of estimated future income tax on disbursements. The value of family pension wealth thus becomes comparable with other financial savings, which are not deductible and thus not taxable.

Source: Own calculations on the basis of register data from Statistics Denmark and other institutions, cf. Box 4.

However, the overall picture masks substantial differences between the individual families, as shown in the previous sections. Since 2003 the gross debt in families with net debt (excluding pension wealth) has increased by kr. 346 billion, which is almost half the increase in total gross debt. At the same time, such families have increased their financial assets by kr. 20 billion, and their pension wealth after tax has risen by kr. 117 billion. Even including pension wealth, the net financial position has thus deteriorated by kr. 210 billion in the period under review, a somewhat stronger deterioration than the growth in the value of their owner-occupied homes.

Despite the generally positive development in wealth since 2003, some groups are thus showing different and far more negative patterns.

Change in debt and wealth items 2003–10, selected groups Table 11

Kr. billion	All families	10th income decile	10th gross debt decile	Families with positive net debt before pension wealth
Gross debt	734	240	348	346
Assets excluding pension wealth after tax	1,212	360	411	212
– housing in Denmark	930	284	346	192
– other assets	282	77	65	20
Assets incl. pension wealth after tax	1,740	487	520	329
– pension wealth after tax	528	127	110	117

Note: The Table shows the absolute changes from 2003 to 2010 in the sum for the variable in question among the families in each of the segments shown. For example, the figure in the top right-hand corner of the Table indicates the absolute difference between total gross debt in 2010 among families with positive net debt at end-2010 and the corresponding sum in 2003 for families with positive net debt that year.

Source: Own calculations on the basis of register data from Statistics Denmark and other institutions, cf. Box 4.

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Household over-indebtedness

Definition and measurement with Italian data

Giovanni D'Alessio[1] and Stefano Iezzi[2]

Introduction[3]

The economic recession following the financial crisis which began in 2008 and the job losses to which it gave rise, together with a continuing squeeze on credit, has triggered concerns that a substantial and growing number of households are likely to have difficulty in managing the debts they accumulated in the years leading up to the crisis.

There is some evidence of this having occurred in the countries hardest hit by the recession, which are also to a large extent those that recorded the largest increase of household debt before the crisis.

In the case of Italy, for many years the significant increase in household debt did not give rise to concern for several reasons: the initial level of household indebtedness was particularly low by international standards; the increase recorded in recent years has only filled part of the gap; the growth in indebtedness has been seen as reflecting the reduction in both nominal and real interest rates as a consequence of the increase in competitiveness in financial markets, which has reduced the cost of debt and the cases of credit constraints. The difficult economic conditions associated with the crisis have also led in Italy to the recent approval of a law on consumer bankruptcy.[4, 5]

The intention here is to examine the accumulation of consumer debt among Italian households, the form which it has taken and the extent to which it has been associated with problems of servicing interest charges and debt repayment. The aim is also to examine the types of households, in terms of income level and other characteristics, likely to become over-indebted, in the sense of having difficulty in servicing their outstanding loans.

Studying over-indebtedness is of interest for many reasons. It is of course a problem for people who live in a condition of economic distress which they are unable to quit. Accordingly, over-indebtedness has to be considered as a social issue and its measurement should focus on the number of people involved and the extent of their difficulty. But over-indebtedness can also be seen as an issue for financial intermediaries, and more in general

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3 We wish to thank Luigi Cannari and Grazia Marchese for their helpful comments. The views expressed are those of the authors and do not necessarily reflect those of the Bank of Italy.

4 See Viimsalu (2010) for an analysis of European legislation in this field.

5 According to Law 3/2012 over-indebtedness is defined as a situation in which there is a persistent imbalance between obligations and assets that can be easily liquidated, as well as an inability to fulfil the obligations regularly. The law says that over-indebted persons can apply for a repayment plan to a specific agency and to the court, and, if accepted, the plan is also binding for the creditors. The judge can also decide on a suspension of any executive action by the creditors against the debtors.

for the stability of the financial system as a whole. Consequently, it is important to emphasize the quantity of the debt and the amount of collateral provided to guarantee the loans.

This research is mainly concerned with the methodological aspects of the problem, as we try to improve the existing knowledge about ways of measuring financial difficulty and over-indebtedness. This will be done following both the approaches described above. The empirical research is conducted on the Italian Household Income and Wealth Survey, which collects data on debts, income and assets, as well as for subjective indicators of well being. A comparative analysis of the phenomenon across several countries will be possible in the near future, when the data on the first wave of Household Finance and Consumption Surveys become available.

The paper is organized as follows. In the next section we outline the main measures of over-indebtedness present in the literature. In the third section the measures are critically examined and discussed with reference to the Italian case by using micro data from the Bank of Italy's Household Income and Wealth Survey. Section 4 examines the performance of the indicators used to identify over-indebted households, as well as the robustness and optimality of the cut points usually adopted. In section 5 we examine how the measures of over-indebtedness characterize the various segments of Italy's population, over the period 2006-10. Section 6 examines how these measures are connected with the traditional measure of poverty. Section 7 outlines the conclusions.

Definitions and indicators of over-indebtedness

According to the life-cycle theory, households apply to credit markets because they want to have steady living conditions over the years. Since income generally increases at the beginning of a person's life and decreases in the period following retirement, debt is the means that allows households to smooth their expenses over their lives; young families expect their future income to grow and spend more than they earn, thus accumulating debts that they will repay when they are more mature.

In the above framework, there are many reasons why a household may accumulate more debt than it can repay.[6]

A first driver of over-indebtedness is financial imprudence (Disney, Bridges and Gathergood, 2008; Anderloni and Vandone, 2010), i.e. poor financial decisions caused by an inadequate understanding of the real cost of repaying the loan. This factor may be linked both to the issue of the transparency of lenders' terms and conditions (Department of Trade and Industry, 2001) and to borrowers' financial literacy and ability to manage their finances correctly (plan expenses and income) (Lusardi and Tufano, 2009).[7] The imprudence may also derive from psychological biases and mental shortcuts that affect consumers' decisions and predictions about borrowing, such as the over-confidence bias, i.e. the tendency to underestimate the probability of suffering an adverse event (Kilborn, 2005). Bucks and Pence (2008) show that borrowers with adjustable-rate mortgages are likely to underestimate or not know how much their interest rates could change.

Over-indebtedness may also arise, however, when unexpected events modify the initial conditions in which the contract between creditor and debtor was concluded (Keese, 2009).[8]

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[6] An analysis of the nature of over-indebtedness in the framework of economic theory, and of its measures can be found in Betti et al. (2007).

[7] A recent critique of financial education public programs can be found in Willis (2008).

[8] Of course, the effects of adverse events can be limited by insurance. When the events are reasonably foreseeable, the lack of insurance can be seen as a form of imprudence.

An unexpected reduction of household income (e.g. a job loss), an unforeseen expense (e.g. expensive medical care), an increase in the cost of debt (e.g. a rise in interest rates) are all events that can lead to over-indebtedness. Unexpected changes in family structure may also affect the ability to repay the debt (e.g. divorce or the birth or death of a family component).

In some cases the condition of over-indebtedness derives from poverty, which pushes individuals incapable of coping with their expenses to ask for a loan that has little chance of being repaid; this mainly happens when creditors are unable to select the right debtors. It is also important to note the particular situation when the need for a loan is determined by the condition of over-indebtedness itself, thus causing a vicious cycle that is potentially disruptive for families and dangerous for financial intermediaries.[9]

But what do we really mean by over-indebtedness and how can we measure it? There is not a consensus in the literature on the definition of over-indebtedness (Kempson, 1992; Bridges e Disney, 2004; Kempson, McKay and Willitts, 2004) or, consequently, on how to measure it. The European Commission in a recent study (European Commission, 2008a) examined and compared definitions and measures of over-indebtedness in the EU countries, and underlined the different points of view emerging from the different socio-economic and legislative environments.

For example, in Germany, over-indebtedness has been defined as a situation where household income "in spite of a reduction of the living standard, is insufficient to discharge all payment obligations over a long period of time" (Haas, 2006). In France, where there is a special Committee on the topic, an individual is considered over-indebted when, with well-meaning intentions, he/she is unable to meet the obligations coming from debts obtained for non-professional reasons. In the UK the focus has been put on being in arrears in paying regular bills, over-indebtedness being defined as a situation "where households or individuals are in arrears on a structural basis, or at a significant risk of getting into arrears on a structural basis" (Oxera, 2004).

In the wide variety of official national definitions of over-indebtedness the European Commission study identifies some features common to all countries: the economic dimension (amount of debt to repay), the temporal dimension (the relevant horizon is the medium-long term), the social dimension (the basic expenses that have to be met ahead of the repayment of the debts) and the psychological dimension (the stress that over-indebtedness causes).

A more recent study carried out for the European Commission to develop a common definition across the EU has identified a set of criteria to be applied (European Commission, 2010):

- the unit of measurement should be the household because the incomes of individuals are usually pooled within the same household;
- indicators need to cover all aspects of households' financial commitments: borrowing for housing purposes, consumer credit, to pay utility bills, to meet rent and mortgage payments and so on;
- over-indebtedness implies an inability to meet recurrent expenses and therefore should be seen as a structural rather than a temporary state;
- it is not possible to resolve the problem simply by borrowing more;
- for a household to meet its commitments, it must reduce its expenses substantially or find ways of increasing its income.

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9 As noted by Valins (2004), factors such as gambling, alcoholism and drug addiction can also be considered as causes of over-indebtedness, although they are barely considered in the mainstream debt literature.

According to these criteria, a household is over-indebted when its existing and expected resources are insufficient to meet its financial commitments without lowering its standard of living, which might mean reducing it below what is regarded as the minimum acceptable in the country concerned, which in turn might have both social and policy implications.

This definition of over-indebtedness might be widely accepted in principle but in practice it is very difficult to identify households in such a situation. Consequently empirical studies have tended to use more practical definitions.

Recent studies of over-indebtedness have tended to converge on a common set of indicators, while noting that there is no universal agreement on which indicator best captures true over-indebtedness (BIS, 2010, Keese, 2009). The indicators broadly reflect four aspects of over-indebtedness: making high repayments relative to income, being in arrears, making heavy use of credit and finding debt a burden (see Table 1).

Table 1

Common indicators of over-indebtedness

Category	Indicator
Cost of servicing debt	Households spending more than 30% (or 50%) of their gross monthly income on total borrowing repayments (secured and unsecured)
	Households spending more than 25% of their gross monthly income on unsecured repayments
	Households whose spending on total borrowing repayments takes them below the poverty line
Arrears	Households more than 2 months in arrears on a credit commitment or household bill
Number of loans	Households with 4 or more credit commitments
Subjective perception of burden	Households declaring that their borrowing repayments are a “heavy burden”

The first two indicators capture the burden imposed by debt repayments and put arbitrary limits on repayments relative to gross income, beyond which they are thought to represent a significant burden for households. Oxera (2004) identifies 50 per cent as the limit for the ratio of the cost of debt to income beyond which repayments are a major burden for households (DeVaney and Lytton, 1995). When considering only unsecured loans, the limit drops to 25 per cent. This indicator is based on the fact that the risks connected with collateralized debts are basically covered by real assets, thus the analysis must be restricted to unsecured loans. The third indicator refers to the situation in which the income available, after paying the debt servicing costs, is not sufficient to meet the basic needs of life.

The arrears indicator captures all forms of debt and household bills for which a household is more than two months overdue. The cut-off is chosen in such a way that households simply forgetting to pay a bill or debt for one or two months are not considered to be over-indebted (Oxera, 2004).

A different approach to measuring over-indebtedness is to use the presence of multiple debts. The DTI Task Force on Tackling Overindebtedness (Kempson, 2002) identified a strong relationship between individuals reporting debt repayment difficulties and being in arrears and having four or more credit commitments. This measure has to be seen as an indicator of risk, as the use of multiple creditors might limit creditors’ ability to measure the risk of insolvency correctly and might be strategic for households wishing to obtain an amount of credit higher than what the banking system would normally allow. However, given the expansion of credit products in recent years, it has been suggested that the threshold of four credit commitments may no longer be meaningful.

Considering the difficulties associated with most indicators of over-indebtedness, arguably the most powerful method is to ask people directly whether or not they are facing debt repayment difficulties. This is the preferred approach in Betti et al.'s (2007) cross-comparison of over-indebtedness in European Union countries. Using the EU's harmonized Household Budget Survey and the European Community Household Panel dataset, Betti et al. argue that although their measure is subjective, and thus prone to error due to different people's interpretations of whether or not they are facing repayment difficulties, there does not appear to be a substantial group of people who hide their difficulties from official surveys.

All of the indicators presented above suffer from a variety of problems.

Repayment-to-income ratios offer an apparently simple way of measuring over-indebtedness, but there are serious problems with this approach. For example, there are questions as to whether an increase in borrowing, which implies an increase in the repayment-to-income ratio, is driven by households who can afford it. In other words, debt can increase relative to income without this necessarily making debt management problems more acute if the increase occurs predominantly among households with high levels of income. Households with high levels of income can potentially bear a debt burden higher than 30 per cent of their income.

In addition, debt-to-income ratio measures typically ignore household assets. Households might accept a debt burden of more than 30 per cent if they can rely on financial assets worth more than their outstanding debts: it appears unrealistic to classify such households as over-indebted. Furthermore, while an increase in outstanding debt might be accompanied by growing difficulty in servicing the loans, it might be accompanied by an increase in the value of assets which are often the counterpart of the debt. In other words, households might be able to meet their debt servicing obligation by selling some of the assets, though this might be problematic if the only asset is the home in which they are living. Furthermore, the availability of assets may allow households with heavy debt burdens to access new credit. An expansion of credit should make it easier for households to manage their debt and cope with temporary reduction in income.

The over-indebtedness indicator that identifies the households that, after taking account of the spending on total borrowing repayments, are below the poverty line has the great advantage of referring to a commonly accepted threshold: the poverty line.

Although the use of data on arrears in making payments avoids such problems to some extent, it is still necessary to judge the seriousness of the arrears and the point where over-indebtedness begins, which itself will depend on the situation in different countries and the financial circumstances of the household. Furthermore, by looking only at the households currently unable to repay their debts, this measure may overlook those who still manage to meet their financial obligations, but who have borrowed so much that they have become vulnerable to external shocks, such as an increase in interest rates or a temporary loss in income. Arguably, such households can also be considered over-indebted.

The criterion based on the number of credit commitments might not reliably detect situations of over-indebtedness since a large number of outstanding small debts does not necessarily imply a condition of difficulty. Similarly, being behind in the payment of small amounts might not correspond to a condition of over-indebtedness.

Moreover, all these measures, for the most part, are measures of the process of becoming over-indebted, rather than measures of the outcome associated with having problems with debts. As these indicators address different aspects of over-indebtedness, they each provide potentially valuable information. However, none of them is ideal in the sense that it prevails over all the others. For example, Disney et al. (2008) argue that the various indicators are likely to capture debt problems in different household types and at different points of the life cycle. The challenge here is to find an appropriate set of indicators that can determine the likely proportion of the population facing debt repayment difficulties. Moreover such a set of indicators will need to operate within the limits of the available data.

Considering the difficulties associated with most indicators of over-indebtedness, arguably the most powerful method is to ask people directly whether or not they are facing debt repayment difficulties. The drawback with subjective indicators is that they inevitably depend on individuals' interpretation of terms such as "heavy burden", which is likely to vary both between households within countries and, even more, between households of different countries.

The application of the indicators to the Italian case

This section provides an assessment of the most common indicators of over-indebtedness for the case of Italy, using micro-data obtained from the 2010 Italian Survey on Household Income and Wealth (SHIW, hereafter). The SHIW has been conducted almost every two years by the Bank of Italy since 1965 to collect information on the economic behavior of Italian households using a sample of about 8,000 households. The survey collects detailed data on income and wealth, but also information on demographics, consumption, savings, and several other topics.

The wealth of data coming from the biennial Italian survey allows the construction of all of the common indicators of over-indebtedness at household-level with a good degree of accuracy. For example, with regard to the debt-burden indicators, the SHIW collects data on income and debt servicing costs for all types of loan with the exclusion of those associated with business.[10]

Considering the debt-to-income ratio indicator with a 30 per cent cut point (A_{30}, where A=R/Y, hereafter), the SHIW survey collects detailed information on household assets, thus allowing us to exceed the limits of the traditional indicator. First of all, we can consider that households who hold financial assets can sell them to pay their debts if there is an unexpected event, such as a job loss, that jeopardizes their ability to make payments. It is also possible to define a different version of the traditional debt-burden indicator, by reducing the total borrowing repayments by an amount proportional to the ratio between the outstanding debt and the value of the financial assets, under the hypothesis that households use their financial assets to repay some or all of their debts, thus reducing their debt servicing costs proportionally.

In formal terms, if AF is the stock of financial assets and D is the outstanding debt, the debt servicing costs are reduced by an amount equal to AF/D. If the value of the financial assets exceeds the debt, the outstanding debt becomes null. Note also that when households sell their financial assets, they stop receiving the related income flows, thus their disposable income, Y, decreases by an amount equal to the income from financial assets, YCF, and the debt-burden indicator becomes:

$$A1 = \frac{\max(0, D - AF)}{D} \cdot \frac{R}{(Y - YCF)}$$

10 The burden indicators could suffer from measurement errors affecting income, assets and liabilities in sample surveys. In SHIW data, under-reporting of debt values is considered to be significantly higher than that of income. D'Aurizio et al. (2006), analyzing the Italian survey data for 2004, arrive at an estimate of the level of under-reporting of debts of about 28 per cent, while D'Alessio and Faiella (2002) show that the under-reporting of income varies from 5 to 14 per cent in the 2000 survey.

The use of financial assets to repay some or all of the outstanding debt implies in general that A1<A, except where the return on the financial assets is particularly high and the financial liabilities are long-term debts.

Households might also own real assets such as their homes and other properties. Since a household's home is generally very illiquid, it is important to distinguish two different upgrades of the debt-burden indicator. In the first case we assume that households can use both financial assets and real assets in the form of properties other than their homes.

If AR2 is the stock of real assets in the form of properties other than the household's home, in the hypothesis that the household sells all these assets together with the financial assets to repay its debts, the debt servicing costs are reduced by an amount equal to (AF+AR2)/D. As for the preceding case, the use of the properties to repay some or all of the outstanding debt implies that the household stops receiving some or all of the income flows coming from those assets, thus their disposable income decreases by YCA, representing the income from real estate associated with the assets sold, and the debt-burden indicator becomes:

$$A2 = \frac{\max(0, D - AF - AR2)}{D} \cdot \frac{R}{(Y - YCF - YCA)}$$

Another version of the indicator also considers the household's home. We assume that households cannot obtain the entire value of the property, but only a part representing the residual life estate value, under the hypothesis that households continue to live in their homes. The value of the residual life estate can be obtained by multiplying the market value of the property by a coefficient depending on the age of the holder of the life estate.[11] If AR1 is the market value of the household's home and f is the conversion coefficient to the value of the residual life estate, the debt servicing costs are reduced by (AF-AR2-AR1·f)/D and the debt-burden indicator becomes:

$$A3 = \frac{\max(0, D - AF - AR2 - AR1 \cdot f)}{D} \cdot \frac{R}{(Y - YCF - YCA)}$$

Finally it is possible to identify three new indicators of over-indebtedness, $A1_{30}$, $A2_{30}$ and $A3_{30}$, by using the three variables A1, A2 and A3, defined above, and the 30 per cent cut point, as used for the traditional indicator A.

With SHIW data it is also possible to construct the B indicator, which identifies households as over-indebted whose income is below the poverty line and who are indebted at the same time, or whose spending on total borrowing repayments takes them below the poverty line. For this purpose we use the modified OECD scale of equivalence (which assigns a coefficient of 1 to the head of household, 0.5 to other household members aged 14 or more, and 0.3 to those younger than 14) and the poverty line equal to 60 per cent of the median income (European Commission, 2008b).

SHIW data also allow us to define the C_{25} indicator (related to households that spend more than 25 per cent of their gross monthly income on unsecured repayments).

With regard to arrears, the D indicator provides data on structural arrears connected only with repayments of mortgage and consumer loans. Arrears on domestic bills are excluded, so that the percentage of over-indebted households is probably underestimated. Note, moreover, that it is plausible to assume that the direct question on arrears is penalized by patterns of shame and embarrassment that are likely to prevent individuals from answering truthfully.

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11 The Italian Revenue Agency provides coefficients for the computation of residual life estate as a function of the current market value and the owner's age.

With the SHIW data it is also possible to measure the number of loans with a good approximation, considering households to be over-indebted that have 4 or more debts (the E_4 indicator). The survey collects information on the number of loans connected with properties. For other household needs (purchases of durable and non-durable goods and for business purposes) the 2010 survey collects data on the number of loans.

With regard to the subjective perception of debt problems, in the SHIW there is no information that allows the construction of this specific indicator. However, in the SHIW questionnaire households are asked whether their income is sufficient to see them through to the end of the month. The information coming from this question relates to any form of spending and not only to debt repayments, consequently the condition of difficulty might be caused determined by an excessive level of indebtedness besides other factors. Thus this indicator cannot be employed as a proxy of the subjective measure of debt problems, but it can be used as a benchmark for assessing the over-indebtedness indicators.

In the last column of Table 2 the estimates of the indicators are reported for the year 2010. According to SHIW 3.1 per cent of Italian households spend more than 30 per cent of their income to repay their debts. If we consider the assets held by households, the percentage drops to 2.4, 2.2 and 1.1 per cent respectively for the indicators A1, which considers financial assets, A2, which considers financial assets and properties other than the household's home, and A3, which considers all assets with the exception of the value of the residual life estate of the household's home. About 6 per cent of households are considered to be poor and indebted or to have debt servicing costs that take them below the poverty line.

The percentage of over-indebted households is only 0.9 per cent when the 25 per cent cut point is considered for non-collateralized debts, given the low diffusion of consumer credit among Italian households and the relatively low average amount of credit per household. The percentage of households in arrears is only 1.1 per cent, partly because arrears on domestic bills are excluded from the computation. The percentage of households with 4 or more credit commitments is also very low at 0.5 per cent.

All the debt-burden indicators are very connected with each other; households who are identified as over-indebted according to the $A3_{30}$ indicator are, with just a few exceptions, a subset of the households who are considered over-indebted by the $A2_{30}$ indicator, and so on backwards to the A_{30} indicator.

Table 2

Over-indebted households according to various indicators, 2010

(percentages)

	A_{30}	$A1_{30}$	$A2_{30}$	$A3_{30}$	B	C_{25}	D	E_4	Total
A_{30}. Households spending more than 30% of their gross monthly income on total borrowing repayments	-	2.39	2.17	0.97	1.92	0.65	0.35	0.17	3.10
$A1_{30}$. Households spending more than 30% of their gross monthly income on total borrowing repayments (after deducting their financial assets)		-	2.17	0.94	1.57	0.41	0.32	0.16	2.39
$A2_{30}$. Households spending more than 30% of their gross monthly income on total borrowing repayments (after deducting their financial assets and properties other than their main home)			-	0.94	1.43	0.41	0.30	0.12	2.17
$A3_{30}$. Households spending more than 30% of their gross monthly income on total borrowing repayments (after deducting financial and real assets except for the residual life estate of the household's home)				-	0.80	0.34	0.28	0.08	1.13
B. Households who are poor and indebted or whose spending on total borrowing repayments takes them below the poverty line					-	0.54	0.71	0.12	6.20
C_{25}. Households spending more than 25% of their gross monthly income on unsecured repayments						-	0.15	0.00	0.89
D. Households in arrears on a credit commitment for more than 3 months							-	0.09	1.15
E_4. Households with 4 or more credit commitments								-	0.37
F. Households reporting they make ends meet "with difficulty" or "with great difficulty"	1.60	1.29	1.10	0.75	4.11	0.68	0.93	0.19	29.83
Households reporting they make ends meet "with difficulty" or "with great difficulty" among the over-indebted households according to the indicator in column	51.6	54.0	50.7	66.4	66.3	76.4	80.9	51.4	-

If we exclude the different versions of the debt-burden indicator, it will be seen that the degree of overlap between over-indebtedness indicators is very limited. The percentage of households who are over-indebted according to two indicators simultaneously is not higher than 1.9 per cent (households who spend more than 30 per cent of their income on borrowing repayments and whose spending on borrowing repayments takes them below the poverty line, i.e. A_{30} and B). In general, 8.2 per cent of Italian households are over-indebted according to at least one of the five indicators (A_{30}, B, C_{25}, D, E_4), 2 per cent according to at least two indicators at the same time and 0.6 per cent according to three indicators, while only 0.2 per cent of households are over-indebted according to four or five indicators contemporaneously.

