Combining micro and macro data for financial stability analysis

Overview of the IFC Workshop, Warsaw, 14–15 December 2015[1]

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Introduction

Dealing with the Great Financial Crisis (GFC) of 2007–09 and its aftermath, policymakers have increasingly focused on the need to strengthen macroprudential frameworks to ensure the stability of the financial system, both nationally and globally (Borio (2015) and Caruana (2014)). However, this does not imply that the traditional, microprudential approach to the supervision of individual financial institutions is no longer necessary[4]. Rather, it argues for the development of a more integrated approach in which both micro and macro dimensions complement each other (Bank for International Settlements (2014)).

To be sure, this requirement for a combined approach is not new and was identified long before the onset of the crisis. Over the past two decades, financial standard-setters have progressively realised the need to focus less on a purely institution-level supervisory approach and more on a broader macroprudential perspective. This shift was seen as a key building block in strengthening the resilience and stability of the financial system (Crockett (2000)).

The prerequisite for any effective policy approach is a statistical framework that allows for an effective analysis and monitoring of the micro and macro dimensions (Borio (2013)). Indeed, a key policy response after the GFC was to launch an international Data Gaps Initiative (DGI) to explore information gaps revealed by the crisis and provide appropriate proposals for strengthening data collection (International Monetary Fund and Financial Stability Board (2009)). That initiative was considered as an essential step for the support of financial stability analysis and monitoring as it would deal with both micro- and macroprudential dimensions. The first phase of the Initiative (DGI-I), launched in 2009, was followed in 2016 by a second phase (DGI-II) to implement "*the regular collection and dissemination of comparable, timely, integrated, high-quality, and standardized statistics*" with a view to helping "*straddle the divide between micro and macro analysis*" (IMF and FSB (2015)).

While significant progress is being made in terms of data collection, a key point is to make sense of the accumulated information and assess its value for policy purposes – especially in mitigating possible systemic risks. What are the issues and

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[4] The financial standard setters lay great emphasis on the ongoing progress of microprudential reforms by regular monitoring of Basel III standards (BCBS (2016)).

challenges arising from the combination of micro and macro data for financial stability analysis? What are the potential benefits for policy use? To what extent can specific country experiences benefit the global community? Looking ahead, what are the opportunities and challenges related to new financial stability policy initiatives in the area of statistics?

To explore these issues of key interest to the central banking community, the Irving Fisher Committee on Central Bank Statistics (IFC) co-organised with the Narodowy Bank Polski (Poland) (NBP) in Warsaw on 13–14 December 2015 a workshop on combining micro and macro statistical data for financial stability purposes.

As highlighted by Marek Belka, the NBP's President, in his opening remarks, this IFC initiative was a welcome opportunity to review how systemic risks in the financial system could be better assessed and managed. The analysis of fragilities should take place both at the macro level, by looking at the means of the distributions, but also at the micro level, to assess tail risks. Having well designed and well structured statistical information systems was essential to support such financial stability analyses.

In introducing the discussions, Turalay Kenç, the IFC's Chair, underlined the shortcomings of traditional financial stability frameworks that had relied primarily on institution-level supervision. He emphasised the need to combine micro and macro information. The reason is that, in the highly interconnected and complex structure of today's financial system, risks that arise at the institutional level can have system-wide dimensions. As such risks cannot necessarily be identified through aggregated data, more granular information is needed. However, combining macro and micro data is not just a matter of aggregation. What is key is a proper statistical framework that allows these two dimensions to be looked at in ways that are parallel, harmonised and complementary.

More than 25 papers were presented at the workshop, allowing for an in-depth exploration of six main themes. Session 1 took stock of the different ways of analysing financial stability that result from having a macro or a micro perspective. Session 2 described the challenges of integrating micro and macro data into an encompassing statistical framework, while Session 3 described how the micro data can be harmonised and used to close gaps in financial stability analysis. Session 4 showed, in particular, how entity-level data can help to better understand systemic risks. Session 5 focused more specifically on emerging market economies, which have gained considerable experience in this area, reflecting their specific challenges. Session 6 reviewed various ongoing international initiatives that can be instrumental in advancing much-needed new statistical frameworks. The IFC Chair, Deputy Governor of the Central Bank of the Republic of Turkey (CBRT), concluded the workshop by highlighting the key statistical priorities in the agenda of the G20, which was chaired by Turkey in 2015.