This result, quite common in the literature,[12] can be justified by the limited ability of the indicators to detect the real situations of over-indebtedness; it is more likely explained, however, by the multidimensional structure of over-indebtedness. Thus it can be useful to analyze how the different over-indebtedness indicators are connected with the more general subjective indicator of economic distress.

In aggregate, 29.8 per cent of households report that they make ends meet with "difficulty" or with "great difficulty". Note, however, that the general condition of economic difficulty might be determined by an excessive level of indebtedness besides other factors. There might be households who report they are in economic distress even if they are not over-indebted. It seems acceptable to assume, however, that households who are over-indebted will have declared themselves to be in economic distress. This condition is not fully satisfied by any of the over-indebtedness indicators.

If we consider the overall debt indicator (A_{30}), it is found that over 50 per cent of households declare they are also economically distressed. In other words, about half of those who are detected as over-indebted according to this indicator report general economic difficulty. The degree of overlap between the over-indebtedness indicator and the subjective measure of economic distress is generally quite low. For instance, one fifth of the households who are in arrears on a credit commitment for at least 3 months (indicator D, equal to 1.15 per cent), report economic difficulty. Half of the households who declare that they have at least 4 debt commitments (indicator E_4, about 0.4 per cent) are also economically distressed. Among the households with a debt burden on non-collateralized loans of more than 25 per cent of their income (indicator C_{25}), about three quarters are also in economic difficulty according to their self-report. Finally, in two cases out of three households that are debt poor declare they are economically distressed.

It is also important to note that over-indebtedness is only a small subset of the households who declare that they are in economic difficulty. No more than 4.7 per cent of the economically distressed households have an overall debt burden higher than 30 per cent of their income. In other words over-indebtedness does not appear to be a widespread factor explaining the perceived condition of economic distress. This result may be due to the relatively limited diffusion of debts among Italian households and the strong correlation between levels of debt and income among households. At the same time another important possible explanation, which deserves to be analyzed in depth, may be the poor ability of the indicators to detect conditions of over-indebtedness. This highlights the need to analyze how the indicators are constructed and the cut points selected.

The performance of the over-indebtedness indicators

The predictive performance of the indicators of over-indebtedness can be theoretically evaluated by comparison with what is called a "gold standard", i.e. a measure that indicates whether a household is over-indebted or not with certainty. If a "gold standard" is available, the performance of each indicator is usually summarized by its sensitivity and specificity. In our case we do not have a gold standard at our disposal; however, we believe that we can use the subjective measure of economic distress which, despite its limitations, can be considered an "imperfect gold standard".

The objective of the following analysis is to evaluate the performance of the indicators by changing the cut points. In general, as the threshold is moved up, the percentage of over-indebted households who declare they are economically distressed rises. This effect also

[12] BIS, 2010.

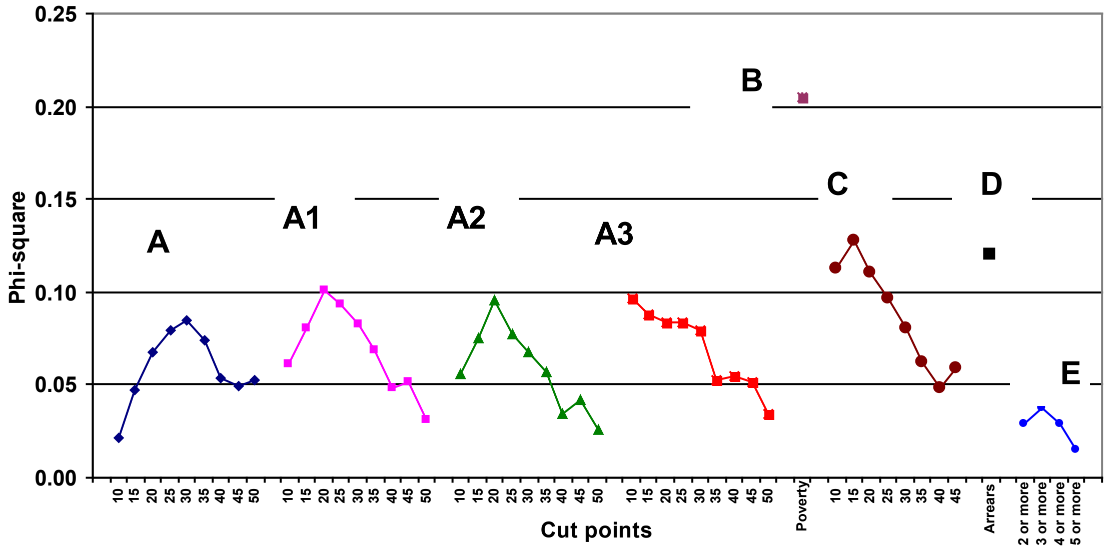
causes a reduction in the percentage of households who are found to be over-indebted. This inevitable trade-off suggests looking for the cut point that maximizes some measure of statistical association between the over-indebtedness indicator and the imperfect gold standard.

Table 3 displays the value of a few measures of statistical association between the over-indebtedness indicator and the dichotomous indicator of household economic distress according to different threshold values for each indicator.[13]

The A indicator has the highest value of statistical association Φ^2 with the subjective indicator of economic distress when the cut point is 30 per cent (A_{30}), thus empirically confirming the importance of this threshold as indicated in the literature. For indicators A1, A2 and A3, which consider the assets held by households, the association measure reaches its peak when the cut point is 20 per cent for A1 and A2, and 10 per cent for A3 ($A1_{20}$, $A2_{20}$, $A3_{10}$). For the indicator C related to non-collateralized loans, the association measure reaches its peak when the cut point is 15 per cent (C_{15}), which is lower than the value generally recommended in the literature. For the indicator relating to the number of debt commitments, the statistical association is highest when the threshold is 3 or more loans (E_3).

Figure 1

Performance of over-indebtedness indicators according to different cut points, 2010



[13] See Appendix A for the definition of the indexes used.

Table 3

Performance of over-indebtedness indicators according to different cut points, 2010

Indicator	Share of over-indebted households	Phi^2		Specificity	Predictivity	Odds ratio	Relative risk	Accuracy
A								
A_{10}	14.1	0.021		0.863	0.322	1.139	1.094	0.651
A_{15}	9.8	0.048		0.911	0.364	1.397	1.252	0.675
A_{20}	6.7	0.068		0.944	0.414	1.730	1.428	0.690
A_{25}	4.4	0.080		0.966	0.468	2.148	1.611	0.699
A_{30}	3.1	0.085		0.979	0.516	2.597	1.772	0.703
A_{35}	2.3	0.074		0.984	0.518	2.590	1.767	0.703
A_{40}	1.7	0.053		0.987	0.483	2.230	1.636	0.701
A_{45}	1.4	0.049		0.989	0.484	2.239	1.639	0.701
A_{50}	1.2	0.052		0.992	0.515	2.535	1.744	0.702
A1								
$A1_{10}$	9.6	0.061		0.916	0.384	1.535	1.329	0.680
$A1_{15}$	6.9	0.081		0.944	0.434	1.891	1.505	0.693
$A1_{20}$	4.7	0.101		0.967	0.506	2.532	1.757	0.702
$A1_{25}$	3.3	0.093		0.978	0.527	2.728	1.816	0.704
$A1_{30}$	2.4	0.083		0.984	0.540	2.840	1.847	0.704
$A1_{35}$	1.6	0.068		0.989	0.540	2.822	1.837	0.703
$A1_{40}$	1.2	0.048		0.991	0.494	2.328	1.671	0.702
$A1_{45}$	1.0	0.052		0.994	0.536	2.747	1.811	0.702
$A1_{50}$	0.8	0.031		0.994	0.460	2.013	1.547	0.701
A2								
$A2_{10}$	9.0	0.056		0.920	0.379	1.494	1.306	0.680
$A2_{15}$	6.5	0.075		0.947	0.428	1.842	1.481	0.692
$A2_{20}$	4.3	0.095		0.969	0.503	2.488	1.740	0.702
$A2_{25}$	3.1	0.077		0.978	0.498	2.402	1.704	0.702
$A2_{30}$	2.2	0.067		0.985	0.505	2.450	1.718	0.702
$A2_{35}$	1.5	0.056		0.990	0.508	2.467	1.722	0.702
$A2_{40}$	1.1	0.035		0.992	0.451	1.946	1.520	0.701
$A2_{45}$	0.9	0.042		0.994	0.504	2.407	1.699	0.702
$A2_{50}$	0.7	0.026		0.995	0.440	1.860	1.481	0.701
A3								
$A3_{05}$	6.0	0.065		0.950	0.415	1.731	1.427	0.691
$A3_{10}$	4.1	0.096		0.971	0.511	2.568	1.767	0.703
$A3_{15}$	2.6	0.089		0.983	0.546	2.919	1.872	0.704
$A3_{20}$	1.7	0.083		0.990	0.586	3.407	1.997	0.705
$A3_{25}$	1.1	0.084		0.995	0.668	4.831	2.271	0.705
$A3_{30}$	0.8	0.080		0.996	0.694	5.413	2.352	0.705
$A3_{35}$	0.6	0.052		0.997	0.604	3.615	2.036	0.703
$A3_{40}$	0.4	0.055		0.998	0.706	5.697	2.380	0.703
$A3_{45}$	0.4	0.052		0.998	0.694	5.382	2.339	0.703
$A3_{50}$	0.3	0.034		0.999	0.607	3.645	2.040	0.702
B	6.2	0.205		0.970	0.663	5.199	2.417	0.722
C								
C_{10}	4.4	0.112		0.971	0.539	2.903	1.877	0.705
C_{15}	2.4	0.127		0.989	0.672	5.028	2.323	0.710
C_{20}	1.5	0.110		0.994	0.708	5.869	2.423	0.708
C_{25}	0.9	0.097		0.997	0.765	7.796	2.600	0.706
C_{30}	0.7	0.081		0.998	0.753	7.285	2.551	0.705
C_{35}	0.4	0.063		0.998	0.724	6.232	2.444	0.704
C_{40}	0.4	0.048		0.998	0.662	4.629	2.228	0.703
C_{45}	0.3	0.059		0.999	0.795	9.165	2.677	0.703
D	1.1	0.120		0.997	0.807	10.136	2.761	0.709
E								
E_2	6.7	0.029		0.938	0.348	1.277	1.181	0.681
E_3	1.4	0.037		0.988	0.439	1.859	1.482	0.700
E_4	0.4	0.029		0.997	0.520	2.561	1.749	0.702
E_5	0.1	0.016		0.999	0.544	2.811	1.826	0.702

With respect to any other indicator and considering any cut point, the debt-poverty indicator B displays the highest level of statistical association Φ^2 followed by the C15 indicator, based on non-collateralized loans with cut point at 15 per cent of disposable household income.

The latter result might be explained by the fact that collateralized debts represent a less severe source of economic distress since the loan is covered by guarantees. Quite a high level of statistical association is also found for the D indicator, based on arrears. The $A1_{20}$, $A2_{20}$ and $A3_{10}$ indicators have values of statistical association that are very similar and slightly higher than the value for the traditional A_{30} indicator, thus confirming the need to redefine this indicator in order to take financial and real assets into account. The number of loan commitments (E) does not seem to contribute to the construction of a performing indicator of over-indebtedness: the highest level of statistical association is reached when the cut point is "3 or more" (E_3), and it is lower than for any other indicator.

The evaluation of the cut points according to different statistical association measures, as shown in Table 3, does not modify the general picture outlined above. The over-indebtedness indicators based on arrears and the non-collateralized debt burden are the best performing indicators in terms of ability to detect conditions of over-indebtedness.[14]

In what follows, we will only consider the indicators with cut points that maximize the statistical association between the subjective condition of economic distress and the over-indebtedness indicator, i.e. A_{30}, $A1_{20}$, $A2_{20}$, $A3_{10}$, C_{15}, E_3, and B and D. The degree of internal consistency of the new indicators, according to Cronbach's alpha is equal to 0.85, which is higher than the level estimated on the set of indicators defined as shown in Table 2 (A_{30}, $A1_{30}$, $A2_{30}$, $A3_{30}$, B, C_{25}, D, E_4), for which it is equal to 0.8.[15] By using the new cut points, the proportion of households with only one indicator decreases while the proportion of households with more than one indicator increases.

Who is over-indebted?

Table 4 shows the percentage of over-indebted households, according to different indicators and according to the cut points that maximize the explicative power of the condition of economic distress.

According to the debt-burden indicators (A) and the debt-poverty indicator (B), between 2 and 4 per cent of Italian households are over-indebted; they are generally with a head of household aged between 31 and 40 years, with a lower or upper secondary education; they are also self-employed, have a middle or low household income and live in a large city.

The non-collateralized loans indicator (C) and the arrears indicator (D) display figures that are very similar, but slightly different from those of the other indicators. According to these two indicators, over-indebted households have a young, employee head of household, are lower income households and resident in the South and Islands. The difference is more pronounced when the comparison is with the debt-poverty indicator.

As already emphasized previously, the proportion of over-indebted households drops drastically when we also consider perceived economic distress. Considering the debt-burden

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[14] In the 2006 and 2008 surveys the statistical association between the over-indebtedness indicators and the perceived condition of economic distress is always lower than in the 2010 survey. This could reveal a lower accuracy of the information collected in the earlier surveys, which implies attenuation bias in the measures of association. It is also possible that over-indebtedness was a less important issue before 2010. The highest levels of statistical association with the perceived condition of economic difficulty still involve the B and D indicators; lower values of association are found for the C indicators. The cut point values are not always confirmed for the 2006 and 2008 surveys. These results suggest that the choice of cut point depends both on the objective of the analysis and on the context.

[15] The Cronbach coefficient is a function of the simple correlation coefficients among the set of variables considered. Under the hypothesis that the variables measure a unique latent trait, Cronbach's alpha is a lower bound for the reliability score of the variable summing up all the variables considered (Cronbach, 1951).

indicator, the percentage halves to 2 per cent for A, A_1, A_2 and A_3, and to 0.6 per cent for E, the number of commitments indicator; it decreases by a third for the B indicator (to 4.1 per cent) and the C indicator (to 1.6 per cent), and by a fifth for the D indicator (to 0.93 per cent). The characteristics of the households are more or less the same as those identified by the only over-indebtedness indicators (Table 5).

It is important to note that in the case of the B and C indicators the amount of debt is lower than 20,000 euros in 70 per cent of the cases. For the other indicators this percentage is much higher (Table 6).

In any case all the figures seem to be much lower than those found in Betti et al. (2007), who used subjective indicators and found that about 10 per cent of households are over-indebted. In Betti et al.'s analysis Italy has the lowest level of over-indebtedness among the European countries (the EU average is 16 per cent).

Table 4

Over-indebted households according to different indicators, 2010

	A_{30}	$A1_{20}$	$A2_{20}$	$A3_{10}$	B	C_{15}	D	E_3	Perceived condition of economic distress
Age									
Up to 30 years	3.0	3.6	3.4	8.3	6.1	3.2	1.9	1.6	37.3
31 to 40 years	6.5	9.6	8.8	11.5	10.3	4.1	1.3	2.3	33.2
41 to 50 years	4.7	7.1	6.9	5.6	9.4	3.4	2.1	2.1	31.2
51 to 65 years	2.9	4.6	3.9	1.9	6.0	1.9	1.0	2.0	24.6
Over 65 years	0.3	0.7	0.6	0.4	1.8	1.0	0.3	0.0	30.0
Educational qualification									
None	0.1	0.8	0.8	0.2	5.3	1.3	0.1	0.2	61.4
Primary school certificate	1.0	1.9	1.7	1.2	4.1	1.5	0.9	0.4	38.2
Lower secondary school certificate	4.5	6.1	5.5	5.5	9.9	3.6	1.9	1.2	36.0
Upper secondary school diploma	3.4	5.6	5.3	5.4	4.8	2.5	0.9	2.7	19.7
University degree	2.6	4.1	4.1	3.3	1.9	0.4	0.3	1.7	9.5
Work status									
Employee	3.7	6.0	5.7	6.1	7.6	3.5	1.7	1.7	29.2
Self-employed	8.0	10.5	9.1	7.5	9.4	3.1	1.3	3.9	20.1
Not employed	0.9	1.4	1.2	0.9	3.6	0.9	0.5	0.3	33.7
Quintiles of household income									
1st quintile	5.3	6.3	5.8	6.7	20.8	6.4	2.8	0.5	74.8
2nd quintile	2.5	3.8	3.3	2.7	7.2	2.3	1.3	1.0	39.2
3rd quintile	3.3	5.1	4.9	4.9	2.1	2.0	0.8	1.7	21.3
4th quintile	1.6	4.9	4.7	4.1	0.5	0.6	0.8	1.4	10.3
5th quintile	2.8	3.3	3.1	2.2	0.5	0.6	0.1	2.6	3.6
Town size									
Up to 20,000 inhabitants	3.6	4.6	4.0	4.2	6.5	2.4	1.2	1.1	27.8
From 20,000 to 40,000 inhabitants	1.9	4.8	4.8	4.2	7.0	2.6	1.0	1.9	30.8
From 40,000 to 500,000 inhabitants	2.7	4.4	4.2	3.8	6.1	2.0	0.9	1.4	32.2
More than 500,000 inhabitants	3.4	5.8	5.2	4.7	4.3	2.8	1.6	2.3	31.2
Geographical area									
North	3.1	4.4	4.2	4.5	4.3	1.7	0.9	1.3	22.2
Centre	3.7	5.7	5.2	4.0	4.4	2.4	1.3	2.4	24.3
South and Islands	2.7	4.6	4.0	3.7	10.3	3.4	1.5	1.1	44.9
Total	**3.1**	**4.7**	**4.3**	**4.1**	**6.2**	**2.4**	**1.2**	**1.4**	**29.8**

Table 5

Over-indebted households according to different indicators and the subjective condition of economic distress, 2006-2010

									First principal component (*)		
	A_{30}	$A1_{20}$	$A2_{20}$	$A3_{10}$	B	C_{15}	D	E_3	2006	2008	2010
	and perceived condition of economic distress										
Age											
Up to 30 years	1.7	1.0	1.0	1.4	4.9	2.0	0.1	0.2	0.05	0.21	-0.08
31 to 40 years	2.8	4.4	3.6	4.8	6.5	2.8	1.1	1.1	-0.01	0.25	0.30
41 to 50 years	2.6	3.6	3.6	3.6	6.5	2.6	1.7	0.9	-0.02	0.06	0.23
51 to 65 years	1.6	2.5	2.3	1.3	3.5	1.0	1.0	0.9	-0.25	-0.16	-0.05
Over 65 years..................................	0.2	0.6	0.5	0.4	1.4	0.6	0.3	0.0	-0.33	-0.33	-0.27
Educational qualification											
None	0.1	0.8	0.8	0.2	5.3	1.2	0.1	0.2	-0.28	-0.24	-0.19
Primary school certificate	0.7	1.5	1.3	1.0	2.8	1.3	0.9	0.2	-0.22	-0.19	-0.15
Lower secondary school certificate ..	3.1	3.9	3.6	3.6	6.8	2.5	1.4	0.7	-0.06	0.14	0.25
Upper secondary school diploma	1.1	1.9	1.7	1.7	2.5	1.3	0.7	1.1	-0.18	-0.14	-0.09
University degree	0.2	0.8	0.8	0.8	1.2	0.2	0.3	0.5	-0.29	-0.29	-0.26
Work status											
Employee	1.9	2.7	2.7	2.8	5.0	2.3	1.4	0.8	-0.04	0.10	0.09
Self-employed	3.3	4.9	4.0	3.8	4.8	1.8	0.9	1.6	-0.22	-0.09	0.26
Not employed	0.7	1.2	1.1	0.8	2.9	0.8	0.5	0.2	-0.26	-0.24	-0.18
Quintiles of household income											
1st quintile	4.3	5.4	5.1	5.9	16.0	5.4	2.5	0.5	0.14	0.44	0.68
2nd quintile	1.5	2.1	1.7	1.5	3.5	1.1	1.0	0.6	-0.15	-0.06	-0.07
3rd quintile.......................................	1.2	2.2	2.2	1.6	0.9	1.2	0.6	0.9	-0.16	-0.12	-0.10
4th quintile.......................................	0.6	1.7	1.7	1.4	0.1	0.3	0.5	0.6	-0.31	-0.28	-0.19
5th quintile.......................................	0.3	0.6	0.4	0.3	0.0	0.0	0.0	0.6	-0.33	-0.35	-0.32
Town size											
Up to 20,000 inhabitants..................	2.0	2.5	2.2	2.3	3.9	1.6	0.9	0.6	-0.12	-0.06	0.02
From 20,000 to 40,000 inhabitants ...	0.7	1.8	1.8	1.6	4.2	1.9	0.8	0.5	-0.15	-0.10	-0.06
From 40,000 to 500,000 inhabitants .	1.5	2.4	2.4	1.8	4.6	1.2	0.9	0.7	-0.21	-0.07	0.00
More than 500,000 inhabitants	1.5	2.4	2.1	2.6	3.6	2.1	1.1	0.8	-0.23	-0.09	0.02
Geographical area											
North	1.3	1.8	1.6	1.9	2.7	1.0	0.8	0.6	-0.19	-0.12	-0.09
Centre	1.4	2.4	2.2	2.0	3.0	1.4	0.8	0.7	-0.26	-0.20	-0.03
South and Islands	2.2	3.3	3.1	2.5	7.0	2.6	1.2	0.7	-0.05	0.09	0.16
Total	**1.6**	**2.4**	**2.2**	**2.1**	**4.1**	**1.6**	**0.9**	**0.6**	**-0.16**	**-0.07**	**0.00**

(*) Principal component analysis conducted on the comparable variables along the period 2006-2010 (A_{30}, $A1_{20}$, $A2_{20}$, $A3_{10}$, B and C_{15}). Households from 2006 and 2088 surveys are treated as supplementary units, and thus do not contribute to determine the principal components.

Table 6

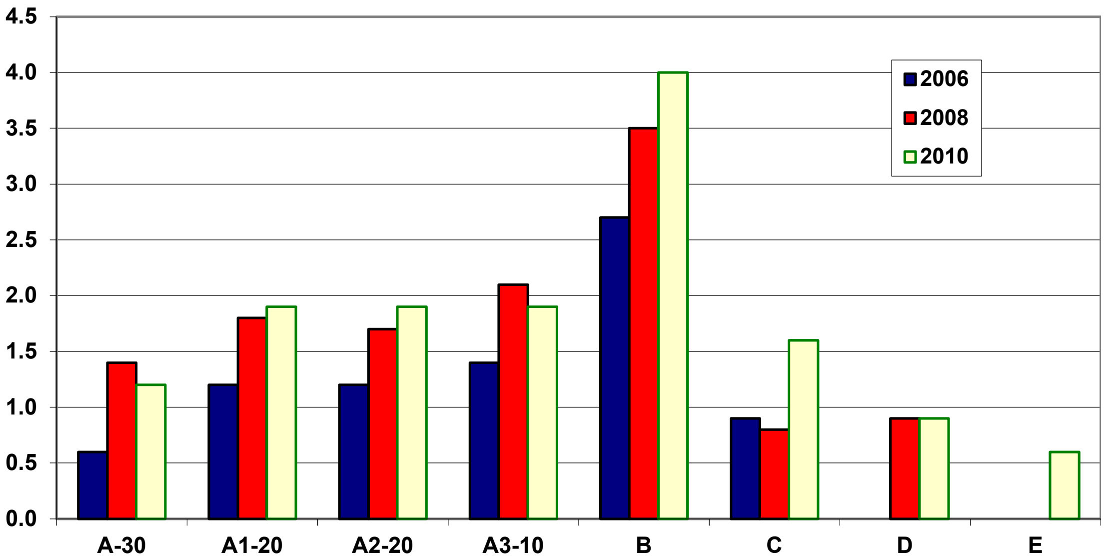
Amount of debt held by over-indebted households according to different indicators and the subjective indicator of economic distress, 2010

Amount of debt	A_{30}	$A1_{20}$	$A2_{20}$	$A3_{10}$	B	C_{15}	D	E_3
Up to 10,000 euros	17.1	9.6	9.2	14.0	51.7	51.7	31.5	5.7
From 10,000 to 20,000 euros.	7.7	8.7	9.3	10.6	12.1	19.8	26.1	13.0
From 20,000 to 50,000 euros.	19.4	20.1	20.3	11.6	13.8	18.9	15.6	15.7
From 50,000 to 100,000 euros	14.4	19.6	19.3	22.0	9.0	4.4	9.7	27.7
More than 100,000 euros.......	41.5	42.0	42.0	41.7	13.4	5.2	17.0	37.9
Total.....................................	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
	A_{30}	$A1_{20}$	$A2_{20}$	$A3_{10}$	B	C_{15}	D	E_3
Amount of debt	**and perceived condition of economic distress**							
Up to 10,000 euros	24.1	15.4	15.3	23.3	56.9	50.0	31.5	11.6
From 10,000 to 20,000 euros.	12.4	14.8	16.2	18.8	13.5	25.9	26.5	20.3
From 20,000 to 50,000 euros.	21.2	26.3	27.4	16.7	12.1	14.8	11.3	19.4
From 50,000 to 100,000 euros	9.5	14.3	13.5	14.9	5.8	2.7	11.4	16.8
More than 100,000 euros.......	32.8	29.2	27.6	26.2	11.8	6.6	19.4	31.8
Total.....................................	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

The comparison of the over-indebtedness indicators across the years shows that the percentage of over-indebted households increased between 2006 and 2010;[16] the largest increase concerned the debt-poverty and non-collateralized loan indicators (Figure 2). This dynamic is consistent with the findings of Magri and Pico (2012), who underline that the economic crisis has caused a decrease in the percentage of households holding a mortgage and an increase in the use of consumer credit.

Figure 2

Indicators of over-indebtedness, 2006-2010 (*)



(*) The 2010 estimates are different from those in Table 5 because, in order to allow comparison with 2006 and 2008, they exclude debt servicing costs for professional reasons.

[16] The computations take account of the changes in the questionnaires from 2006 to 2010.

If we consider the first principal component of the over-indebtedness indicators continually available in 2006-2010 (A_{30}, $A1_{20}$, $A2_{20}$, $A3_{10}$, B and C_{15}),[17] over-indebtedness grew significantly between 2006 and 2008, followed by a less rapid increase between 2008 and 2010. However, it is important to note that, whereas in 2006-2008 the rise of the first principal component refers to households in the first quintile of income, with an employee or self-employed head of household aged up to 40, in 2008-2010 the rise refers to households with a middle-aged self-employed head (Table 5).

Over-indebtedness and poverty

Notwithstanding debts represent liabilities, they are not generally a sign of bad economic conditions. In fact, indebted households have higher levels of income and wealth than non-indebted households (respectively by 27 and 12 per cent; Table 7).[18] A possible explanation of this result is that indebted households have regular incomes and use loans especially to buy their main home; thus debts are usually counterbalanced by assets and income from real estate. By contrast, less well-off households apply for loans less frequently, not least because debtors are selected by financial intermediaries.[19]

It makes one wonder whether the relationship between indebtedness and income and wealth is reversed in the case of over-indebtedness and what is the relationship between over-indebtedness and poverty.

The analysis of the different indicators does not provide a clear answer to this question. Over-indebted households according to the debt-poverty indicator, B, have a level of income and wealth that is approximately 45 per cent lower than that of other households. The same gap for income and a wider gap for wealth are recorded when using the C_{15} non-collateralized loans indicator with a cut point at 15 per cent. According to these two indicators, there is a positive connection between over-indebtedness and economic poverty.

Over-indebted households according to indicators D and $A3_{10}$ also have a significantly lower level of income and wealth than other households; the D indicator has a positive association with the condition of economic poverty; the association for the $A3_{10}$ indicator is still positive but more limited.

For the $A1_{20}$ and $A2_{20}$ indicators the figures are very similar to those for $A3_{10}$ but with a lower intensity. It is important to note that households that are over-indebted according to the A_{30} indicator (overall debt burden and cut point at 30 per cent of disposable income) have income that is 17.8 per cent lower than that of other households but wealth that is 26.2 per cent higher. The statistical association with economic poverty is positive but weak.

By contrast, households that are over-indebted according to the E_3 indicator have much higher levels of income and wealth than other households, and a negative association with economic poverty.

In sum, the indicators with the highest levels of statistical association with the subjective condition of economic distress (B, C_{15} and D) are those with higher levels of association with the objective condition of economic distress, in terms of income, wealth and economic

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[17] The first principal component explains 63.8 per cent of the total variability.

[18] There is a similar difference for the average value of the subjective indicator of happiness, which is 6.4 for indebted households and 6 for non-indebted households, in a range between 1 and 10 points.

[19] In accordance with these results, Brandolini et al. (2010) find that the share of poor households decreases when wealth other than income is taken into account.

poverty. These indicators detect situations of both over-indebtedness and general economic distress.

It is also important to note that the indicators that contribute most to explaining the condition of economic difficulty, after deducting the effect of economic poverty, are $A3_{10}$ and C_{15}. These indicators have an important explanatory power with regard to the perceived condition of economic distress, beyond a mere condition of poverty.

Table 7

Over-indebted households and economic poverty 2010

(percentages)

Indebted or over-indebted indicator	Percentage points of income gap respect to other households	Percentage points of wealth gap respect to other households	Statistical association Φ^2 with economic poverty	Contribution of over-indebtedness (in row) to the perceived condition of economic distress (after deducting the effect of economic poverty) (*)
A_{30}	-17.8	26.2	0.0636	0.0005
$A1_{20}$	-13.3	-1.9	0.0423	0.0062
$A2_{20}$	-13.7	-16.1	0.0406	0.0070
$A3_{10}$	-22.8	-71.7	0.0636	0.0099
B	-45.4	-46.5	0.3052	0.0032
C_{15}	-39.7	-72.8	0.1314	0.0083
D	-30.5	-52.7	0.0754	0.0020
E_3	51.5	102.0	- 0.0386 (**)	0.0040
Indebted households	26.9	12.2	- 0.0397 (**)	-

(*) Increase in the statistical association Φ^2 due to the condition of over-indebtedness (in row), with respect to the basic model (with only economic poverty) explaining the perceived condition of economic distress. (**) In a 2x2 table, the negative sign indicates the most of the data falls off the diagonal (inverse relationship).

Conclusions

The objective of this research is to examine the measures of over-indebtedness proposed in the literature and apply them to the Italian case by using the broad information coming from the Bank of Italy's survey on households.

The main result of the analysis is that the proposed indicators allow the different aspects of over-indebtedness to be measured; in fact, there is a limited overlap of the indicators. Considering the five most popular objective indicators, whereas about 8 per cent of households are over-indebted according to at least one indicator, no more than 2 per cent are over-indebted according to two indicators simultaneously. Moreover, the condition of over-indebtedness according to these indicators rarely coincides /???/ with the subjective condition of economic distress; the percentage of concordance varies between 50 and 80 per cent.

The limited performance of the traditional over-indebtedness indicators suggests it is worth critically assessing both the existence of alternative indicators and the use of different cut points from those commonly used.

We have evaluated the performance of different versions of the debt-burden indicator, taking into account the financial and real assets held by households. In some cases these indicators seem to outperform the traditional debt-burden indicator in detecting situations of economic distress.

As regards cut points, the analysis reaffirms the validity of the 30 per cent threshold for the overall debt burden, whereas it suggests a reduction to 15 per cent for the non-collateralized indicator cut point and to 3 for the number of commitments. In general, the indicators incorporating the new cut points have a higher internal consistency, thus suggesting they are better able to capture the multidimensional nature of over-indebtedness.

The indicator that best detects the condition of economic distress associated with over-indebtedness is the debt-poverty indicator, according to which a household is over-indebted if its total borrowing repayments bring its income below the poverty line. The non-collateralized loans indicator with 15 per cent cut point and the arrears indicator also have a very good performance in detecting debt problems. We have also analyzed the use of multivariate techniques, such as principal component analysis, in order to identify a synthetic indicator.

In 2010, if we also consider the subjective condition of economic distress as an additional necessary condition, the percentage of over-indebted households varies between 0.5 and 4 per cent. The broadness of these estimates can be explained by a certain vagueness in the definition of over-indebtedness. We believe that this issue needs to be investigated further, including in relation to specific economic and social contexts; in particular it will be important to conduct a comparative analysis across European countries when the first data from the Household Finance and Consumption Survey become available.

However, the percentage of over-indebted households seems to be much lower than that found in Betti et al. (2007), who, by employing only subjective measures, find the proportion of over-indebted households in Italy to be 10 per cent. The comparison of these figures with those found in former years, shows that over-indebtedness increased between 2006 and 2010, especially between 2006 and 2008; the increase was associated with consumer credit and conditions of poverty.

Finally the paper shows that, in spite of the positive relationship between indebtedness and income/wealth, the over-indebtedness indicators are positively connected to conditions of economic poverty; leaving aside the debt-poverty indicator, which by definition is strongly correlated with economic poverty, the association with the non-collateralized loans indicator is particularly high. According to this indicator, for 70 per cent of over-indebted households the amount of debt is not higher than 20,000 euros, thus suggesting that this form of over-indebtedness represents a social issue more than a problem of financial stability. A different conclusion can be drawn when considering the debt-burden indicator, according to which the average amount of debt held by over-indebted households is quite high (more than 100,000 euros). Even if the indicator detects a limited percentage of households at large, the risk connected to these cases is potentially more significant in terms of financial stability. diagonal (inverse relationship).

Appendix A

Let us consider a 2 by 2 contingency table crossing a condition (typically an illness) and a test. In such a situation the 4 possible outcomes are as shown below:

	Illness	Not illness
Positive	TP (True Positive)	FP (False Positive)
Negative	FN (False Negative)	TN (True Negative)

In the paper we have applied this scheme considering self-perceived well being as the gold standard and the over-indebtedness index as the test.

From this table several indexes can be defined:

- sensitivity, Se = TP/(TP+FN), i.e. the portion of the population in a bad condition that is correctly classified by the test. It defines the ability of a test to catch the over-indebted; it reaches its maximum when there are no false-negative results;
- specificity, Sp = TN/(TN + FP), i.e. the portion of the population in a good condition that is correctly classified by the test. It defines the ability of a test to classify those who are not over-indebted correctly; it reaches its maximum when there are no false-positive results;
- predictivity, Pv = TP/(TP+TN), i.e. the portion of the population classified by the test as over-indebted that is correctly classified;
- accuracy, Ac = TP+TN / (TP+TN+FP+FN), i.e. the portion of the population correctly classified by the test;
- odds ratio, Or = (TP/FP) / (FN/TN), i.e. the ratio of the odds of being in a bad/good condition, in the 2 groups (over-indebted/not);
- relative risk, Rr = TP/(TP+FP) / FN/(FN+TN), i.e. the relative increase in the probability of being in a bad condition due to over-indebtedness;
- the $\square^2$ contingency index, $\square^2$ = (TP TN) / Sqrt(TP TN FP FN)

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Cross-border banking transactions in the euro area[1]

Antonio Colangelo[2] and Michele Lenza[3]

1. Introduction

The objective of this paper is to describe a framework that allows analysing cross-border activities of Monetary Financial Institutions (MFI) in the euro area. In light of the importance of MFIs in the euro area financial system, they are key for studying financial intermediation in this economy[4]. Our main reference source is the MFI balance sheet statistics dataset compiled by the European Central Bank (ECB), which contains monthly information of the balance sheet of MFIs resident in the euro area, that is: the Eurosystem, credit institutions, money market funds and some other institutions that meet the MFI definition. In addition, we complement this information with data from the consolidated financial statement of the Eurosystem, in order to disentangle transactions between MFIs *other than central banks* and the Eurosystem at euro area level. For the same purpose, we also use at national level further information which is made available by the IMF as part of the International Financial Statistics dataset.

The MFI dataset is fully documented in the ECB Manual on MFI balance sheet statistics. The statistics are collected and compiled in a fully harmonised manner under Regulation ECB/2008/32 concerning the balance sheet of monetary financial institutions sector.[5] In this paper we explain the criteria used for data collection and the key characteristics of the dataset which should help users to understand advantages of these data with respect to alternative sources of information on banks' financial intermediation. Particular attention is paid to describe the statistical data that the ECB releases in this framework, both for the euro area as a whole and for individual euro area countries.

It is interesting to notice that MFI balance sheet statistics constitute an important basis for the compilation of the input to the BIS locational banking statistics dataset for euro area countries. Hence, the MFI balance sheet statistics contain similar but more detailed information, which is also released at higher frequency and in a timelier manner. In particular, currently available BIS data only focus on international claims, and do not include comparable information for domestic positions. This is an important limitation if the aim of a study is to encompass both cross-border activity *and* domestic developments.

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1 The views expressed in this paper are solely those of the authors and do not necessarily reflect the opinion of the European Central Bank. The work draws on a broader research project on banking transactions that the authors have undertaken with Domenico Giannone and Lucrezia Reichlin, whose comments and suggestions are gratefully acknowledged. This draft has also benefited from useful input by Celestino Giron and Henning Ahnert, as well as from the technical support of Noemie Maurice.

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4 At the end of 2011 MFIs accounted for about 61% of the total assets of the whole euro area financial sector and for about 63% of the total financing (loans and debt securities) received by the euro area non-financial private sector (households and non-financial corporations). These figures are to be compared with the corresponding US figures which reveal that depository institutions at the same date, accounted for about 27% of the total assets of the financial sector, and for about 22% of the total financing received by the non-financial private sector.

5 Regulation (EC) No 25/2009 of the ECB of 19 December 2008 concerning the balance sheet of the monetary financial institutions sector (Recast), OJ L 15, 20.1.2009, p. 14.

An additional drawback with BIS data is that they are only available for outstanding amounts, and not for transactions. This may be a serious limitation when interpreting developments over time, given that developments of outstanding amounts may be affected by relevant breaks due to non-transaction effects (mainly revaluations and reclassifications). For this purpose, although we refer to data on outstanding amounts and transactions, we also provide some data elaboration to calculate notional measures of stocks, the *so called* notional stocks. Such measures use information on transactions in order to correct outstanding amounts for series breaks due to non-transaction effects and, hence, they are better suited for economic analysis than the outstanding amounts themselves.

In this paper we will focus on the aggregated balance sheet of the euro area MFI sector, to be distinguished from the consolidated balance sheet which nets-out the inter-MFI positions. Section two describes the general framework for the collection and the compilation of the MFI balance sheet statistics. It focuses on the release of national MFI balance sheet data by the ECB and, then briefly describes how the latter can be complemented with other data sources. Section three highlights some stylised facts on the developments of MFI balance sheets. First, a distinction is drawn among (i) domestic, (ii) intra euro area cross border and (iii) extra euro area cross-border positions and transactions. For what concerns the domestic positions, those with the Eurosystem are also analysed. Moreover, in order to highlight heterogeneity across countries, some information on national balance sheet data is reported. Section four concludes.

2. MFI balance sheet statistics

2.1 The collection framework

MFIs comprise central banks, credit institutions and money market funds (MMFs).[6] Credit institutions are defined in European legislation as undertakings whose business is to receive deposits or other repayable funds from the public and to grant credits for their own account.[7] These institutions are subject to hold minimum reserves with national central banks within the framework of the Eurosystem's minimum reserve system and, subject to the fulfilment of eligibility criteria, they represent eligible counterparties for the Eurosystem's monetary policy operations.[8] MMFs instead are a type of collective investment undertakings which invest in very liquid assets and whose shares/units can thus be seen as substitutes of bank deposits.[9]

This statistical framework addresses balance sheet data. No supervisory, profit and loss or other types of financial statistics are made available in this context. Similarly, no information on off-balance sheet items is covered. Statistical reports are allocated according to the residency of the institution ("host country" residency approach) and are based on solo

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6 The EU list of MFIs provides an exhaustive and up-to-date enumeration of MFIs located in EU countries (see http://www.ecb.europa.eu).

7 See Article 4(1) of the European Parliament and Council Directive 2006/48/EC.

8 Under certain conditions, institutions can be exempted from their obligations under the Eurosystem's minimum reserve system but would then not be eligible for monetary policy operations. For more insights on these aspects, see "The implementation of monetary policy in the euro area."

9 A handful of other institutions are also included in the MFI sector. Those include certain financial institutions whose business is to receive deposits and/or close substitutes of deposits from entities other than MFIs and, for their own account, to grant credits and/or invest in securities. For example, institutions that are principally engaged in financial intermediation in the form of issuing electronic money are part of this group.

accounts reporting (thus unconsolidated[10]). Hence, the focus is not on banks themselves (e.g. supervisory purposes), but rather on their impact on the economies of the territories where they are resident. Euro area branches and subsidiaries of non-euro area banking groups are considered as resident MFIs and are thus covered by the reporting framework in the country where they are registered. Non-euro area branches and subsidiaries of euro banking groups, however, fall out of the scope of the reporting.

The concepts underlying the statistical requirements for MFI balance sheet statistics are based on international statistical standards, namely the System of National Accounts (of which the SNA 2008 is the latest version) and the European System of National and Regional Accounts 1995 (ESA 95).[11] Adherence to these standards guarantees the international comparability of the statistics and ensures a sound methodological background. MFI balance sheet statistics are thus also broadly consistent with the financial and non-financial accounts (i.e. flow of funds) which are also based on these standards. At euro area level, in particular, MFI balance sheet statistics represent the major input for the compilation of the quarterly integrated euro area accounts with reference to the MFI sector. The same often applies at national level, where statistical compilers directly draw on MFI statistical returns to construct the financial accounts for the MFI sector.

These harmonised MFI statistics have been regularly collected by euro area NCBs since 1999. In particular, the collection framework for MFI balance sheet statistics was first laid down in Regulation ECB/1998/16. Since then, substantial amendments have taken place in 2001 (ECB/2001/13) and 2008 (ECB/2008/32), entailing additional coverage from 2003 (e.g. for sector breakdowns) and from 2010 (e.g. for securitisation).[12] The reporting scheme covers asset and liability positions of the MFI balance sheet broken down by instrument categories, with additional information by sector and residency area of the counterpart and original maturity. Data are collected for amounts outstanding at the end of the period, but additional statistics are also covered to allow the derivation of statistics on financial transactions – see next section. In particular, on the assets side the reporting scheme covers information on cash, loans,[13] holdings of MMF shares/units, securities other than shares and shares and other equity, fixed assets, and remaining assets. On the liabilities side, data are collected for currency in circulation (NCB only), deposits,[14] MMF shares/unit (MMFs only), debt securities issued, capital and reserves, and remaining liabilities. Breakdowns by sector and residency of the counterpart are collected for asset claims related to loans and holdings of securities (securities other than shares and shares and other equity), and for deposit liabilities.[15] The geographical split is required between domestic, other euro area and rest of

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[10] In particular, the Regulation (Annex II, Part 1) requires MFIs to consolidate the business of all their offices (registered or head office and branches) located within the same national territory. Furthermore if an MFI has subsidiaries (as opposed to branches) in the same country which are also MFIs, the parent MFI may (but is not required to) consolidate in its statistical returns the business of these subsidiaries. But the Regulation permits no consolidation across national boundaries.

[11] The ESA 95 is broadly consistent with the SNA 1993 (the previous version of the SNA) and is currently being revised in line with the SNA 2008.

[12] For a more detailed discussion of the reporting and methodological framework of MFI balance sheet statistics, see also the "Manual on MFI balance sheet statistics."

[13] Deposits claims by MFIs are indistinguishably included under "loans".

[14] Loan liabilities of MFIs are indistinguishably included under "deposits". Deposit liabilities vis-à-vis non-MFIs (excluding the central government) are also broken down by type (overnight deposits, deposits with agreed maturity, deposits redeemable at notice and repurchase agreements).

[15] The splits are not collected for securities (securities other than shares and shares and other equity) issued by MFIs and MMF shares/units as the holders of the assets are most often unknown to the issuers of the instruments. For securities in M3 (MMF shares/units and debt securities with an original maturity of up to two

the world positions.[16] For positions with domestic residents and residents of other euro area countries, the sectoral breakdown consists of a split between MFIs, and non-MFIs. The latter is further expanded into general government, and other residents. In addition, for loan claims and deposit liabilities, other residents are further decomposed in insurance corporations and pension funds, other financial intermediaries (excluding insurance corporations and pension funds), non-financial corporations and households. The detailed split of "other residents" into its sub-components for holdings of securities (securities other than shares and shares and other equity) is collected quarterly. Additional details are covered for MFI loans to households, namely a breakdown by purpose of the loan (consumption, house purchase, other). For positions with non-euro area residents, data are collected on a quarterly basis broken down by banks,[17] general government and other resident sectors.

Breakdowns are also collected according to the original maturity of the instrument for loans to other residents and holdings of debt securities (assets), and for deposits and debt securities issued by MFIs (liabilities).[18] For certain instrument categories maturity breakdowns are only reported at quarterly frequency. A split by currency of denomination of the instruments is also collected (in most cases) at monthly frequency between euro and non-euro denominated positions. Additional breakdowns by individual currency of denomination are reported at quarterly frequency.

2.2 The compilation process

According to Regulation ECB/2008/32, the reporting population for MFI balance sheet statistics in each euro area country consists of the MFIs resident in the national territory. Data are reported to the relevant NCB, which aggregates the reported information at national level. The statistics are then transmitted to the ECB, which aggregates the national statistical returns to obtain the aggregated balance sheet for the euro area MFI sector as a whole.

Statistics are compiled for amounts outstanding at the end of the period, and (more importantly) for financial transactions. It is transactions that are used to measure the flow of financing between MFIs and other sectors and the rest of the world, and it is from transactions that growth rates are calculated. In line with international statistical standards, transactions are calculated at the ECB by taking, for each asset and liability item, the difference between stock positions at end-period reporting dates, and then removing the effect of developments that are not the result of transactions. These other factors comprise valuation effects arising from changes in prices or in exchange rates, and what the ESA 95 calls other changes in the volume of assets, including loan write-offs/write-downs and

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years), however, the geographical split is estimated at aggregated level by NCBs (or, in some cases, by the ECB) to allow a more correct derivation of M3.

16 Additional breakdowns by country of the counterparties are collected at quarterly frequency.

17 The EU list of MFIs provides a clear reference to define the boundaries of the MFI sector in EU countries, but no fully equivalent definition is applied elsewhere. Hence, for the rest of the world the definition can only be functional. According to the "Monetary financial institutions and markets statistics Sector manual", the rest of the world category "banks" comprises MFIs located in EU Member States outside the euro area, and *banks* located outside the EU, including branches and subsidiaries of MFIs located in the euro area. The latter also includes NCBs and international organisations that undertake banking activities as central monetary authorities (e.g. the BIS and the IMF). The treatment of MMFs residents outside the EU is not clear and may vary according to the guidance provided by the relevant NCBs, but they are likely to be excluded from the category.