Session 1: Micro and macro views on financial stability: different perspectives of the risks affecting the financial system

The first session, chaired by Gülbin Sahinbeyoglu (CBRT), looked at different ways of analysing financial stability and the related data implications. The various presentations included a review of the new approaches to analyse financial stability

(BIS) and illustrations from various angles, eg banking resolution (Manchester University), bank profitability (NBP), and supervisory monitoring (ECB).

The BIS paper provided a bird-eye view on macroprudential policy frameworks, instruments and indicators and reviewed the associated recent literature. A key lesson from the GFC is that comprehensive frameworks of this kind can help to better monitor financial stability risks. In particular, they allow for a clearer understanding of financial cycles, as distinct from "traditional" business cycles. They can also be a useful tool for measuring the two key dimensions of systemic risk, its cross-sectional dimension (ie to how financial risk is distributed within the system at a given point in time) and its time dimension (ie how financial fragilities progressively build up over time). Lastly, they help to design, calibrate and implement adequate macroprudential tools based on the combination of micro and macro level data. Indeed, a number of ambitious macroprudential frameworks have been implemented since the GFC with the aim of (i) strengthening the resilience of the financial system and (ii) controlling financial booms and thereby the subsequent busts (see FSB (2011a)). But, while a wide array of macroprudential tools is available, their deployment involves costs and benefits. Interactions between macroprudential policy and monetary and fiscal policies as well as the overall global financial environment complicate the impact of these policies and the measurement of their effectiveness (see BIS (2015)).

The paper from the University of Manchester presented a theoretical model for examining the scope of a central bank's financial stability policy, including in particular its lender of last resort function and its regulatory function. Various courses of action are open to the central bank (eg closure of an individual bank, intervention in the interbank market, provision of liquidity assistance) depending on its financial stability objectives. How these micro-level actions impact the financial system at the macro level depends on factors such as the scale of interbank activity, general risk-taking behaviour in the banking system and the risk of system-wide distress. Therefore, central bank policy actions must take into consideration both micro level data on institutions under stress and more general macro conditions, underscoring the importance of combining these two perspectives.

The paper from the NBP examined the impact of market structure and business cycles on bank profitability. Using panel data consisting of micro- and macro-statistical data sets, the paper analysed the performance of the Polish banking system over a 15-year period spanning the GFC. Not surprisingly, a key finding was the confirmation that there was a strong correlation between micro level performance and the macro situation. For instance, the profitability of individual banks was significantly influenced by general business cycle developments; in turn, the strong performance of individual institutions played a key role in withstanding shocks to the Polish financial system during the GFC.

The session's final paper, from the ECB, discussed the conceptual and operational issues in building a comprehensive and high-quality data set building on micro supervisory sources. A key post-GFC priority for the European System of Central Banks (ESCB) has been to strengthen its macroprudential framework and, within this framework, to generate more detailed and timely information on the banking system. The related Consolidated Banking Data (CBD) has become an important data source for macroprudential analysis. It includes granular information on balance sheet data including profitability, asset quality and solvency, distributed by size classes of banks and covering nearly all of the EU's banking system. The data are consolidated on a cross-border as well as cross-sector basis. The main conceptual and operational

challenges relate to deriving aggregate statistics from these micro-supervisory data, which were not designed initially for statistical reporting and were collected on a national, non-harmonised basis.

To conclude, the session's main theme was that financial stability assessments may differ significantly depending on the micro and/or macro focus of the analysis, and that it would be useful to combine these perspectives. This was emphasised by Martin Arrowsmith in his discussion remarks, drawing on recent experience at the Bank of England in combining macro and micro sources for financial stability analyses.