18 Loans to non-MFIs are available with a maturity split of "up to one year", "over one year and up to five years", "over five years". Deposits with agreed maturity as well as holdings and issuance of debt securities are available with a maturity breakdown of "up to one year", "over one and up to two years" and "over two years". Finally, deposits redeemable at notice are broken down between "up to three months" and "over three months". Information on original maturity of monetary liabilities is key to the derivation of M2 and M3.

reclassifications and other adjustments (e.g. changes in the composition and structure of the MFI sector, changes in the classification of counterparties and of assets and liabilities, correction of reporting errors, changes in definition).[19]

The aggregated balance sheet of the euro area MFI sector constitutes the basis for the derivation of the consolidated balance sheet (netting the inter-MFI positions within the euro area), and of monetary aggregates and counterparts.[20] The aspects, however, fall outside the scope of this paper, as the discussion aims a describing the framework to analyse banking flows, and are thus not reviewed in more detail.

2.3 Publication of national data

Based on the data collected, the ECB and euro area NCBs publish a wide range of MFI balance sheet statistics. While the ECB mainly focuses on disseminating data for the euro area as a whole supplemented by national contributions to the euro area aggregates, the publication of additional statistics for the individual countries is left at national level The ECB, however, in agreement with euro area NCBs, also publishes a comprehensive (though limited) set of national statistics for individual countries. As the focus of the paper is on national developments, the section reviews the availability of country data in more detail.[21]

The first set of published data relates to the aggregated national balance sheets of MFIs excluding the Eurosystem, which thus mainly relates to credit institutions and MMFs. Table 1 reviews the data availability in detail. The time series are published at a monthly frequency and, in most cases, cover periods as from September 1997. Asset and liabilities positions are made available disentangling positions with euro area residents from positions with residents of the rest of the world. Hence, the publication does not take the national perspective here, but rather provides a decomposition of the aggregated balance sheet of the euro area MFI sector (excluding the Eurosystem) into the underlying national contributions. No data on MFI holdings of euro currency (1) are made available; these positions are included in remaining assets (8). In addition to the items listed in the table, other information is also published by the ECB. In particular, for loans (2) additional sectoral breakdowns are made available,

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[19] NCBs compile data on reclassifications and other adjustments based on various sources they have available and transmit the information to the ECB. Statistics on loan write-offs/write-downs are collected by NCBs from MFIs in accordance with the minimum requirements set out in Regulation ECB/2008/32, and transmitted on an aggregated basis to the ECB. Revaluations, in turn, are of two types. MFIs are not subject to report information of revaluations for changes in exchange rates. Rather, the adjustments are estimated directly by the ECB on an aggregated basis. Similar procedures, however, are in place in NCBs to allow the derivation of transactions at national level (whenever more accurate estimates are available at NCBs, they may transmit the adjustments to the ECB directly). As regards revaluations due to changes in prices, NCBs report them to the ECB on an aggregated basis. In most cases, this input is based on revaluations data directly reported by MFIs. In some cases, however, NCBs directly collect data on financial transactions, and price revaluations are then obtained as a residual. For more details on the derivation of transactions, see the "Manual on MFI balance sheet statistics."

[20] The consolidated balance sheet of the euro area MFI sector provides statistical information on the MFI sector's assets and liabilities vis-à-vis residents of the euro area outside the MFI sector (i.e. general government, non-financial corporations, households, insurance corporations and pension funds and other financial intermediaries) and vis-à-vis non-residents of the euro area. The netting of inter-MFI positions is not confined to deposits and loans, but covers all balance sheet items where counterparty information allows the amount of the MFI liability held within the MFI sector to be determined. The final step leading to the derivation of monetary aggregates and counterparts consists of deducting from MFI monetary liabilities type the non-euro residents' holdings of short-term securities (including MMF shares/units) issued by euro area MFIs, and adding those deposit liabilities of the central government and certain post offices that have a monetary character.

[21] The publication also covers other additional concepts (among those, detailed breakdowns by currency of denomination of the instruments), but those are not reviewed here as they have secondary importance on the context of banking flows' analysis.

splitting the private sector into its underlying sub-sectors (i.e. households, non-financial corporations, insurance corporations and pension funds, and other financial intermediaries), and, for loans to households, by purpose of the loan (i.e. consumer credit, house purchase, other). For holdings of securities other than shares (4) issued by MFIs, data are also broken down according to the original maturity of the instrument. In the case of deposits (9), detailed breakdowns by type of instrument, maturity and sector of the counterparty are published for those entering into M3. Debt securities issued (11) are further broken down by original maturity. An important remark relates to the geographical split of debt securities issued and capital and reserves. It is important to stress that only for debt securities in M3 (issued with an original maturity of up to two years) estimates are made between holdings of euro area residents and non-euro area resident holdings. Debt securities issued with an original maturity above two years and capital and reserves are fully allocated to euro area holdings.

Table 1

ECB publication of aggregated balance sheet statistics for MFIs excluding the Eurosystem for euro area countries

Assets	Liabilities
Positions vis-à-vis euro area residents	
1. Currency (euro) [1]	
2. Loans	**9. Deposits**
MFIs	**MFIs**
o/w Eurosystem [2]	o/w Eurosystem [2]
Government	**Government**
Private sector	**Private sector**
3. MMF shares/units	**10. MMF shares/units**
4. Securities other than shares	**11. Debt securities issued** [3]
MFIs	
Government	
Private sector	
5. Shares and other equity	**12. Capital and reserves** [3]
MFIs	
Private sector	
Positions vis-à-vis extra-euro area residents	
6. External assets	**13. External liabilities**
Other counterparts - Residency non specified	
7. Fixed assets	**14. Remaining liabilities**
8. Remaining assets [1]	
Total	
Total assets	**Total liabilities**

1) Holdings of euro currency are included indistinguishably in remaining assets.

2) Data on loans and deposit MFI claims and liabilities on the Eurosystem are not published by the ECB but by the IMF as part of the International Financial Statistics dataset (http://www.imf.org/external/data.htm).

3) As clarified above, for debt securities issued and capital and reserves, MFIs do not report breakdowns by residency of the counterpart. NCBs and, in some cases, the ECB, however, estimate for securities other than shares with an original maturity of up to two years the holdings by non-euro area residents to allow a more accurate estimation of M3. No such estimates are performed at current stage for securities other than shares with an original maturity above two years, and for capital and reserves. In this case, the working assumption is that they are fully held by euro area residents.

Notes: Data relate to MFIs excluding the Eurosystem (i.e. the NCB). All time series (with the exception of the items relating to positions with the Eurosystem) are made available on the ECB Statistical Data Warehouse (http://sdw.ecb.europa.eu) and on the ECB website (http://www.ecb.europa.eu/stats/money/aggregates/bsheets/html/outstanding_amounts_index.en.html).

An additional important remark relates to the external assets and liabilities positions (6 and 13). While external assets offer a reliable picture of the asset positions on non-euro area residents (mainly loans to non-euro area residents and holdings of securities issued outside the euro area), external liabilities (consisting of deposits vis-à-vis non-euro residents and estimated holdings by non-residents of debt securities in M3) likely underestimate the foreign positions. Loans claims and deposit liabilities vis-à-vis euro area MFIs also include MFI positions with the Eurosystem. While the ECB's MFI balance sheet statistics framework does not provide this information, the separate identification of these positions is of interest in light of the higher relevance of central bank operations since the intensification of the financial crisis. At euro area level, the consolidated financial statement of the Eurosystem provides weekly data on the outstanding amounts of Eurosystem's claims and liabilities vis-à-vis euro area credit institutions.[22] For individual euro area countries, statistics on MFI positions against the NCB are made available by the IMF in the context of the International Financial Statistics dataset and are included in the reference conceptual framework of this paper (yellow cells in Table 1).

Table 2

ECB publication of cross-border data for MFIs excluding the Eurosystem for euro area countries

		Domestic	Other euro area	Extra-euro area
Assets				
2. Loans				
	MFI / banks			
	non-MFI / non-banks			
3. MMF shares/units				
	MFI / banks			
4. Securities other than shares				
	MFI / banks			
	non-MFI / non-banks			
5. Shares and other equity				
Liabilities				
9. Deposits				
	MFI / banks			
	non-MFI / non-banks			

Notes: Data relate to MFIs excluding the Eurosystem (i.e. the NCB). All time series corresponding to the item relating to the red cells are made available on the ECB Statistical Data Warehouse (http://sdw.ecb.europa.eu).

Turning to cross-border positions (and flows), the ECB releases for the main asset and liability items of the national aggregated balance sheet detailed breakdowns by residency of the counterpart, distinguishing between domestic residents, resident of other euro area countries and non-euro area residents, as described in Table 2. The time series are published at a quarterly frequency and, in most cases, cover periods as from September 1997. Additional breakdowns are in principle available by individual counterpart country (outstanding amounts only), but not all time series are released due to confidentiality considerations.

[22] See http://www.ecb.int/press/pr/wfs/2012/html/index.en.html.

The operational framework of the Eurosystem provides that operations with MFIs are always conducted via the relevant NCBs. It thus follows that the IMF series shown in Table 1 effectively relate to domestic positions, as MFIs claims and liabilities vis-à-vis the Eurosystem have the domestic NCB as direct counterpart. Information from Tables 1 and 2 can thus be merged to split loans and deposits vis-à-vis domestic MFIs between positions with the NCB (i.e. the Eurosystem) and other domestic MFIs.

Data on (balance sheet) outstanding amounts are often used by researchers to draw analyses. In particular, the difference between stock positions at two consecutive ends-of-period are often used as a proxy to measure flows within the period. This approach fails to take into consideration the effect of developments (revaluations and other changes in the volume of assets, as discussed above) that are *not* the outcome of transactions and insert breaks in the stock series. Hence, transactions data should be directly used to measure economic flows (and to calculate growth rates). This paper makes benefit of these ideas and uses notional measures of stocks ("notional stocks") instead of outstanding amounts. Those are constructed by cumulating transactions and using Q4 2011 stocks as base value.

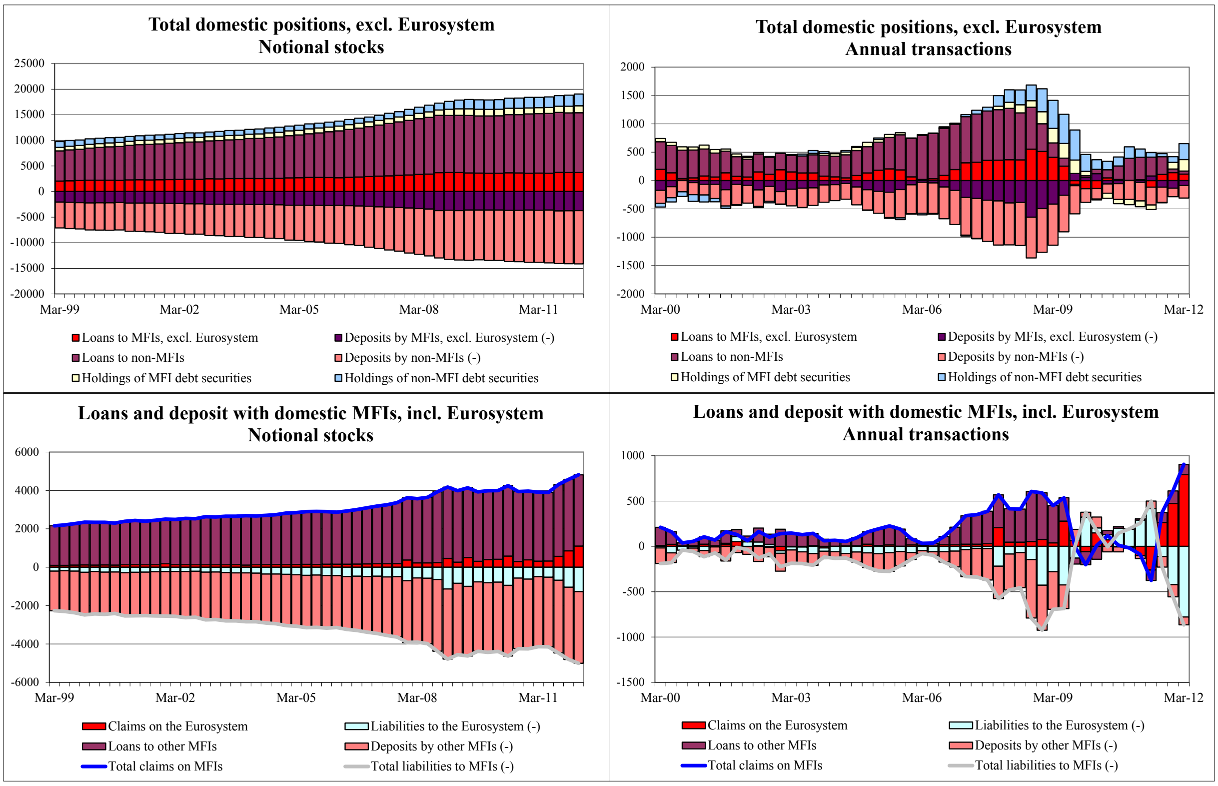
3. Cross-border activities of MFIs (excluding the Eurosystem)

In order to study cross-border banking activities, we focus on the main items of the MFI balance sheet. For the asset side, we consider loans and holdings of securities other than shares, while on the liability side we limit the analysis to deposits. For the period between January 1999 and March 2012, these items covered, on average, about 87% of MFI assets and 65% of MFI liabilities. It is also worth recalling here that the allocation of the instruments by area of residency of the counterpart (domestic, other euro area, extra-euro area) is not available for all balance sheet instruments (notably for debt securities issued by MFIs with a maturity over two years, and for capital and reserves). The selected instruments cover, on average over the period from January 1999 to March 2012, over 90% of assets and liabilities for which the allocation by area of residency of the counterpart is available. For the three instruments, we consider the MFI balance sheet amounts outstanding (notional stocks) at euro area level and the corresponding transactions, and distinguish between MFI activities with domestic and non-domestic residents.

Figure 1 concentrates on MFI domestic positions. The top panels show series developments excluding positions with the Eurosystem. Starting from 1999, balance sheet domestic positions steadily increased over time, accelerating in periods preceding the inception of the financial crisis. Domestic positions kept increasing, although at a slower pace, between Q3 2007 and Q3 2008, to then come to a sudden stop with the Lehman's episode, mainly driven by developments on the domestic interbank market and, to some extent, loans to non-MFIs. In the course of 2010, transactions on loans and deposits with non-MFIs started to grow again and remained in positive territory till recent quarters, while the domestic interbank market (excluding the Eurosystem) remained stable, without further signs of contraction. The lower panels include positions with the Eurosystem, showing the increasing importance of Eurosystem on the interbank market since the start of the financial crisis in 2007 (as recalled above operations with the Eurosystem are always allocated domestically). Three phases can be identified. First, after the failure of Lehman, a lot of liquidity was injected on the market. This was an answer to dynamics on the interbank market, but it is worth stressing that cross-border rather than domestic positions were mostly concerned at this juncture, as it will be shown next. A period of "normalisation" thus followed, until around fall 2011, when new tensions led to the launch of the Eurosystem's long-term refinancing operations. An interesting observation relates to the developments in transactions, i.e. that the Eurosystem accounted for most of the transactions relating to domestic inter-MFI loans and deposits since Lehman's default.

Figure 1

Domestic positions of MFIs excluding the Eurosystem, with separate identification of activities with the Eurosystem, EUR billions



Source: ECB (MFI balance sheet statistics and consolidated financial statement of the Eurosystem).

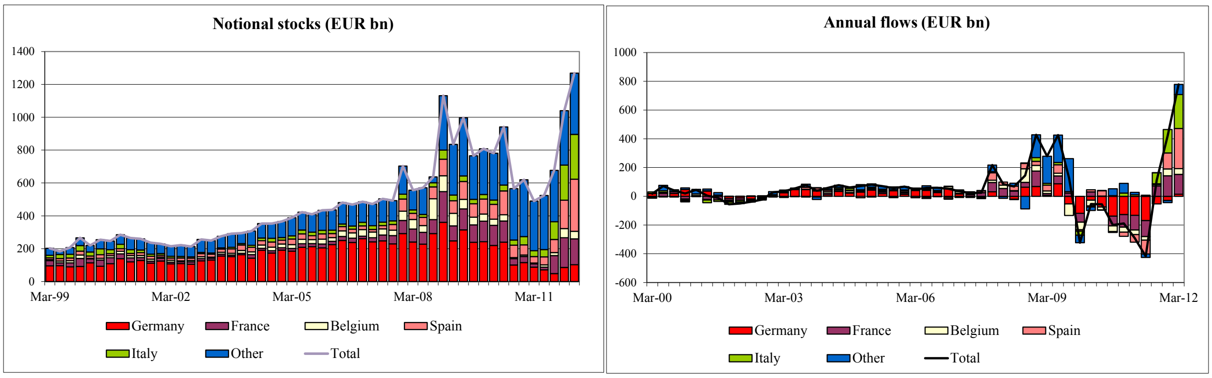
Notes: Notional stocks are obtained by cumulating quarterly transactions and using Q4 2011 as base period.

IMF data can also be used to investigate country developments as regards claims of the Eurosystem on credit institutions (e.g. access to refinancing operations).[23] Figure 2 show that German banks have traditionally accounted for large part of loan claims of the Eurosystem on euro area banks. The picture changed as from end-2009, where German MFIs reduced their liabilities on the Eurosystem to a large extent. Developments in other countries follow less clear dynamics. French and Spanish MFIs, for instance, also reduced their liabilities to the Eurosystem's from end-2009, but then increased again these positions in the second half of 2011 (and especially as from Q4 2011, thus suggesting a high recourse to the long-term refinancing operations). Italian MFIs, instead, follow a different pattern: while their liabilities to the Eurosystem have always remained at low level, those rapidly increased as from Q3 2011, probably in relation (from Q4 2011 onwards) to a high recourse to the long-term refinancing operations also in this case.

[23] A similar decomposition could also be performed for Eurosystem's liabilities to credit institutions (e.g. use of the deposit facility).

Figure 2

Decomposition of Eurosystem loan claims on euro area credit institutions by country, EUR billions



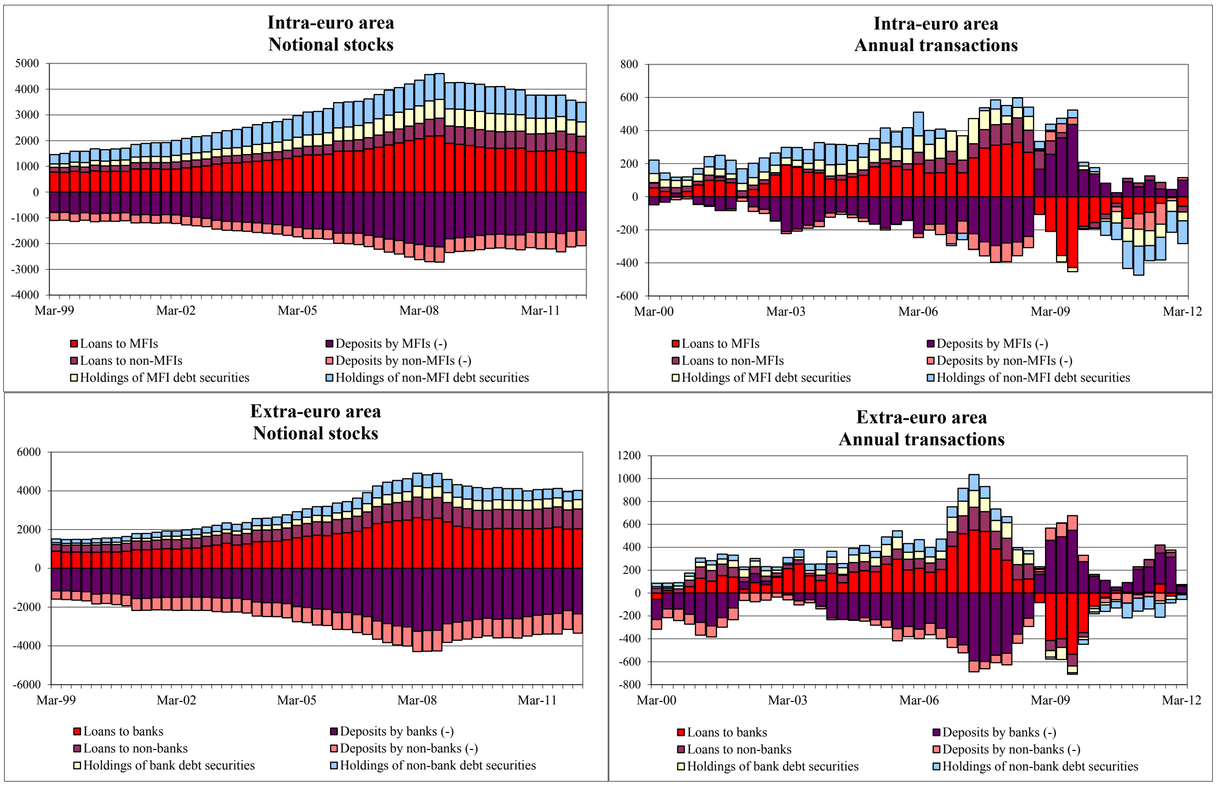
Source: ECB (consolidated financial statement of the Eurosystem) and IMF (International Financial Statistics).

Notes: Notional stocks are obtained by cumulating quarterly transactions and using Q4 2011 as base period.

Turning to MFI cross-border positions, Figure 3 provides a split of MFI positions with non-domestic residents between intra-euro area activities and operations with non-euro area residents. A first observation (well documented by the economic literature) relates to the increases in cross-border interbank activities since 1999, especially at euro area level. These dynamics are often used as a proof of the increasing financial integration within the euro area since its inception.

Figure 3:

Cross-border positions of MFIs excluding the Eurosystem, EUR billions



Source: ECB (MFI balance sheet statistics).

Notes: Notional stocks are obtained by cumulating quarterly transactions and using Q4 2011 as base period.

While dynamics in intra and extra-euro area interbank activities followed similar patterns in historical terms, they were affected differently by the inception of the financial crisis in mid-2007, with extra-euro area cross-border transactions showing early sign of deceleration, while intra-euro area developments kept increasing till Lehman's default. This episode determined, however, a firm contraction on the cross-border interbank markets, with transactions turning sensibly negative both within the euro area, and with non-euro area residents. Figure 3 is in line with recent economic literature (for instance, see Giannone et al., 2012), which has widely documented that interbank activities after the collapse of Lehman were characterised by an unusual decline of transactions with non-euro area residents, and shows that similar dynamics have also characterised intra-euro area cross-border flows. After several quarters of intense contraction, flows have then reduced over time, while remaining in negative territory.

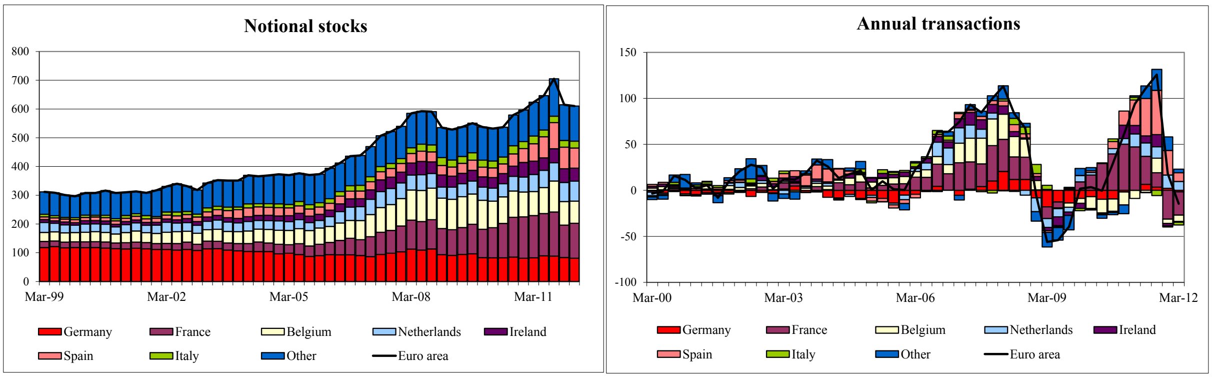
While cross-border activities with non-euro area residents are mainly characterised by interbank loan/deposit developments, intra-euro area cross-border activities are (to a certain extent) also affected by other factors. Those mainly relate to deposits by non-MFIs and holdings of debt securities. Developments in these categories are often covered by the specialised press, but we would feel that they rarely exploit in full the richness of the available data. In this respect, we now show how aggregated developments can be decomposed to study the patterns at country level, and also highlight the drawbacks of some of the popular accounts.

3.1 Intra-euro area cross-border activities relating to deposits with non-MFIs

Financial press often makes reference to large flows from the euro area "periphery" (e.g. Greece) to the "centre" (e.g. Germany) affecting non-MFI deposits. In fact, the euro area aggregated data shown in Figure 3 would seem to confirm this story: starting from Q1 1999, the total intra-euro area cross-border positions were smoothly increasing till end-2005, and then accelerated until Lehman's default; after suffering a sharp decline, they moved back to a positive-growth territory as from the beginning of 2010, to start decreasing again as from Q3 2011. Looking at the underlying country contributions, however, helps better interpreting the dynamics and, at least to a certain extent, to confirm or invalidate stories that are often built on the aggregated developments.

Figure 4

Deposits by non-MFIs – Decomposition of intra-euro area cross-border positions of MFIs excluding the Eurosystem by country, EUR billions



Source: ECB (MFI balance sheet statistics).

Notes: Notional stocks are obtained by cumulating quarterly transactions and using Q4 2011 as base period.

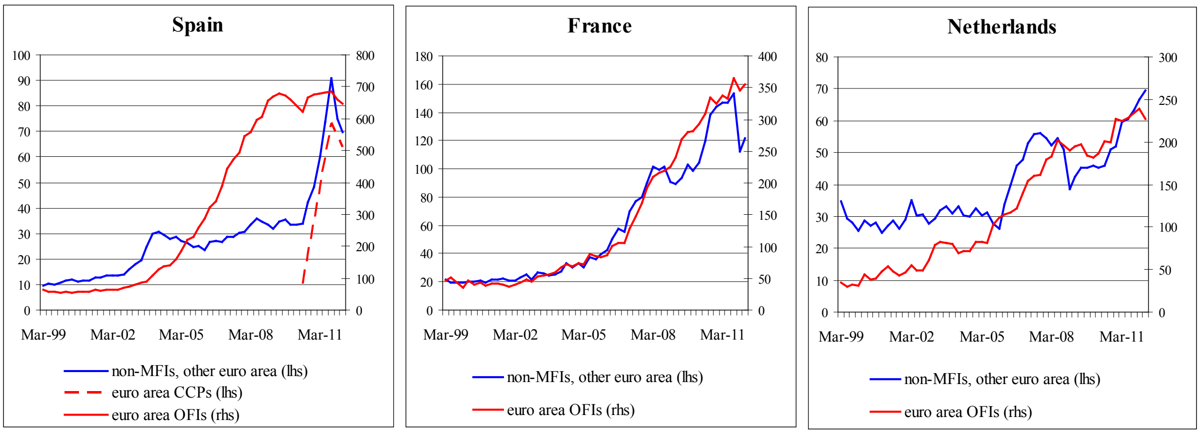
Importantly, Figure 4 shows that while German MFIs accounted for about a third of the euro area total cross-border positions relating to deposits by non-MFIs in 1999, their importance decreased over time, and after the Lehman's episode transactions actually turned negative.

The cross-border large positive transactions before Lehman's default are actually mainly due to France and Belgium while, as from early 2010, France, Spain and (to a smaller extent) the Netherlands account for most of the aggregated development. Unfortunately, no data are available that would allow identifying which sectors within "non-MFIs" are behind these developments. In fact, such national sectoral breakdowns are released by the ECB only for positions with euro area residents as a whole, but without the separate identification of intra-euro area cross-border activities (as recalled above). However, some stories fitting with the facts just described can be told by comparing the developments of *MFI deposits with non-MFIs resident in other euro area countries* for France, Spain and the Netherlands with data on *MFI deposits with other financial intermediaries resident in the whole euro area*.

Figure 5 shows that the developments in cross-border deposits by non-MFIs match rather closely those in the corresponding series on deposits placed by euro area other financial intermediaries in all cases, hinting at the fact that this sector is likely to drive the developments for non-MFIs.

Figure 5

Cross-border deposits placed by non-MFIs with MFIs excluding the Eurosystem and developments of the OFI sector, Notional stocks, EUR billions



Source: ECB (MFI balance sheet statistics).

Notes: Notional stocks are obtained by cumulating quarterly transactions and using Q4 2011 as base period. "OFIs" and "CCPs" stand for "other financial intermediaries" and "central counterparties" respectively. Data for central counterparties are only available as from June 2010 and relate to tri-party repurchase agreements only.

In particular, in the case of Spain, repurchase agreements with central counterparties seem to play a major role. These instruments (often called tri-party repos) represent an attractive way for financial intermediaries to access the secured (interbank) lending market, as they have the advantage of reducing counterparty risk for the lender compared to a normal bilateral repo operation.[24]

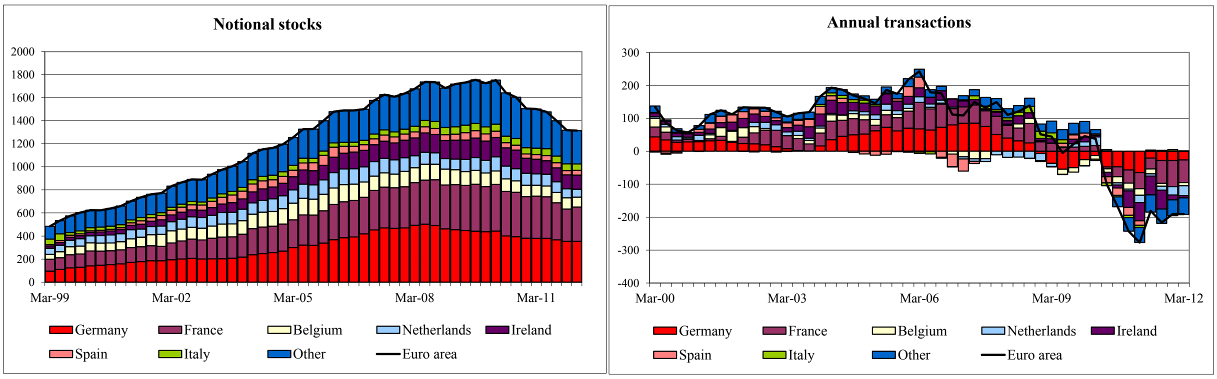
[24] Tri-party repos are structured as follows: i) the cash borrower enters into a repurchase agreement with the third party, borrowing the required amount and providing collateral to the third party as required; ii) the cash lender enters into a reverse repurchase agreement with the third party; iii) the third party administers the transaction and the collateral, acting as the direct counterparty to the seller and the buyer, thus assuming the risk of default of the borrower. In addition, the collateral management is highly standardised in terms of profiling and margining with the consequence of improving the transparency of the product, and the administrative burden for the counterparties is significantly reduced compared to a bilateral repo.

3.2 Intra-euro area cross-border activities relating to holdings of debt securities

Data on intra-euro area cross-border MFI holdings of debt securities are very often utilised by the financial press to study the linkages between euro area bond markets. The ECB also uses these statistics to construct financial integration indicators for the euro area bond market.[25] Starting from Q1 1999, the total intra-euro area cross-border positions were smoothly increasing until mid-2009, when they reached their peak. Since then, transactions started to turn negative. These large negative transactions, jointly with data on holdings of domestic securities (see Figure 1), show that the de-leveraging of euro area MFIs on their security portfolios was mainly connected to their intra-euro area cross-border holdings.

Figure 6

Holdings of debt securities – Decomposition of intra-euro area cross-border positions of MFIs excluding the Eurosystem by country, EUR billions



Source: ECB (MFI balance sheet statistics).

Notes: Notional stocks are obtained by cumulating quarterly transactions and using Q4 2011 as base period.

Figure 6 allows to examine the underlying national contributions and to highlight the different behaviours that have emerged across countries, which is hardly analysed in detail by the financial press. Until mid-2008, the steep increases in cross-border holdings were mainly led by German and French MFIs. MFIs resident in Germany, however, were the first to start reducing their exposure on these assets after Lehman's default. MFIs resident in other euro area countries started to reduce their cross-border holdings of debt securities only later, as from Q2 2009. Once again, besides German MFIs, French MFIs were upfront leading the development, together with Irish MFIs (for certain periods) and Dutch MFIs (to a lower extent).

A natural question to investigate would be whether the de-leveraging affected all issuing sectors, or rather certain issuers. Detailed data are only available for securities issued by MFIs and non-MFIs. These statistics show that, indeed, both sectors were affected in similar terms (see also Figure 1). Although no split is available, for instance, between government and (non-bank) corporates, indicators published in the 2012 edition of the ECB report "Financial integration in Europe" show that both sub-sectors were equally affected.

25 See, for instance, Chart S12 of the 2012 edition of the ECB report "Financial Integration in Europe."

4. Conclusions

This paper describes key features of MFI balance sheet statistics and reviews in some detail the data which are published by the ECB. While the dataset is accompanied by large pieces of official documentation that explain it in detail, what is missing is a quick (but comprehensive) reference guide for interested non-statistical users.

Particular attention is paid to explaining the importance of using transactions data and notional measures of stocks, as opposed to stocks themselves, in order to correct breaks in stocks due to revaluations and reclassifications that have limited importance for economic analysis.

The richness of the dataset is then used to describe developments in MFI balance sheets, with a special focus on cross-border activities. Our main message is that users often do not use the available data in full, and sometimes the connections with other existing datasets are not fully exploited. For instance, we show how national data can be matched with existing euro area aggregates to decompose aggregated dynamics into the underlying country contributions. We also give account of one case where aggregated developments may fit with a story whose fallacy could be easily identified, should an appropriate study of the underlying available data be performed.

This paper aims to provide a synthetic description of recent developments in the balance sheet of euro area MFIs. The next step in our research agenda is to use this wealth of information in order to investigate in much detail cross-country differences, their determinants and their likely evolutions.

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Towards a better view of Dutch net foreign assets

Gerrit van den Dool[1] and Rini Hillebrand[2]

1. Introduction

Once every quarter, DNB calculates the amount of Dutch net foreign assets. The IMF has laid down that such calculations must be based to the extent possible on up-to-date figures at market value. Where Dutch subsidiaries abroad and (foreign owned) subsidiaries in the Netherlands are concerned, this requires the use of estimates, because in general only book values are available, which are usually much less up-to-date than market values. When these (in most cases) lower book values are raised to the level of market values, it becomes clear that the Netherlands is richer than one would conclude from the usual figures, in which holdings of equity capital in subsidiaries are included at book value. Over the past decades, the difference repeatedly exceeded EUR 100 billion, sometimes even EUR 200 billion. At the end of 2011, the difference amounted to EUR 70 billion. The present article focuses on the factors determining the difference and on the procedure used by DNB to estimate this difference in order to be able to publish net foreign asset figures at market value. An insight into these issues is all the more important now that European countries have agreed to monitor each other´s financial position much more closely using a so-termed macro-economic scoreboard. The scoreboard features not only the current account balance, but also such quantities as a country´s net foreign assets.

Traditionally, the Netherlands is a country with considerable net external (net foreign) assets. The country's external assets consist to a large extent of portfolio investments, loans and deposits as well as subsidiaries of the many multinationals having their head office in the Netherlands. At the end of 2011, Dutch external assets totalled EUR 2,898 billion (Chart 1). In large measure, these external assets are offset by external liabilities, totalling EUR 2,673 billion at end-2011. The difference between the two constitutes the country's net external assets, which amounted to EUR 224 billion in 2011.

The level of a country's net external assets depends among other things on the method used for determining the value of assets and liabilities. In the calculation of net external assets, most external assets and liabilities are included at their current value; for instance, for investments in equities and bonds, current stock exchange prices are available. However, net external assets also include assets and liabilities for which no current market value is available. Thus, foreign subsidiaries of Dutch multinationals are included at their – usually lower – book value. This also holds, of course, for Dutch subsidiaries of foreign multinationals. As a result, measured in euro, liabilities and notably the assets (being the largest of the two) are understated. This has considerable consequences for Dutch net external assets, as cross-border participating interests – interests of 10% and more – represent substantial amounts.

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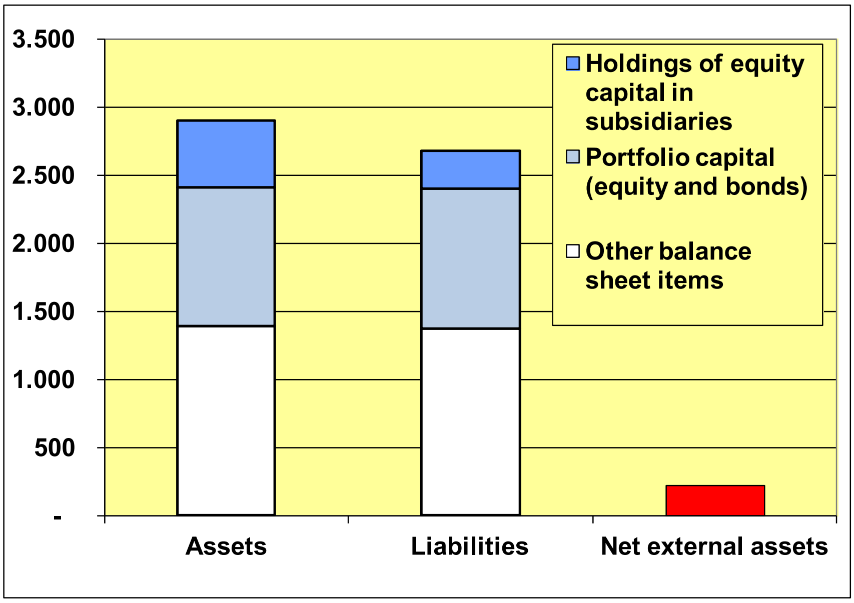
Chart 1

External assets and liabilities on the Dutch balance sheet (EUR billion, end-2011)



DNB calculates the country's net external assets in accordance with internationally agreed rules, but it is far from simple to do so from the market's perspective as prescribed by the IMF with a view to obtaining the most up-to-date and realistic results.[3] This is because the value according to the market is simply not known for all external assets or liabilities, a problem which is also faced by DNB's sister institutions abroad. Where the current value of equities is concerned or the value of a multinational group as a whole, stock exchange prices could provide a clue, but even then it is not known how "the market" would value specific companies within such a group, such as Canadian subsidiaries of a Dutch multinational enterprise. Hence, DNB complies with international practice and derives the relevant amounts for the subsidiaries from the accounting systems of the groups and the subsidiaries themselves. As in other countries, it is thus accepted that, for lack of better information, such book values are usually lower than the corresponding market values. After all, as a rule, book values are determined on the basis of prudent accounting principles. In addition, contrary to stock exchange prices, book values do not reflect any (positive) earnings expectations prevailing in the market.[4]

As a result, the different *entities* of a multinational enterprise are included in external assets at a lower amount than the amount by which they contribute to the stock exchange value of the group *as a whole*. This practice leads to underestimation of outward and inward participations in the equity capital of individual entities). Using both book value and market value does not help to obtain a sound insight into Dutch net external assets. This may also

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[3] In principle, this is also true of the many special financial institutions (SFIs) established in the Netherlands, being "empty" subsidiaries of foreign groups of companies and acting as financial pivots between third countries. In this case, however, departures from the rules work out in a neutral fashion for net external assets. To the extent that the capital and reserves on the balance sheets of SFIs, that is, their external *liabilities*, are not based on market value, the resulting divergences reflect equally large divergences for external *assets*. Consequently, SFIs are left out of consideration in the remainder of this article.

[4] Only in the event of a take-over by another company could the market value of a subsidiary be approximated by taking the amount that the new parent company was prepared to pay at the time of the take-over (and that it has entered in its own books).

be illustrated for individual groups, such as Royal Dutch Shell. Given that the shares in this group held by foreign investors are counted as Dutch liabilities at stock exchange value, whereas the foreign subsidiaries are counted at (much) lower book value, Dutch external assets are clearly understated.

How net external assets figures are distorted *on balance* differs from one country to the next. An additional problem in interpreting *developments* is constituted by the fact that the distortions are not constant, but depend notably on the stock exchange climate, since the more optimistic investors are, the larger will be the gap between market value and book value.

In the Netherlands, the assets, that is, the Dutch outward direct investment, are understated to a larger extent than the liabilities. This is caused by the fact that, for a large number of years, Dutch companies' outward direct investment has been much larger than inward direct investment (so that more or less equal distortions in percentage terms are, in euro terms, easily larger for assets than for liabilities). In 2011, Dutch outward and inward holdings of equity capital in subsidiaries totalled EUR 489 billion and EUR 271 billion, respectively. (book value, see Chart 1). Consequently, Dutch net external assets would be billions of euro higher (see below) if a more market-based valuation of capital participations were to be used.

The level of and the movements in Dutch net external assets depend heavily on the income earned by our country from external trade (section 2). In addition, net external assets depend strongly on the way in which assets and liabilities are valued. This is all the more true as the Netherlands has substantial external assets and liabilities, where a minor distortion in percentage terms would already have major consequences in terms of euro. This article discusses a method developed by DNB for translating book values into market values (section 3). Initial results suggest that Dutch net external assets were understated in the period 2004-2011, at times by as much as EUR 140 billion. In this respect, the stock exchange climate played a major role (section 4).

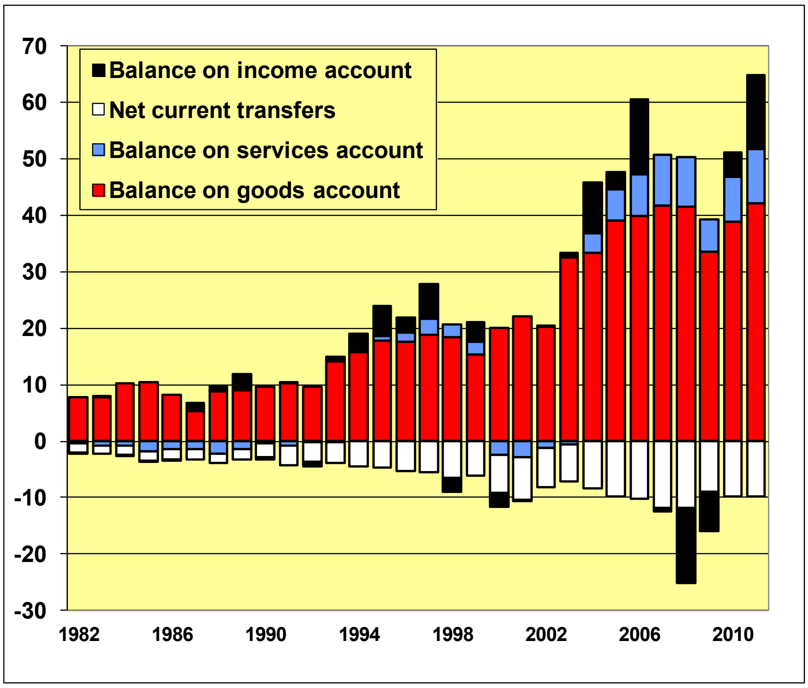
2. Current account surpluses as well as other factors decisive for net external assets

The Netherlands owes much of its prosperity to its favourable location in Northwest Europe. Exports and imports of goods and services have increased steadily over the years. Thanks to its exports of agricultural products and chemicals, transport services and many other forms of high-quality services, the Netherlands earns sizable net amounts from international trade. Over the past three years, the surplus on the goods and services account of the balance of payments averaged some EUR 40 billion (Chart 2). Incidentally the surplus on the current account is usually lower. This is because annually some EUR 10 billion in income is transferred to European institutions, relatives abroad and development cooperation.

Transactions on the current account, whose balance is, by definition, equal to the national savings surplus, result in equally large changes in the country's external claims and liabilities. Export earnings, for instance, may show up in the deposits that exporters (or their local banks in the Netherlands) hold at foreign banks. Thus, it might be expected that, aside from other factors, the Dutch current account surpluses have over the years resulted in a significant increase in net external claims.

Chart 2

Breakdown of current account transactions (EUR billion)



In reality, for many decades external assets and liabilities have also been living "a life of their own", determined in part by the sharply increased international capital transactions since their liberalisation. That is especially true of the Netherlands, characterised as it is by a large financial sector, the presence of many multinational corporations and high levels of savings for old-age pensions which are often invested abroad by pension funds.

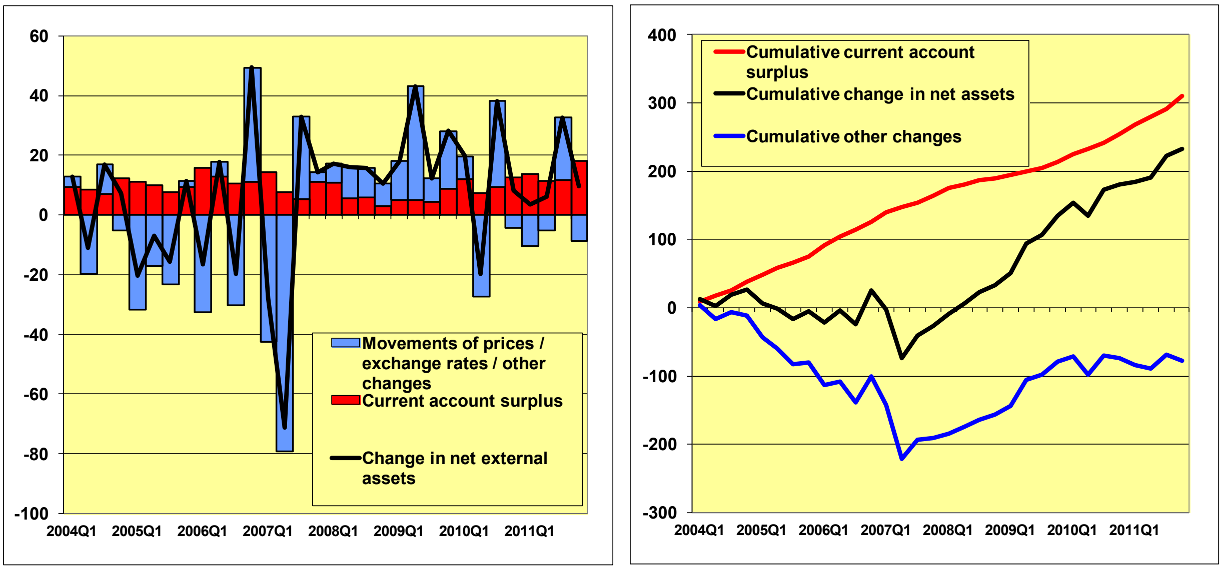
In 2011, external assets and liabilities, amounting to EUR 2,898 billion and EUR 2,673 billion, respectively, were already 50 times as high as the current account surplus. This also illustrates the importance of other factors, including the *valuation method* used for financial assets and liabilities, for the level of and the movements in our country's net external assets. In the period 2004-2011, Dutch net external assets increased from around nil to EUR 224 billion. This may be ascribed to current account surpluses, which totalled over EUR 310 billion for the period 2004-2011, but price, exchange rate and other changes depressed the total by about EUR 100 billion (Chart 3 shows data about these changes as from 2004, the first year after the introduction of new surveys by DNB).

During the first three to four years of the period concerned (2004-2011), revaluations depressed net external assets, but worked out positively in later years. These deviations from the underlying trend of net external assets would have been considerably smaller – as will be illustrated below – if, on the Dutch balance sheet, not only listed equities, but cross-border participating interests, too, would have moved in line with stock exchange prices.[5]

5 A case in point is the example, cited earlier, of Shell: when stock exchange prices go up, foreign holdings in Shell increase, but the values of Shell's foreign subsidiaries do not; as a result, Dutch net external assets go down due to purely statistical inconsistencies.