Session 2: New statistical frameworks for financial stability analysis: experiences and challenges for micro and macro data integration

The second session, chaired by Robert Kirchner (Deutsche Bundesbank), focused on the main challenges faced in integrating micro- and macro-level data for financial stability, both for analysing systemic risk and for designing macroprudential policy tools. The key issue is how best to capture the build-up of vulnerabilities that have a system-wide importance but arise in specific sectors of the financial system or even at the level of individual entities. Looking only at macro aggregates thus raises the risk of missing pockets of vulnerabilities in the system; moreover, a more granular analysis is often required even when vulnerabilities are detected at the macro level, not least to calibrate macroprudential tools. The session provided a good illustration of these issues, with presentations describing the challenges faced when marrying micro and macro data, in particular to diagnose household vulnerabilities (ECB/Statistics Finland), especially those related to mortgage lending (Ireland), or to implement monetary or macroprudential policy actions (ECB, NBP).

The first paper, jointly from the ECB and Statistics Finland, presented a way to assess household indebtedness by linking micro and macro balance sheet data. As observed during the GFC, assessing household balance sheets (eg debt, wealth) is of particular policy interest, due to the implications not only for the macro economy through the effects of household financial position on consumption and saving, but also from a financial stability perspective (see IFC (2015a)). Despite methodological and data limitations, the paper was able to mobilise a mixture of national accounts and survey sources to build a data set of household wealth and debt in a reliable and timely manner and at quarterly frequency. Using three measures of indebtedness – debt-to-income ratio, financial leverage ratio and leverage ratio – the paper showed how the impact of the financial crisis varied both across euro area countries and, within each country, across household groups depending on their incomes. This promising approach suggests that efforts to better integrate national accounts and survey data would yield information that could usefully illuminate the distributional impact of policy actions.

The purpose of the paper from the Bank of Ireland was also to integrate macro and micro data to better analyse the state of domestic household mortgage lending, in a post-GFC context marked by a sharp increase in delinquency and repayment arrears. To this end, aggregate quarterly data on mortgage balances published by the Bank of Ireland were combined with micro level loan data. This allowed a granular analysis of loan and borrower characteristics, since the micro data sets contained more comprehensive coverage of origination, geographic distribution, loan-to-value ratios and interest rate types. The study confirmed that the value of this type of micro-

macro combination exercise lies in enabling an analysis of the underlying factors affecting mortgage arrears, thus providing a better understanding of the build-up of risks in the financial system.

The next paper, from the ECB, also emphasised the challenges faced by the "new statistical framework" when integrating macro and micro data, namely by describing the setup of a collection of regular statistics on balance sheet items and interest rates from individual monetary financial institutions (MFI) in Europe. Combined with macro monetary aggregates, these data have helped to better evaluate the effectiveness of monetary policy and its transmission mechanisms. They also support financial stability analysis. One example highlighted in the aftermath of the GFC is that assessing the situation in interbank markets or of "macro" liquidity conditions is facilitated by taking into account the heterogeneity among individual banks.

But using micro level data such as household surveys to draw inferences about macroeconomic patterns can be a methodological challenge, not least due to data limitations as well as quality issues. Yet there are a growing number of statistical techniques that can be used to address these difficulties. One example was provided by the paper from the NBP, which studied economic patterns among a sample of Polish households based on micro household budget survey data. This allowed the identification of specific household groups with similar characteristics (in terms of propensity to consume, for example), and in turn provided insights into the state of household balance sheets (eg savings, debt) at a more macro level. While the study pointed to the methodological and data challenges of such (complex) approaches, it also showed that there is a potentially quite large area to be explored looking ahead.

Certainly, the challenges in integrating micro and macro data can in turn limit the effectiveness of policy. In particular, micro household information has proved to be a key building block in developing macroprudential tools in several countries, in particular for instruments such as debt service-to-income (DSTI) and debt-to-income (DTI) limits. The last paper of the session, from the NBP, used household wealth survey data to evaluate the effectiveness of DSTI as a policy tool for restricting credit growth. It concluded that DSTI could be a blunt policy instrument that could impose costs on relatively healthy segments of the financial sector, thereby adversely affecting market conditions. The study emphasised the need for a proper statistical apparatus to ensure that the policy tool is correctly calibrated to target over-indebted or financially distressed households.