Chart 3

Movements in net external assets (EUR billion)



3. Estimating market values from book values

In a company's accounts, the capital and reserves (shareholders' equity) show the company's worth, that is, in accordance with generally accepted accounting rules. Under normal conditions, with favourable prospects, this book value is lower than market value, the amount which "the market" would be prepared to pay for the company. When calculating net external assets, DNB includes subsidiaries at book value; as a result, both assets (Dutch outward direct investment) and liabilities (inward direct investment) are included at amounts below market value. In practice, the difference between market value and book value, the so-termed value gap, is usually positive.

In this section, a description is given of the manner in which such distortions resulting from the valuation of both Dutch outward participations (in equity capital) and inward participations in the Netherlands at book value have been adjusted and how book values have been converted into market values. In this context, three categories of companies are distinguished.

Diagram – From book value to market value

a. Company having its head office in the Netherlands		**b. Company with head office abroad** *Foreign subsidiaries at net asset value*		**c. Company with head office abroad** *Foreign subsidiaries at historical cost*	
Book value of capital and reserves	20	Book value of capital and reserves	20	Book value of capital and reserves	26
Market value (stock exchange value)	32	Estimated market value (1.6 x 20)	32	Estimated market value (1.6 x 26/1.3)	32
MV/BV = 32/20 = 1,6		(1.6: average of group a)		(1.3: halfway between 1 and 1.6 of group a)	
Value gap	12	Value gap	12	Value gap	6
Operational group result	3	Operational group result	3	Operational group result	3
Of which: profits earned abroad	2	Of which: profits earned abroad	2	Of which: profits earned abroad	2
Foreign share	2/3	Foreign share	2/3	Foreign share	2/3
Foreign subsidiary (net asset value)	10	Foreign subsidiary (net asset value)	10	Foreign subsidiary (net asset value)	14
Allocated part of value gap (2/3 x 12)	8	Allocated part of value gap (2/3 x 12)	8	Allocated part of value gap (2/3 x 6)	4
Foreign subsidiary (market value)	18	Foreign subsidiary (market value)	18	Foreign subsidiary (market value)	18
Adjustment of foreign assets	8	Adjustment of foreign assets	8	Adjustment of foreign assets	4
Adjustment of foreign libailities	0	Adjustment of foreign libailities	12	Adjustment of foreign libailities	6
Net adjustment	8	Net adjustment	-4	Net adjustment	-2

a. Companies with head office in the Netherlands

For companies with their head office in the Netherlands, mainly outward direct investment needs to be adjusted (apart from foreign (minority) interests in the Dutch company; see below). For the adjustment of outward direct investment, first the value gap is determined, being the difference between the market and the book value of the Dutch company. *Book value* is understood to mean the company's capital and reserves on a (globally) consolidated balance sheet, i.e. the difference between assets and debt of all group entities with the exception of intragroup claims and liabilities.[6] For the *market value* of listed companies, market capitalisation is used, i.e. the number of outstanding shares multiplied by the share price. The (unweighted) average ratio of market to book value of these companies is also used to estimate the market value from the book value of non-listed companies with their head office in the Netherlands.

If a value gap occurs, it can be ascribed to the group entities in the Netherlands and those abroad, but the extent of their individual contributions is unknown. Which part of the value gap is to be allocated to domestic or foreign group entities can therefore only be approximated, for instance by looking at their contributions to overall group operations, measured by balance sheet totals, for instance. In the case of *financial* institutions, mostly banks, it is assumed that, thanks to solvency requirements, the balance sheet totals are sufficiently in line with shareholders'equity capital for the latter to be used for proportionally allocating the value gap. If shareholders' equity capital of the Dutch parent company is, for instance, 1,000 and its outward direct investment is worth 600 (the shareholders' equity capital of the foreign subsidiary), then 60% of the value gap is allocated to the foreign subsidiary and 40% to the parent company in the Netherlands.

For *non-financial* institutions, this method is usually not an option. A foreign subsidiary often represents far more (or, conversely, far fewer) operations than can be deduced from shareholders' equity capital. A useful indicator for the contribution to operations and value gap in that case is constituted by the profits earned (the operational result). Dutch companies have to report to DNB about the part of operational profits earned abroad. A comparison with the amount earned domestically provides a key for the domestic/foreign allocation of value gaps. The foreign parts of the value gaps can then be used to convert outward investment from book to market value (see the diagram).[7]

b. Companies with head office abroad – foreign subsidiaries at net asset value

A Dutch company may form part of a group of companies with its head office abroad. In that case, inward capital participations in such a company, i.e shareholders'equity capital, qualifies for an adjustment from book to market value. After all, the inward investment is reported to DNB at book value. The *size* of the adjustment – the value gap, the difference between market value and capital – partly depends on the manner in which a company values its foreign subsidiaries (see below). That is why two categories, b and c, are

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[6] In the same manner and based on the same accounting rules, the value of individual (foreign) subsidiaries can be determined as the difference between all assets and debt of those subsidiaries while leaving out intragroup claims and liabilities. For foreign subsidiaries, reporting to DNB takes in accordance with this *net asset value* method.

[7] If a Dutch company mainly earns its profits *abroad*, the largest part of the value gap will be allocated to outward direct investment. An example is constituted by Royal Dutch Shell. At year-end 2009, the value gap for this company, derived from publicly available figures, amounted to EUR 35 billion (EUR 130 billion market value minus EUR 95 billion book value). Of the profits in the fourth quarter, X% (a confidential percentage) originated from abroad. On this basis, it may be estimated that the equity capital held in foreign subsidiaries at market value instead of book value would be X% of EUR 35 billion higher.

distinguished. However, in both cases, the market value of the inward direct investment is obtained by adding the value gap to the book value.

Companies of category b value their domestic and/or foreign *subsidiaries* in the same manner as companies in category a, that is, at net asset value. Hence, by definition, the shareholders' equity capital of the company (the balancing item) is also comparable to that of companies from category a. Consequently, it is assumed that shareholders' equity capital differs just as much from market value as in the case of companies from category a. The diagram uses the same factor, 1.6 (market value/book value), so a value gap of 60%, for companies from categories a and b.

If the company has subsidiaries abroad and there is outward direct investment, the adjustment to market value proceeds in the same manner as that described for companies of category a.

c. Companies with head office abroad – foreign subsidiaries at historical cost

Many companies established in the Netherlands with their head office abroad can only value their foreign subsidiaries at historical cost, since they know too little about those subsidiaries to determine the net asset value, as defined above, under a, and preferred by DNB. For instance, they do not know how much profit these subsidiaries (and, in turn, their subsidiaries) have reinvested abroad and, consequently, how much the value has increased in the course of time; quite often, only the group's management knows this and they could have their offices elsewhere abroad, without having any obligation to report to DNB. In this respect, valuation at historical cost provides a less clear a picture than the net asset value. On the other hand – and assuming for the time being that this carries more weight − the historical cost of foreign subsidiaries includes the goodwill paid at the time of their take-over. The goodwill included in foreign assets is often substantial, resulting in a proportionally higher shareholders'equity capital of the Dutch company. For companies in this category it is therefore assumed that this capital, i.e. inward equity capital in subsidiaries, already better approximates the higher market value and that inward direct investment therefore requires less adjustment. Shareholders' equity capital is therefore only raised by half of the average adjustment percentage for categories a and b.[8]

A special subcategory is constituted by the so-called special financial institutions (SFIs). Their assets and liabilities have been left unadjusted. In footnote 1, it was already noted that, in the case of SFIs, differences from market value have no noticeable impact on net external assets. Moreover, for SFIs the book value of assets and liabilities (mostly valued at historical cost) often constitutes a better approximation of market value than for other companies established in the Netherlands. This is because SFIs are relatively frequently subject to intra-group transactions (restructuring operations with attendant changes in ownership), so that the valuation at historical cost is often more up-to-date.

From each of the three categories distinguished above, the principal companies (and, in the case of category a, all companies) have been subjected to an examination. The examination covered the quarterly figures for the period 2007 IV-2011 IV. For these companies, that is, at the micro-economic level, direct investment has been adjusted to market value. Subsequently, the results, in terms of the percentage adjustments found, have been used as

[8] This is as yet an arbitrary assumption, which, for instance, in part c of the diagram on page 6 results in a higher book value of the foreign subsidiary and higher shareholders' equity capital of the Dutch parent. A sensitivity analysis showed that the full adjustment of inward direct investment resulted in an approximately EUR 20 billion larger addition to net external assets and that leaving the figures unadjusted led to a EUR 20 billion lower addition to net external assets (averages for the period under consideration). In all cases, adjustment led to an *upward* adjustment of net external assets.

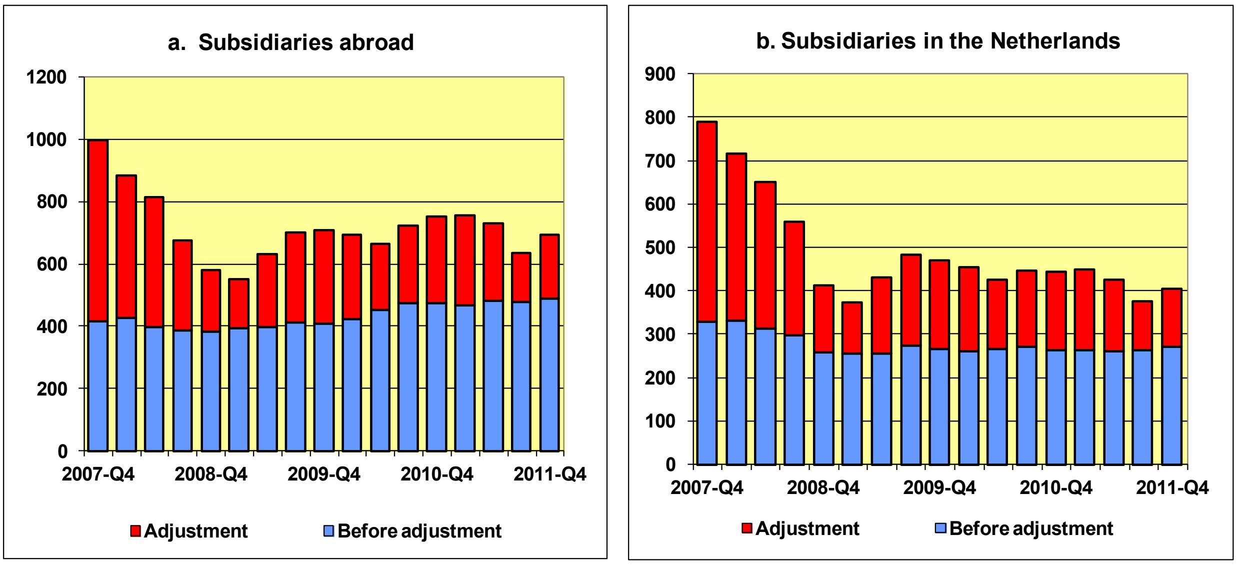
a basis for estimates concerning direct investment by the companies not covered by the examination.

4. Result: The Netherlands richer than with net external assets calculated in the usual manner

The adjustment of direct investment to market value has major consequences for both Dutch assets and Dutch liabilities. Although the adjustments vary greatly during the course of the period covered by the examination, they invariably lead to a substantial increase in both Dutch outward direct investment and inward direct investment (Chart 4).

Chart 4

Equity capital in subsidiaries abroad and in the Netherlands (EUR billion)



In euro terms, the largest adjustments mostly concern Dutch outward direct investment. In the fourth quarter of 2007, these adjustments totalled EUR 580 billion. On the Dutch balance sheet, adjusting the value of direct investment to market value would result in an increase in assets in particular. In most cases, the effects on net external assets are likewise substantial; in the first quarter of 2011, Dutch net external assets would be as much as EUR 100 billion higher if direct investment were valued at market value instead of book value.

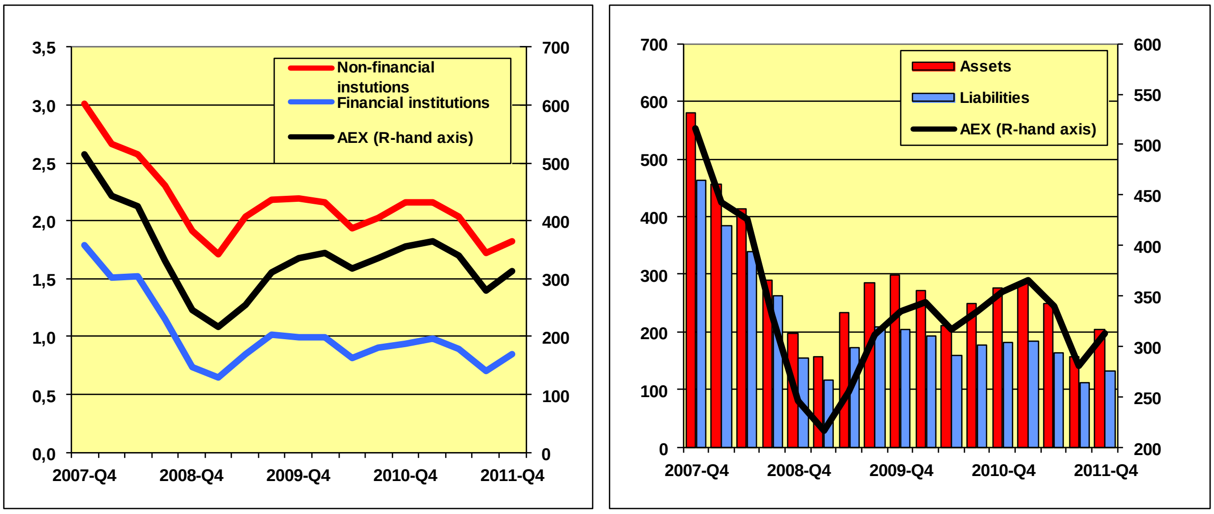
Valuation at market value also has consequences for the movements in net external assets. The period covered by the examination (2007 IV-2011 IV) includes years of major unrest. During the financial crisis, the fall in stock exchange prices caused shareholders' equity capital of the non-financial institutions examined to drop to a low averaging 1.6 times their book value (Chart 5a). For financial institutions, the drop was even more pronounced, with a market value temporarily at a level of no more than two-thirds of book value (and, as a consequence, a negative value gap).

Chart 5

Relationship between AEX and adjustment of direct investment (shareholders' equity)

a) Ratio of market value to book value

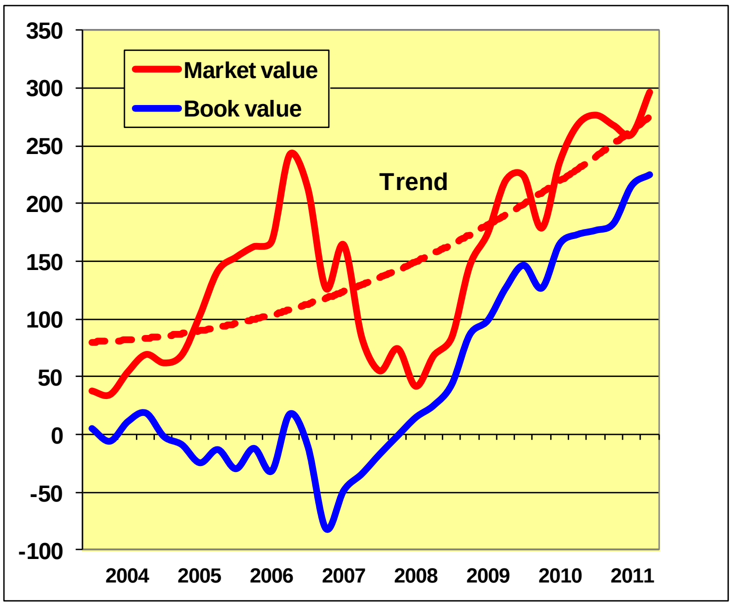
b) Adjustment of direct investment (EUR billion)



Both the ratios of market value to book value (Chart 5a) and the adjustments of direct investment (Chart 5b) are closely in line with the movements in the AEX index, in both percentage and euro terms. Hence, this significant correlation has been relied on to make estimates for earlier periods preceding the period 2007 IV-2011 IV of the differences between market value and book value, without first calculating the value gaps for individual companies in the three groups distinguished.[9] Subsequently, net external assets have been calculated to as early as 2004 I.

Chart 6

Dutch net external assets



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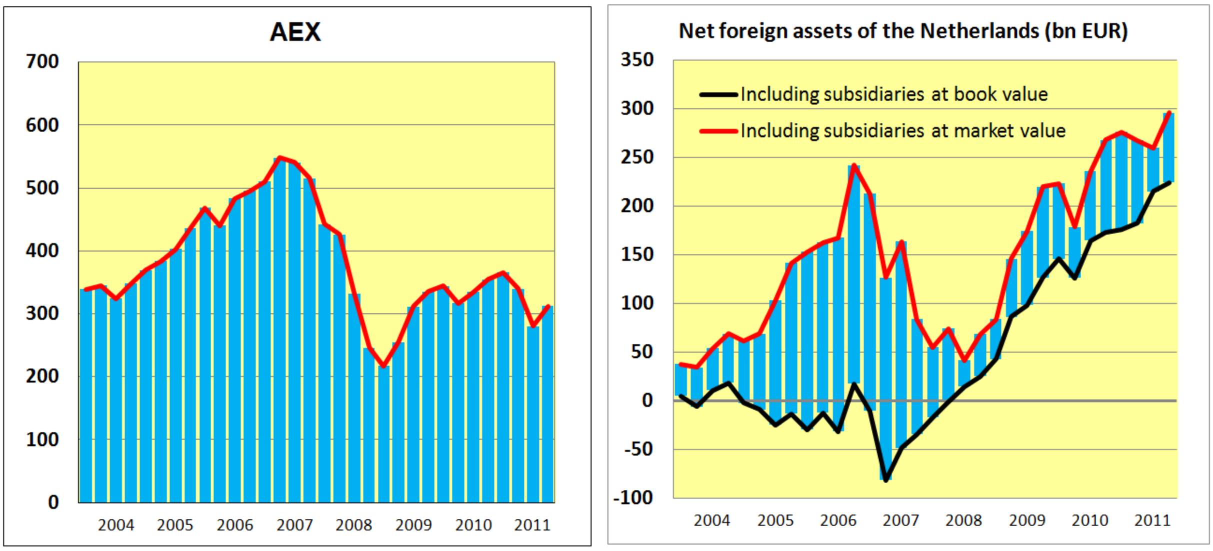
9 A linear relationship has been estimated, separately for outward and inward direct investment, between percentage changes in the AEX index (explanatory variable) and in the ratio of market to book value (dependent variable).

In the period 2004-2011, *valued at book value*, Dutch net external assets did not at first show an increase, despite sustained surpluses on the current account of the balance of payments (Chart 6). Until 2007, this reflected negative effects of price, exchange rate and other changes, especially for those items within external assets that are sensitive to changes in the stock exchange climate. These effects could make themselves felt because direct investment at book value could *not* move with "the market". As a result, net external assets (at book value) temporarily moved away significantly from the trend. By contrast, valued at market value, net external assets clearly regain the upward trend in line with the large current account surpluses earned in the period concerned.

Hence, whenever the AEX index shows large upward and downward movements, while direct investment is valued at book value, major gaps may arise from time to time between the movements in net external assets at market value and net external assets at book value (Chart 7). For that reason, in the future the Dutch net external asset figures published on DNB's website will also include figures in which holdings of equity capital in subsidiaries are valued at market value.

Chart 7

AEX index and distortion of net external assets



5. Conclusion

It may be concluded that, in many cases, valuation of outward and inward direct investment at market value instead of book value results in a considerable increase in Dutch net external assets. In the period 2004 I-2011 I, the difference repeatedly exceeded EUR 100 billion, sometimes even EUR 200 billion. Both inward and outward holdings of equity capital in subsidiaries are often significantly understated if valued at book value. Moreover, this valuation method also gives rise to fluctuations in net external assets of a purely statistical nature. Hence, the usefulness of the present statistics may be enhanced if, in addition to the figures compiled using the standard method, users are also given data showing Dutch net external assets at market value. A better insight into this quantity is all the more important since data on the current account and external assets will come to play an important role in the Excessive Imbalances Procedure, the agreements recently made by European countries to better monitor and prevent macro-economic imbalances.

Concentration indicators: assessing the gap between aggregate and detailed data

Fernando Ávila,[1] Emilio Flores,[1] Fabrizio López-Gallo,[1, 2] and Javier Márquez[3]

Introduction

Banks and other financial intermediaries tend to specialize in market segments where they exercise a competitive advantage. Whereas specialization facilitates banks to benefit from market conditions or their expertise, specialization may be accompanied by concentration of resources in counterparties, regions, industry sectors, or business products, compromising banks' diversification of their sources of business or income. This lack of diversification increases a bank's exposure to losses arising from the concentrated portfolio. Therefore, Concentration could work as a magnifying mechanism of financial shocks which may lead an institution to insolvency In fact, the Basel Committee on Banking Supervision (2006) affirms that "*concentration is arguably the most important cause of large losses on banks' portfolios*". The BCBS exhorts financial authorities to supervise and measure the risks of the portfolios of their financial institutions, including concentration risk.

The BCBS made an important effort at the beginning of the last decade to establish risk sensitive capital requirements for credit risk under Pillar I. It included a proposal to recognize concentration risk in a consistent manner. The main idea was to incorporate a *Granularity Adjustment* to the *Asymptotic Single Risk Factor Model* (ASRF) which is the base model for the IRB approach to compute capital requirements for credit risk. The ASRF computes the asymptotic loss distribution of loans portfolios, which is based on the model proposed by Vasicek (1987). The ASFR assumes that all credits in the portfolios are of equal size, and hence, credit VaR is asymptotically a linear function of the exposures in the portfolio. Evidently, real portfolios are not perfectly granular, so Gordy (2002) proposed to add a Granularity Adjustment factor to the ASRF, to include the diversification effect in the credit risk capital requirements of Basel II. Many authors further explore this approach: Gürtler et al. (2009), Bonollo et al. (2009), Lütkebohmert (2009), and Ebert and Lütkerbohmert (2010).

However, as Pillar I capital requirements for credit risk were intended to be derived from individual positions, the granularity adjustment introduced to capture concentration risk, dependent on the characteristics of the whole portfolio, was not compatible with the way overall capital requirements were computed. Indeed, credit risk capital requirements are obtained as the sum of the capital requirements applied to each exposure within the portfolio (see BCBS (2006b)).

As concentration risk, which is portfolio-based, is not yet considered under pillar I, Basel II permits additional capital requirements under Pillar II, subject to the discretion of local authorities. Pillar II explicitly states that regional authorities as well as banking institutions themselves "*should supervise, measure, and control concentration risk in their credit portfolios*" (see BCBS (2006), paragraph 773). To accomplish this task, banking supervisors and authorities should have their own models or estimates to monitor and measure the risk

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of banks' portfolios. Hence, models used by supervisors should be sensitive to concentration, either implicitly or explicitly.

To include concentration risk, supervisors may need information on the full set of exposures of banks. This information is rarely available for supervisors around the world, especially for those of financial systems with a large number of banks where reporting the whole portfolios to the authorities may be complicated. Such supervisors may be provided only with information of the largest counterparties of the banks, but not with the full detail of small credits in the banks' portfolios, and thus, risks may be neglected. Even if small credits may not contribute individually in a large extent to the bank's risks, these credits may be generating concentrations in a single sector, such as small and medium size enterprises (SMEs), consumer loans and credit cards, or mortgages.

However supervisors may not need the full set of exposures of the banks: estimates of concentration may be enough. If, as in the case given above, supervisors are provided with aggregate information on the exposures of a bank, they will be able to compute estimates of the concentration, and then, additional capital requirements.

Few studies in the literature have proposed measures of concentration. The most popular ones have been the Herfindahl-Hirschman Index (HHI) and the Gini-Coefficient (GC is an inequality measure rather than a concentration one). Most of these measures where proposed to study industry concentration and market competition during the 70's and 80's.[4] At the end of the 80's and during the 90's, some of these measures were extended to measure concentration risk on portfolios.

Some methodologies to estimate concentration measures from aggregate data have been proposed in the literature. The main purpose of this paper is to review some of these methodologies and to assess their accuracy. To this end, information on the overall credit exposures of banks operating in Mexico is considered. This information is provided periodically by financial institutions to Mexican authorities and banking supervisors since the middle of the last decade. Before that, financial authorities and supervisors were only provided with information on the largest credits of each banks' portfolios. Loans below a given threshold (200 thousand pesos or approximately 15 thousand US dollars) were aggregated in sector-buckets, and only the total amount of the bucket was reported: not even the number of credits in the bucket was known by supervisors. Thus, using the overall credit exposures of the banks, the exact concentration measures can be computed and compared to the estimates furnished by approximation methodologies, assuming that small-size loans are aggregated and only limited information is available.

The article proceeds as follows. Section 1 reviews some of the most popular measures of concentration proposed in the literature. From data on the portfolios of corporate loans and mortgages of banks operating in Mexico, these measures are estimated. Section 2 reviews some methodologies to estimate concentration measures, especially the HHI, when aggregate data is furnished. These methodologies are applied to the portfolios considered in section 1. Section 3 concludes.

1. Review of Concentration and Inequality Measures proposed in the literature

Concentration and Inequality are related concepts which have been historically confused. In a credit portfolio context, inequality refers to the distribution of the loans' exposures within a

[4] See Jacquemin and Berry (1979) and Clarke and Davis (1983).

portfolio, while concentration is related to the value of the portfolio which is held by a small number of debtors, as defined by Hoffman (1984). Both concepts are related as concentration incorporates both the size inequality of the exposures and the number of loans within the portfolio.[5, 6]

The most common measure of concentration has historically been the Herfindhal-Hirschman Index (HHI), which is defined as:

$$HHI = \sum_{i=1}^{n} \xi_i^2 \qquad \mathbf{1}$$

where n is the number of credits in the portfolio and ξ_i is the exposure of credit i relative to the portfolio's total value. Meanwhile, the most popular measure of inequality has been the Concentration Ratio (CR) defined as the aggregate share of the k-largest credits on the portfolio:

$$CR^k = \sum_{i=0}^{k-1} \xi_{(n-i)} \qquad \mathbf{2}$$

where $\xi_{(1)}, \dots , \xi_{(n)}$ are the relative exposures of the credits ordered from the smallest to the largest.

Hall and Tideman (1967) compare estimates of concentration from both measures and found that they produce similar results. However, they remarked that, even if the CR may be a good proxy for concentration and inequality, it has the main issue that it depends only on the k largest firms, neglecting the contribution of the smaller credits, and hence, changing k changes the accuracy of the CR. Moreover, given that when $k \to n$ the CR tends to 1, the value of k which provides more information should be estimated; but there is not a universal optimal value of k, because it depends on the structure of the portfolio.

A solution was given by the Gini-Coefficient (GC) which is the area between the Lorenz Curve[7] of the portfolio and the Lorenz Curve of a perfectly diversified portfolio, represented by a 45 degree line. Further studies stress the idea that the CR and the GC are in fact measures of inequality and not measures of concentration. This last point becomes evident for the case where all credits are of equal size, then the GC is zero independently of the number of credits in the portfolio, while it is known that the more credits are on the portfolio, the more diversified it will be.

Other alternative measures of concentration were proposed during the 60's and 70's. Among those we have the one proposed by Hall and Tideman (1967) and defined as:

$$THI = \left(2\sum_{i=1}^{n} i\xi_{(i)} - 1 \right)^{-1} \qquad \mathbf{3}$$

5 See Bajo and Salas (1999).

6 In the case of concentration risk in credit portfolios, regulators should monitor concentration rather than inequality. Actually, as will be shown later, there may be banks with highly unequal portfolios but well diversified, for example a bank which allocates a few credits to large size enterprises but a large number of loans to small debtors may have low concentration but high inequality.

7 The Lorenz Curve is a representation of the cumulative distribution of the relative exposures of the credits in the portfolio, starting from the highest credit to the lowest.

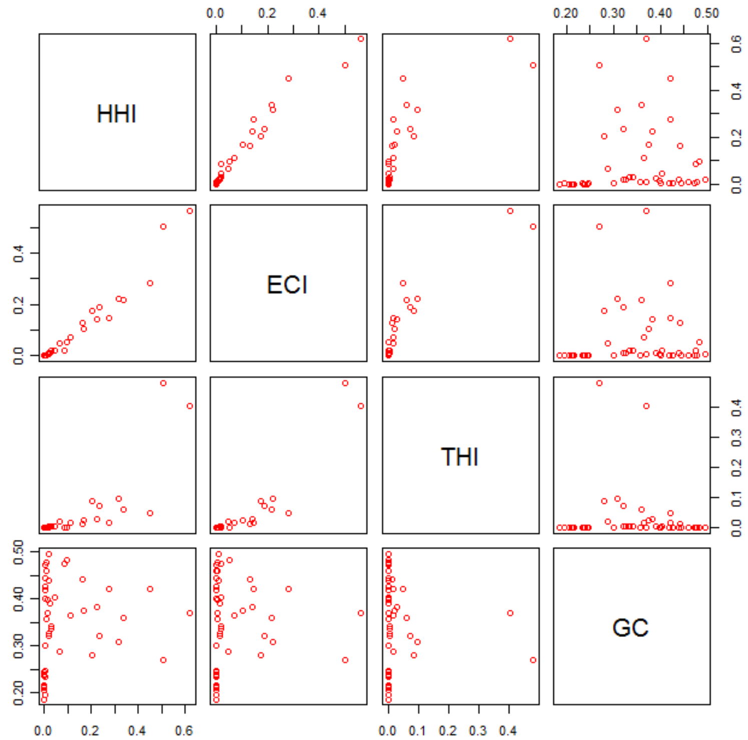
and the Entropy Concentration Index (ECI) proposed by Jacquemin (1975) and defined as:[8]

$$ECI = \exp\left(\sum_{i=1}^{n} \xi_i \ln \xi_i\right) \qquad \mathbf{4}$$

According to their proponents, these two measures are not different from the popular HHI, but the THI has the property of emphasizing the absolute number of credits composing the portfolio, while the ECI is more sensitive to small credits.

Figure 1

Comparison between concentration measures – Herfindahl-Hirschman Index (HHI), Entropy Concentration Index (ECI), Tideman-Hall Index (THI) – and inequality measures – Gini Coefficient (GC).



* Concentration and inequality measures calculated for all Banks in the Mexican Financial System.

In order to compare these measures of concentration and inequality, figure 1 shows the scatter matrix plot between the HHI, the EDI, the THI and the GC for the corporate loans and mortgages portfolios of banks operating in Mexico. It is observed that the HHI and the ECI present a linear relation (i.e. its scatter plot could be described by a linear function), which

[8] In fact, Jacquemin defined an Entropy Diversification Index (EDI) which is computed as:

$$EDI = -\sum_{i=1}^{n} \xi_i \ln \xi_i$$

Therefore, we transform this measure of diversification into a concentration measure by following the method of Hall and Tideman (1967).

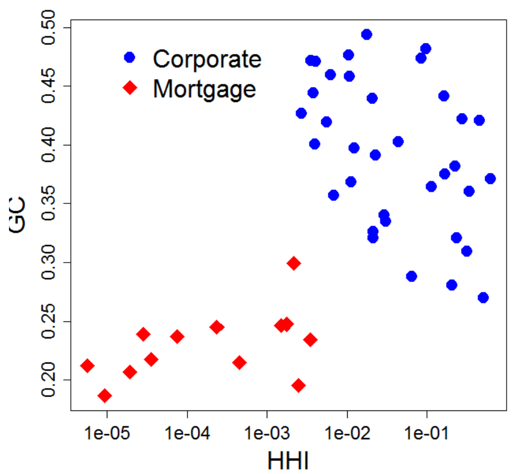
implies that these two measures give similar information regarding the portfolios' concentration. In view of the THI, which is the other measure of concentration, a slight deviation from linearity is observed, which may indicate that the THI may give different information than the other two indexes. Finally, no linear relationship between the GC and the other concentration measures is observed, because as Hall and Tideman (1967) stated, concentration and inequality are different concepts.

It should be noticed that, regarding concentration and inequality measures, mortgage portfolios and corporate loans portfolios behave in completely different ways. Figure 2a clearly shows this difference. It shows a scatter plot between the HHI and the GC for corporates and mortgages, where it can be observed that the scatter plots for both sectors are separate; corporate loan portfolios are more concentrated and exhibit higher inequalities than mortgages. Mortgage portfolios tend to have a greater number of loans, which reduces its concentration, and with more homogeneous exposures, which reduces inequality.

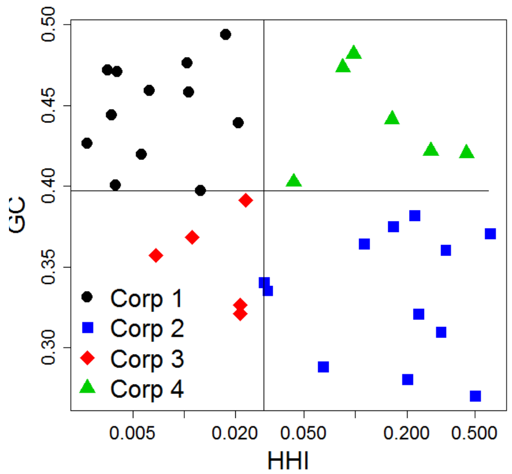
On the other hand, corporate loans tend to have more heterogeneous exposures due to the different sectors and sizes of the enterprises and may differ significantly between banks, depending on the sectors and the size of the enterprises to which they allocate credits. The differences between banks when allocating credits impact directly their measures of concentration and inequality. In fact, banks' portfolios may be classified into 4 groups depending on whether they are more or less concentrated, and whether they have high or low inequality. This is shown in figure 2b which plots the HHI against the GC for corporate loan portfolios. In this figure, the vertical-black line represents the median of the HHI, so that portfolios at the left side of the line are less concentrated, while portfolios at the right side are more concentrated. Similarly, the horizontal-black line represents the median of the GC: portfolios below the line have a lower measure of inequality, while portfolios over this line have higher levels of inequality.

Figure 2

HHI and GC for corporate loans and mortgage portfolios.



a) HHI[1/] and GC for mortgages and corporate loan portfolios.



b) Representation of corporate loan portfolios' classification[1/,2/]

1/ Concentration in logarithmic scale.

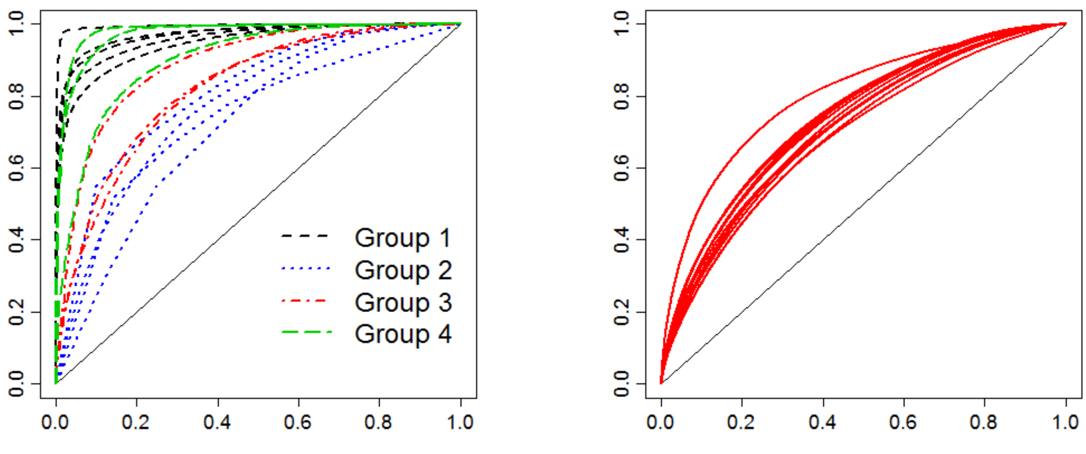
2/ The horizontal and vertical lines correspond to the GC and the HHI medians respectively.

Therefore, banks in group 1 have low concentration but a high level of inequality. Banks falling in this category participate actively in the corporate credit market. Their portfolios are diversified among enterprises of different sizes and from different economic sectors. Thus, they allocate a few large-size loans in a small number of debtors, as well as a large number of small-size loans. This diversification makes its GC to be high, but the large number of loans makes its concentration measures to be below average. In contrast, banks falling in group 2 have highly concentrated portfolios but low inequality. These banks do not contend in the market of corporate loans having only a few huge exposures in a small number of selected counterparties. In the other hand, banks that compose group 3 actively participate in the market assigning large-size loans. These banks have diversified portfolios with low inequality levels as well. As to group 4, banks in this category do not participate in this market. They assign few small-size loans, with the corresponding high concentration and inequality measures.

To go deeper in this analysis, figure 3 shows the Lorenz Curves for some representative banks of each group. It is observed that banks in group 1, which have the least concentrated portfolios, also have the highest inequality; in contrast, banks in group 4 which are the most concentrated, locate their Lorenz curves the closest to the 45 degree line, implying a lower inequality. This result may be counter intuitive, but is explained by the fact that more concentrated portfolios tend to have fewer numbers of loans.

Figure 3

Lorenz curves for typical corporate loans portfolios in each group and for mortgage portfolios.



a) Corporate Loans Portfolios

b) Mortgage Portfolios

2. Estimating Concentration under aggregate data

In order to compute any of the measures presented in last section, the complete credit portfolio is required. This may be an important limitation because in most cases, only aggregate data is available; the detail of the portfolio is unknown. This was the case for banking supervisors in Mexico in the past decade, when they only had access to detailed information on credits allocated by banks operating around the country, that were greater than a certain threshold, while credits below the threshold were aggregated and only the total exposure of the bucket was reported.

During the 80's, many studies on industry concentration and market competition were confronted with similar problems: researchers only had access to listings of the largest firms in a given industry so that calculation of the HHI (or other measures) was not possible.

One of the first attempts to overcome this situation was due to Cowell and Mehta (1982) who proposed a "rule of thumb" derived by interpolating the histogram of the industry's participants. Their main idea was to estimate upper and lower bounds of the tail of the Lorenz Curve from the Concentration Ratio at different levels, and then, to take a linear combination of these bounds to estimate the Gini-Coefficient of the industry. Hoffmann (1984) and Michelini and Pickford (1985) extended this approach to estimate concentration measures, especially the HHI. Mathematically, assume that the portfolio is divided in m buckets. Denote by F_k the total amount of bucket k relative to the total value of the portfolio, and by H_k the HHI in each bucket. Then, the HHI in equation 1 can be written as:

$$HHI = \sum_{k=1}^{m} F_k^2 H_k \qquad \textbf{5}$$

Now, we can compute two bounds for the HHI of the portfolio in terms of the bounds of the HHI of each bucket.[9] The lower bound for the HHI is, then:

$$HHI_{-} = \sum_{k=1}^{m} \frac{1}{n_k} F_k^2 \qquad \textbf{6}$$

where n_k is the number of credits in each bucket; and the upper bound is:

$$HHI_{+} = \sum_{k=1}^{m} F_k^2 \qquad \textbf{7}$$

Then, the HHI of the portfolio should be a convex combination of the lower and upper bounds:

$$HHI = \gamma HHI_{-} + (1-\gamma) HHI_{+} \qquad \textbf{8}$$

for $\gamma \in [0, 1]$. The problem now becomes to estimate the real weight γ which is an unknown parameter.[10] Cowell and Mehta (1982) proposed as a "rule of thumb", to establish γ=1/3. Hoffman (1984) and Michelini and Pickford (1985) showed that this rule of thumb worked pretty well on their studies of industry concentration.

Some recent studies suggest probabilistic approaches to estimate concentration. These methods are more accurate than the rule of thumb proposed by Cowell and Mehta. Two of these methodologies are presented: one proposed by McCloughan and Abounoori (2003), and another one proposed by Kanagala et al. (2005).

The methodology proposed by McCloughan and Abounoori (2003) assumes that the portfolio is divided in size-buckets[11] and that the number of credits on each bucket and its total size is provided. This information provides some points on the Lorenz Curve of the portfolio. The authors proposed to interpolate a distribution over these points, and then, to distribute the

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9 We know that, for a bucket composed of n credits, the HHI of the bucket is bounded between $1/n$ and 1.

10 As Michelini and Pickford (1985) stated, to estimate γ we must know the real HHI, but in this case, computing the linear combination is redundant.

11 The original method of McCloughan and Abounoori estimates the CR for different levels of k. This is why the methodology requires the portfolio to be divided in size buckets. The approach we describe here is slightly different as our interest is in estimating concentration measures, especially the HHI.

credits uniformly among the range of its bucket. The method would provide estimates of the size of each credit on the portfolio and then, it would be possible to estimate concentration.[12]

As for the methodology of Kanagala et al. (2005), the authors suggest to assume that the relative exposure of each credit on a given bucket (equation 5) follows a Gaussian random variable. Then, the HHI in the bucket would be a Chi-Square random variable. The main disadvantage of these methods is that it requires information on the number of credits and the standard deviation of the relative exposures in the bucket;[13] this information is rarely available.

Two more methodologies to estimate the HHI were suggested by Márquez (2006). The first approach assumes that the only available information on a bucket is the size of the largest credit in the bucket. Then, an upper bound for the HHI in equation 5 is:

$$HHI \leq \sum_{k=1}^{m} \xi_k^* F_k^2 \qquad \textbf{9}$$

where ξ_k^* is the maximum exposure in bucket k relative to the bucket total exposure. It should be noted that this upper bound is more accurate than the upper bound defined by equation 7. If information on the number of credits in each bucket is also available, the estimator on equation 8 could be improved using this upper bound proposed by Márquez.

The second estimator suggested by Márquez (2006), as the one proposed by Kanagala et al., is founded on the knowledge of the number of credits in a bucket and the standard deviation of the relative exposures, σ_X. Márquez derived an exact expression for computing the variance of the relative exposures in terms of the HHI:

$$\sigma_X^2 = \frac{1}{n-1}\sum_{i=1}^{n}\left(\xi_i - \frac{1}{n}\right)^2 = \frac{1}{n-1}\sum_{i=1}^{n}\left(\xi_i^2 - \frac{2\xi_i}{n} + \frac{1}{n^2}\right) = \frac{1}{n-1}\left(HHI - \frac{1}{n}\right)$$

and then:

$$HHI = (n-1)\sigma_X^2 + \frac{1}{n} \qquad \textbf{10}$$

This equation shows that there is a linear relation between the portfolio HHI and the variance of the exposures in the portfolio. Thus, unbiased estimators for the HHI may be computed from unbiased estimators of the variance of the exposures and the approach of Márquez is better than that of Kanagala et al. However, the second approach may be useful for making predictions on the future concentration of the portfolio, but this is not the purpose of this paper.

Table 1 summarizes these methodologies and the information required to estimate the HHI. To assess the accuracy of these methodologies to estimate concentration when aggregate data is provided, it is assumed, as in the case of the information reported to Mexican supervisors, that loans below a given threshold are not reported in detail, but only some information is provided. Different thresholds will be considered to show how, the more information is provided, the more reliable are the concentration estimators.

[12] Appendix A better describes this approach.

[13] The average relative exposure is not required as it is the inverse of the number of credits.

Table 1

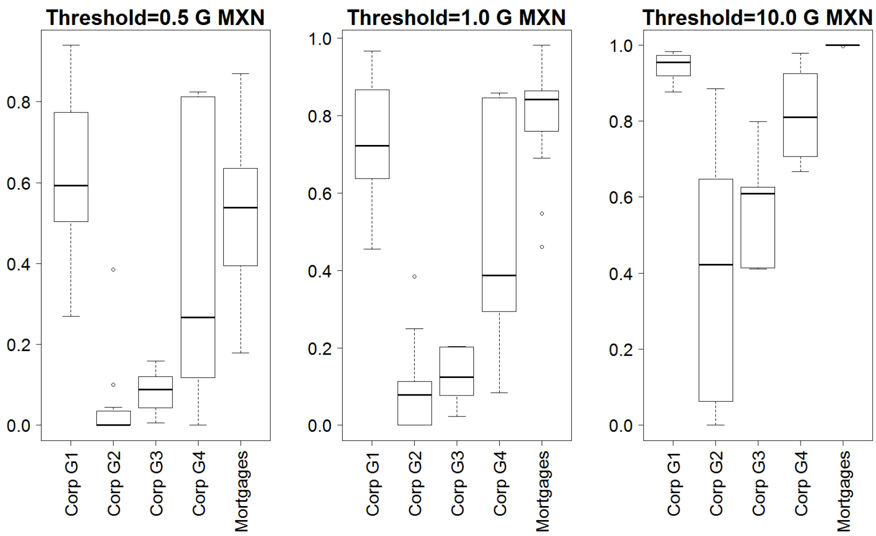
Summary of methodologies to estimate the HHI from aggregate data.

Author	Required information	Method
Cowell and Mehta Convex Combination	Number of credits. Total exposure. Weights for upper and lower bounds.	Calculate upper and lower bounds in each bucket and estimate a convex combination of these bounds.
McCloughan and Abounoori Interpolation Method	Number of credits. Total exposure.	Assume the portfolio is divided in size-buckets. Build the skeleton of the Lorenz Curve using the buckets. Interpolate the Lorenz Curve assuming credits in each buckets are uniformly distributed.
Kanagala Probabilistic Approach	Number of credits. Standard deviation of credit exposures.	Assume exposures are Gaussian random variables. Then HHI has a Chi-Square distribution. Make inferences on the HHI value from its distribution.
Márquez Upper Bound	Total Exposure Upper bound for credit exposures.	Compute HHI upper bound.
Márquez Exact HHI	Number of credits. Standard deviation of credit exposures.	Compute the exact HHI from its relation against the standard deviation.

Figure 4 illustrates the number of loans that are lost on aggregation for each group of loans' portfolios considered in last section. The thresholds that are considered are 0.5, 1.0 and 10 million pesos. It is observed that the higher the threshold is the more information is lost. The portfolios for which more information is lost are corporates in group 1 and mortgages.

Figure 4

Box-plot of the number of credits lost on aggregation by groups of corporate loans portfolios and mortgage portfolios. Aggregate loans are those of size exposure below a given threshold (0.5, 1.0 and 10.0 million pesos).



Percentage of loans lost on aggregation.

The results on the estimates of the HHI are presented in figures 5, 6 and 7, for the thresholds 0.5, 1.0 and 10 million pesos, respectively. These figures show box-plots for the relative errors on the estimation of the HHI using different methodologies, for each group of corporate loans portfolios and for the mortgage portfolios. The estimate errors shown in these figures correspond to the following methodologies:[14]

- **LowB:** Corresponds to the lower bound of the HHI established in equation 6.
- **MqUB1:** Márquez upper bound in equation 9, assuming that the highest exposure in each aggregate bucket is known.
- **MqUB2:** Márquez upper bound in equation 9, assuming we do not have any information on the aggregate data, but the threshold from which loans are aggregated. Then, we use this threshold to compute an upper bound for the HHI.
- **MA.exp:** Interpolation method of the portfolios' Lorenz curve, proposed by McCloughan and Abounoori, assuming an exponential function of the form:[15]

$$f(x) = \exp(\alpha \ln x), \qquad \alpha \in (0,1)$$

- **MA.sin:** Interpolation method of the portfolios' Lorenz curve, proposed by McCloughan and Abounoori, assuming a sinusoidal function of the form:

$$f(x) = \sin\left(\frac{\pi}{2} x^{\alpha}\right), \qquad \alpha \in (0,1)$$

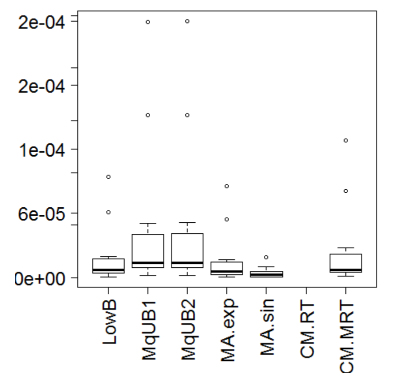
- **CM.RT:** "Rule of thumb" proposed by Cowell and Mehta, which is a linear combination of the HHI lower and upper bounds, equation 8 with γ=1/3.
- **CM.MRT:** Modified "Rule of thumb" proposed by Cowell and Mehta, changing the upper bound of the HHI to the upper bound proposed by Márquez (MqUB2), and fixing γ=1/3.