The necessity of verifying the usefulness of the micro data mobilised in the new statistical frameworks was also emphasised by Bruno Tissot (BIS) in his discussion remarks. The rising demand for more granular information, reflecting a structural shift as well as new, concrete policy needs, creates the need for an adequate framework for the integration of this information to facilitate economic analysis. To meet this requirement, the "tool kit" of micro data users should clearly identify the data foundations and provide for a comprehensive and consistent aggregation process to produce sound macro analyses. This in turn will open up new knowledge opportunities, based on more meaningful information. Using micro data within this framework can help users to think differently and to reframe policy questions.

Session 3: Closing data gaps for financial stability analysis: the importance of micro level data sources and harmonisation

The session, chaired by Pietro Franchini of the Financial Stability Board (FSB), focused on the benefits of using micro level data for financial stability analysis and closing the gaps identified by the international community after the GFC. Using different country and sector-level databases, the various papers in this session emphasised the importance of data harmonisation, in particular for internal purposes (Bank of Portugal), external users (Bundesbank) and cross-country comparisons (ECB, Netherlands Bank).

The Bank of Portugal's paper argued that closing data gaps for financial stability analysis could be achieved by a better integration of the micro databases already available either in central banks or in other public agencies. Portugal has been leading progress in this area, with the creation of an integrated statistical system among authorities, across several dimensions and policy uses. Examples of the micro databases included in this framework are the Central Credit Register (CCR), the Central Balance Sheet Database (CBSD) and the Securities Statistics Integrated Systems (SSIS), allowing for a fully integrated granular data set with credit, borrowing, balance sheets and security information.

The paper from the Deutsche Bundesbank explained how its Research Data and Service Centre allows internal and external researchers to make use of harmonised data on the domestic financial system. The Bundesbank has one of the largest repositories of micro-level data in Germany, covering banks, securities, enterprises and households. The system allows external users to access a wide range of granular statistics while preserving the confidentiality of institution-level information.

The paper from the ECB presented the Centralised Securities Database (CSDB), a key harmonised reference data set for European securities. This database integrates a variety of micro sources on a daily basis and provides useful information for analyses related to financial and monetary stability (eg the analysis of the refinancing needs of deposit-taking institutions and of their funding structures), particularly from a cross-country perspective. However some challenges remain. First, the use of the CSDB data has not yet reached its full potential for policy purposes and could be further extended. Second, there is a need to develop tools that are more user-friendly to access the large volume of micro data and generate meaningful aggregated information.

Continuing on the same theme, the paper from the Netherlands Bank used the ESCB's Securities Holding Database to analyse investor heterogeneity across countries and sectors, again underscoring the importance of harmonisation for these data. This study provides important insights into the degree, and evolution, of home bias in asset allocation and the related implications for financial stability assessments.

In his discussion remarks, Jacek Kocerka (NBP) emphasised that, in addition to the importance of collecting and harmonising micro data, attention should focus on dissemination methods. One has to shift away from the "traditional" presentation of aggregated tables and graphs and find new ways of extracting useful information from the "ocean" of micro data. This is the key challenge for statisticians and policymakers alike.

Session 4: Transforming entity-level credit information into knowledge about macro stability threats

The fourth session, chaired by Aurel Schubert (ECB), discussed how entity-level credit information can be utilised to analyse the potential development of system-wide risks. Many countries have set up CCRs under the auspices of their central banks or financial supervision offices and use them mainly for micro-level supervision, especially for credit and counterparty risk analysis. But it is also possible to use CCRs as a source of more "macro" information drawing connections between financial institutions to support the analysis of contagion across sectors and jurisdictions. The five papers presented in the session described a variety of country experiences in using entity-level data to inform a macro-level analysis of credit risks, with specific attention to vulnerabilities relating to banks (Portugal), non-banks (Poland), OTC derivatives (Ireland) and mutual funds (Japan).