[14] Neither the Kanagala probabilistic approach nor the Márquez exact estimation of the HHI are considered in our results, because they require estimates of the variance of the exposures of the aggregate. To provide such estimates is not the main issue of this paper, so we drop these methodologies.

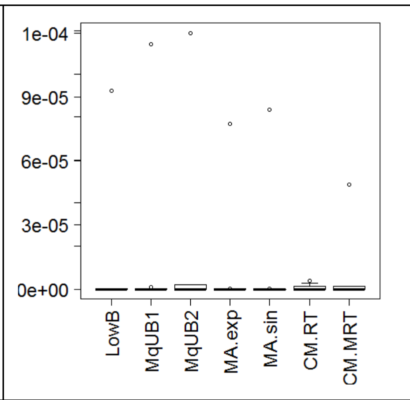
[15] It should be noticed that McCloughan and Abounoori proposed more sophisticated functions, as the log-normal, the type I Pareto and the exponential. The functions proposed in this study, while relatively simple, adequately capture the heterogeneity within the portfolios (see appendix A).

Figure 5

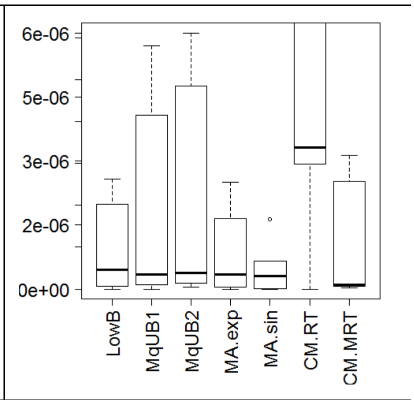
Box-plots for the error of estimation of the HHI when loans under 0.5 million pesos are aggregated using different methodologies.



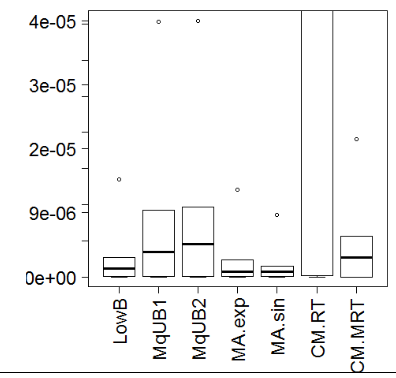
a) Corporates Group 1



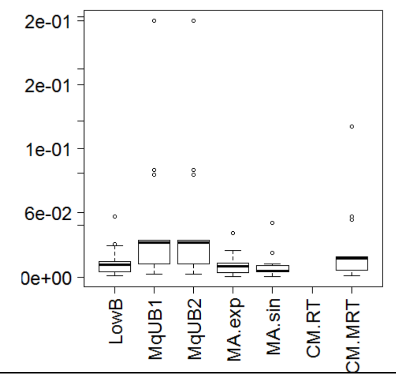
b) Corporates Group 2



c) Corporates Group 3



d) Corporates Group 4

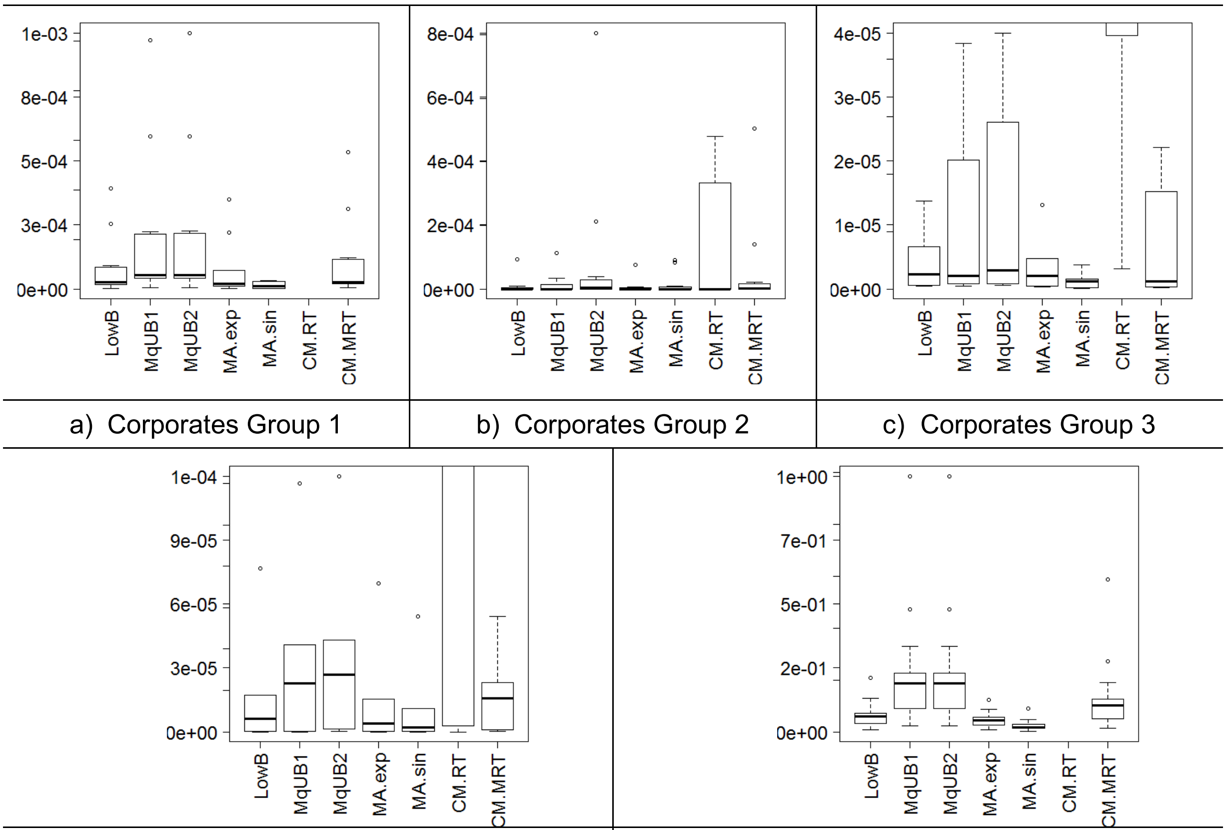


e) Mortgages

LowB: Lower bound by Cowell and Mehta. **MqUB1**: Márquez upper bound assuming the maximum size of the aggregate loans is provided. **MqUB2**: Márquez upper bound assuming all credits in the aggregate bucket are lower than the threshold. **MA.exp**: McCloughan and Abounoori interpolation method, from an exponential function. **MA.sin**: McCloughan and Abounoori interpolation method, from a sinusoidal function. **CM.RT**: Cowell and Mehta rule of thumb. **CM.MRT**: Cowell and Mehta modified rule of thumb.

Figure 6

Box-plots for the error of estimation of the HHI when loans under 1.0 million pesos are aggregated using different methodologies.



a) Corporates Group 1 | b) Corporates Group 2 | c) Corporates Group 3

d) Corporates Group 4 | e) Mortgages

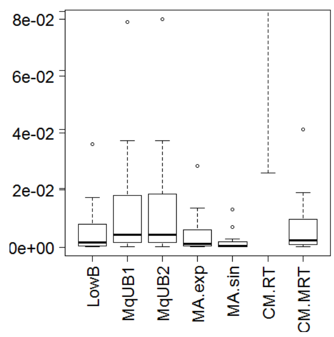
LowB: Lower bound by Cowell and Mehta. **MqUB1**: Márquez upper bound assuming the maximum size of the aggregate loans is provided. **MqUB2**: Márquez upper bound assuming all credits in the aggregate bucket are lower than the threshold. **MA.exp**: McCloughan and Abounoori interpolation method, from an exponential function. **MA.sin**: McCloughan and Abounoori interpolation method, from a sinusoidal function. **CM.RT**: Cowell and Mehta rule of thumb. **CM.MRT**: Cowell and Mehta modified rule of thumb.

Firstly, it is noticed that, as expected, for all portfolios – corporate loans and mortgages portfolios – accuracy improves with the amount of information provided. In other words, when loans below 10 million pesos are aggregated (figure 7), the estimation errors are higher than when considering lower thresholds. Moreover, for all thresholds, HHI estimation errors are higher for mortgage portfolios than for corporate loans. The main reason is that there are a larger number of loans below the thresholds for mortgage portfolios, so that more information is lost when aggregating. It should also be pointed out that even for mortgage portfolios, the estimators are highly accurate. For instance, the mean error for mortgage loans considering the 10 million pesos threshold is about 2.7 times the real HHI, which is reasonably accurate, considering that the HHI for mortgage portfolios is of the order of 1e-05 and 1e-03.

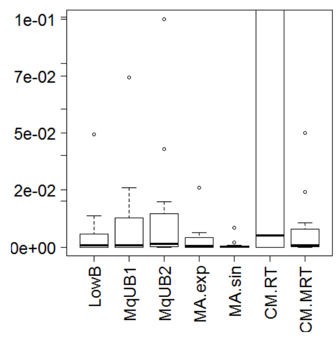
In regards of corporate portfolios, it is observed that estimates of the HHI are more accurate. For the 10 million pesos threshold, the relative errors of the estimators are of orders of 1e-02, which again, are very accurate. In the other hand, more concentrated and more homogeneous portfolios (higher HHI and lower GC) present better estimates of concentration. Indeed, group 2 portfolios, which are highly concentrated and homogeneous, have the lowest estimation errors (except for an outlier bank). As already mentioned, the reason is that these banks allocate large size credits in a few selected counterparts.

Figure 7

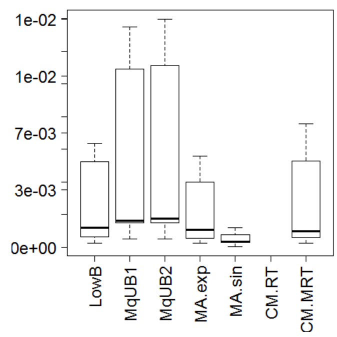
Box-plots for the error of estimation of the HHI when loans under 10.0 million pesos are aggregated using different methodologies.



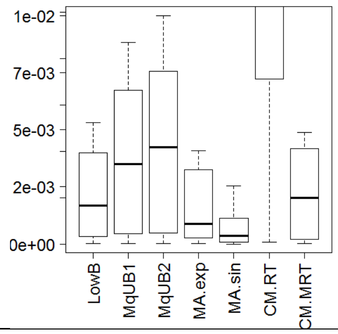
a) Corporates Group 1



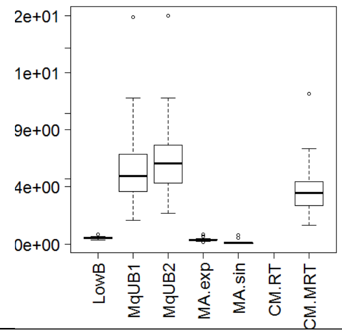
b) Corporates Group 2



c) Corporates Group 3



d) Corporates Group 4



e) Mortgages

LowB: Lower bound by Cowell and Mehta. **MqUB1**: Márquez upper bound assuming the maximum size of the aggregate loans is provided. **MqUB2**: Márquez upper bound assuming all credits in the aggregate bucket are lower than the threshold. **MA.exp**: McCloughan and Abounoori interpolation method, from an exponential function. **MA.sin**: McCloughan and Abounoori interpolation method, from a sinusoidal function. **CM.RT**: Cowell and Mehta rule of thumb. **CM.MRT**: Cowell and Mehta modified rule of thumb.

For group 1 of corporate loan portfolios, which comprises the most active banks in this sector, it is observed that the average estimation error is of the order of 1e-05 for the 0.5 million pesos threshold and 1e-02 for the 10 million pesos threshold.

Regarding the different measures, it is observed that the HHI upper bounds of Márquez, MqUB1 and MqUB2, have the highest errors for all portfolios. The reason is that these upper bounds consider an upper bound of the credits in the aggregate bucket, which may not give any information on how loans are distributed among the buckets. The other methodologies, which are based on the number of aggregate loans, assume that aggregated loans are at least uniformly distributed in the bucket, and then, they give better estimates than the upper bounds. Indeed, estimating the HHI by the lower bound (LowB), assumes that all credits in the aggregate bucket are uniformly distributed, while the McCloughan-Abounoori interpolation method (MA.exp and MA.sin) assumes more general distributions.

For the methodologies based on the knowledge of the number of loans in the aggregate buckets, the McCloughan-Abounoori interpolation methods give better estimates than the lower bound. The reason is that loans are not uniformly distributed in the bucket, which is the assumption of the lower bound. Then, assuming more general distributions may provide better estimates, as in this study. However, it should be considered that more general distributions may require more complex process than just computing the lower bound. Even though, both distributions considered in this paper (exponential and sinusoidal) took a few seconds to be computed. The methodology is explained in appendix A. In the other hand, it is observed that for all portfolios, the sinusoidal function gives better estimates than the exponential. The sinusoidal function has the property of being more concave than the exponential; therefore, a sinusoidal function may adjust better for more heterogeneous portfolios. This may imply that the size-exposures of the loans in the aggregate buckets are not homogeneous.

Finally, the Cowell and Mehta "rule of thumb" give the highest errors. Actually, this methodology gives highly biased estimators. In some cases, especially for corporate portfolios in group 1 and for mortgage portfolios, the box-plots for the errors are not presented because they are out of the scale. The reason is that the portfolios considered in this paper are closer to the low bound of the HHI than to the upper one, which implies that such portfolios may be diversified. The exception is for corporate portfolios in group 2, for which the Cowell and Mehta rule of thumb is quite accurate. However, this methodology losses precision as the threshold for aggregating loans increases.

Even though, the Cowell and Mehta "rule of thumb" can be modified to create more accurate estimates of the HHI. This "modified rule of thumb" (CM.MRT), rather than considering as upper bound the one given in equation 7, it considers the upper bound proposed by Márquez (MqUB2). Then, the estimator proposed by this "modified rule of thumb" is given by:

$$HHI = \frac{1}{3} LowB + \frac{2}{3} MqUB2$$

This modified rule of thumb gives better estimates than the simple rule of thumb of Cowell and Mehta, because the upper bound of Márquez is much closer to the real HHI than the upper bound used by Cowell and Mehta. Furthermore, more accurate estimates can be proposed by changing the weight γ. Actually, the real value of γ lies between 0.6 and 0.8 for most cases, and hence, proposing γ=2/3 may increase considerably the accuracy of the estimates of the HHI. However, computing the best value of γ may not be possible *a priori*, and the error of this "rule of thumb" may not be controlled.

3. Conclusions

As concentration is presumably one of the most important causes of large losses in the banks' portfolios, banking supervisors and authorities are encouraged to monitor and evaluate the concentration risks of their financial institutions. To this end, they should have their own models to assess the capital adequacy of the banks, and furthermore, such models should be sensitive to concentration measures.

If concentration is explicitly incorporated in those models, supervisors and authorities may not need the full set of exposures of the banks' portfolios. Instead, accurate estimates on the portfolios' concentration may be sufficient to properly assess the capital adequacy of banks.

The paper presented some methodologies that properly fulfill this task. By comparing estimates on the HHI – one of the most popular measures of concentration – from aggregate data, against the actual index, for the credit portfolios of the Mexican banking institutions, we were able to properly assess the accuracy of some methodologies that have been proposed in the literature. Depending on the structure of the portfolios and the available information on the aggregate data, the mean relative error of the estimates lies between 1e-07 and 1e-02, which is quite accurate. Therefore, even if banking supervisors and authorities are provided with aggregate data on the credit exposures of a bank, they are able to compute estimates of concentration measures, and thus monitor the risk of banks' portfolios and to assess their capital adequacy.

However, we should remark that concentration is not the only source of large losses in a credit portfolio, there are sources of risk that supervisors and authorities should consider, for example common exposure to the same risk factors in a single portfolio, have a direct influence on the *concentration of risk*, which is really the issue. In other words, even If concentration in terms of number and size of credits can be accurately estimated from aggregate data, other risk factors such as how defaults are correlated within a portfolio, may require supervisors to have access the full set of exposures of banks and its characteristics. Even though, the proper measurement of concentration is one step forward on the assessment of banks' capital adequacy.

A. The McCloughan-Abounoori interpolation method o estimate concentration under aggregate data

This appendix is concerned on the mathematical description of the McCloughan and Abounoori (2003) interpolation method, its implementation for the cases presented in this paper, and some comments on its accuracy.

The problem that McCloughan and Abounoori dealt with was to estimate concentration measures, particularly the Gini-Coefficient, when loans[16] in the portfolio were aggregated in size-buckets, and only the total exposure of the bucket and the number of loans that conformed it were reported. For example, they were provided with the total exposure of the largest 100 loans in the portfolio, the exposure of the next 500 largest loans, the next 1000 thousand loans, and so on. This information gives some points on the Lorenz Curve of the portfolio, as represented in figure 8a. The red dots in the figure represent the known points on the Lorenz curve, which is the black dotted line. McCloughan and Abounoori proposed to fit a distribution to these points and then, complete the rest of the Lorenz Curves with the fitted function. Once the Lorenz Curve is approached, whichever of the measures of concentration or inequality presented in section 2 could be estimated.

In the context of this article, loans over a given threshold are reported in detail, while loans below the threshold are aggregated. This situation is represented in figure 8b. In this figure the red dots correspond to the cumulative exposure of the largest loans in the portfolio, those which are not aggregate. The black dotted line represents the unknown part of the Lorenz Curve, which corresponds to the aggregate loans. Then, in our case, we only have to fit a function to the black-dotted part of the portfolio Lorenz Curve.

To this end, we should consider that the fitted curve must pass through the point where the non-aggregate loans finish. In other words, if we denote by x^* the number of non-aggregate loans in the portfolio divided by the total number of loans, and by ξ^* the total exposure of the non-aggregate loans relative to the portfolio value, then the fitted function h:[0,1]→[0,1] should verify that:

$$h\left(x^*\right)=\xi^*$$

Moreover, the fitted function should be strictly increasing and concave.

[16] McCloughan and Abounoori were dealing with the problem of estimating industry concentration from aggregate data. We describe their methodology in the context of credit risk concentration, which is, actually, the problem we are considering in this paper.

To simplify the computation of the fitted function, only functions with one parameter are considered.[17] Figure 9 illustrates the fitted Lorenz Curve for one portfolio, considering four distinct functions:

$$f_1(x) = x^{\alpha}, \quad \alpha \in (0,1)$$

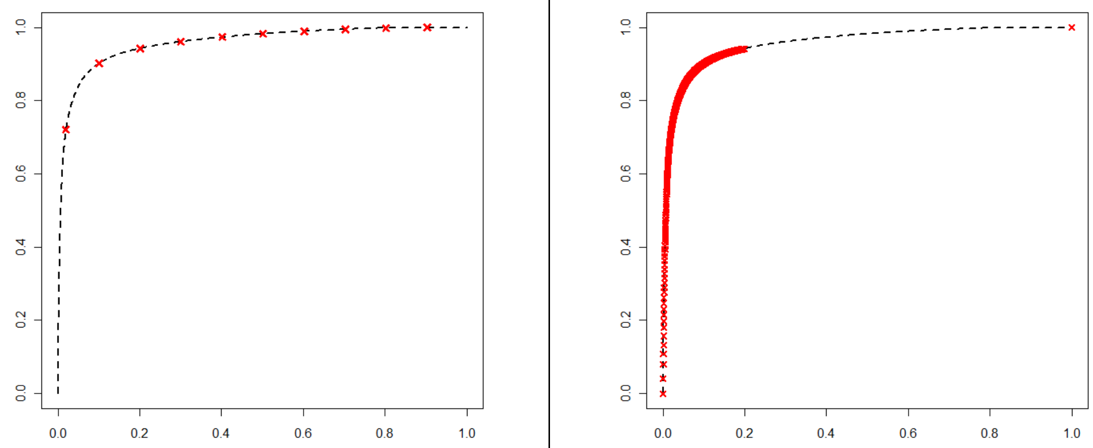
$$f_2(x) = \sin\left(\frac{\pi}{2} x^{\alpha}\right), \quad \alpha \in (0,1)$$

$$f_3(x) = 1 - |x - 1|^{\alpha}, \quad \alpha \geq 1$$

$$f_4(x) = 1 - \alpha(1 - x), \quad \alpha > 0$$

Figure 8

Representation of Lorenz curves when aggregate data is provided.



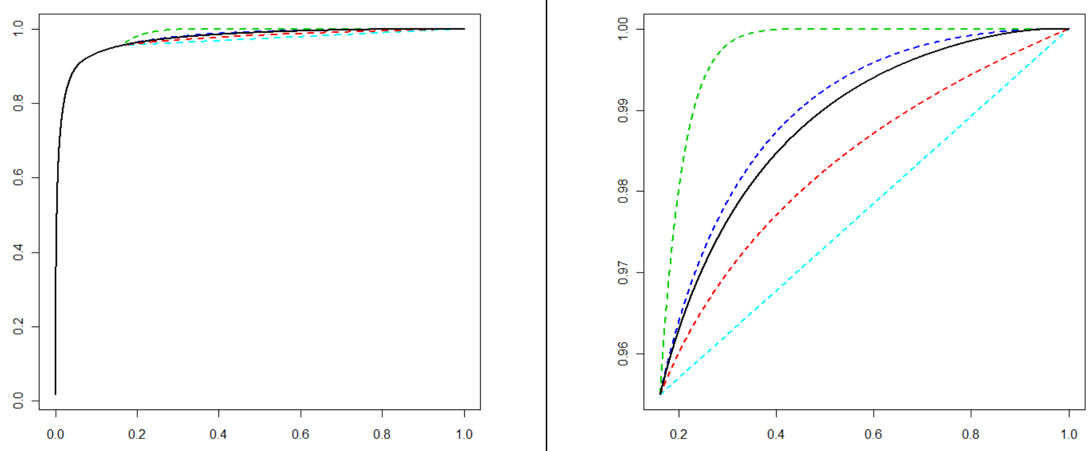
a) Lorenz curves when data on the largest 100,500, 1000, etc. loans is provided.

b) Lorenz curves when aggregating loans under a given threshold.

17 More general functions may be considered, as proposed by McCloughan and Abounoori. However, one parameter functions worked properly for our case, but more important was that the improvement on the accuracy of the HHI estimates when considering more general functions was diminished by the errors committed on the fitting procedure.

Figure 9

Fitted Lorenz curves for different functions.



a) Lorenz curves and fitted functions.

b) Zoom of the Lorenz curves and the fitted functions on the aggregate loans.

In these figures, black lines represent the current Lorenz Curve; red lines correspond to the fitted curve using the exponential function, f_1; blue lines correspond to the sinusoidal function, f_2; green lines correspond to f_3; and the linear function, f_4, is represented by light-blue lines. Panel one of the figure 9a, shows the Lorenz Curve of the portfolio and the fitted curves using these functions. The second panel, figure 9b, zooms in the part of the Lorenz Curve which corresponds to the aggregate data. It is observed that the sinusoidal function, blue line, best fits the Lorenz Curve.

We remark that the McCloughan-Abounoori interpolation method using the linear function, light blue line, corresponds to the HHI lower bound, where loans in the aggregate bucket are assumed to be equally distributed.

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