The first paper, from the Bank of Portugal, described the structure and uses of the CCR maintained by the Bank's Statistics Department. In Portugal, this database supports many of the central bank's functions including monetary policy analysis, financial stability and banking supervision. The study shows that a CCR can be a powerful, multipurpose source of credit information covering all banks and other credit institutions. One example is the key inputs provided by the CCR in designing early warning indicators (EWIs) that are used to shape timely macroprudential policy interventions.

Two papers from the NBP focused on the situation of non-bank entities. The first presentation showed how the credit risks of non-bank financial companies can be assessed in Poland, drawing on multiple data sources: balance sheet and income statement databases, prudential reports of credit information, and insolvency data from a national register. This information can for, instance, be mobilised to estimate a PD (probability of default) model and to develop credit scores for non-financial corporations with the aim of gauging the sources of potential distress. The second NBP presentation looked at the determinant of banks' lending standards and the terms of loans granted to corporates and households, in particular to assess the relative importance of supply and demand factors.

Credit information is also an important element to be considered when monitoring the derivatives market, and particularly the credit default swap (CDS) market, as evidenced during the GFC. The American International Group (AIG) case shows how uncertainty about the scale of counterparty credit risk exposures and potential contagion effects can generate acute financial stress in these markets, with system-wide implications. International regulation has since tried to enhance transparency in derivatives. Of particular importance was the G20 decision on the reporting of over-the-counter (OTC) contracts to trade repositories (TRs). The paper from the Central Bank of Ireland used TR data on CDS and network analysis to identify interconnectedness among financial entities and possible contagion paths resulting from counterparty credit risk. The study highlighted the importance of accessing micro-level data to better assess the risks arising from the shadow banking sector.

An interesting aspect of credit information relates to the cross-border implications of financial stability risks. The Bank of Japan paper covered this topic by analysing the cross-border portfolio investment flows of Japan's mutual funds. Search for yield had resulted in a significant build-up of the funds' exposure to European

banks, with potentially destabilising effects, although the scale of such investments is not yet systemically important. The paper emphasised the usefulness of collecting micro, fund-level level data to enhance policymakers' understanding of how investors may react to changing market conditions (particularly sharp variations in exchange rates), to assess the possible magnitude of associated "fire sales", and to spot potential sources of financial instability.

Discussing these papers, Maciej Piechocki (BearingPoint) stressed the challenges posed to the financial industry by the growing reporting requirements from public authorities since the GFC. As policymakers and supervisors seek a more timely risk assessment on an entity-by-entity basis as well as at systemic level, a move away from "traditional" template-based aggregated reporting structures will be required. The use of new standards for automatic data reporting (eg XBRL, SDMX)[5], as well as new approaches such as disaggregated cube-based data reporting will be needed. The potential benefits will include limiting the reporting burden for the industry while improving the transparency of the data collected.

Session 5: The experience of emerging market statistical institutions in combining micro- and macro-level data: different approaches, a common goal

The fifth session focused on practices and challenges encountered by emerging market countries in combining micro and macro data, with a specific focus on the experiences of Chile, Indonesia, Malaysia, Poland and Turkey. As highlighted in the opening remarks of the Chair, Masahiro Higo (Bank of Japan), such experiences were particularly enlightening with regard to (i) the type of granular data (information on debtors, lenders, market segments, regulations) that are essential for analysing financial stability, (ii) how micro databases (eg CCRs) can contribute to the improvement of these statistics and (iii) what was required in terms of statistical cooperation.

The Central Bank of Chile presented a model for assessing mortgage default risk. It relies on the combination of aggregated macro data on loans and prices with micro data from the Chilean Survey of Household Finance. The study found that both system-wide (macro) features and idiosyncratic (micro) factors provide value when assessing the possibility of defaults, and that this value is even greater when one takes into consideration the interaction between these two types of information. This suggests that financial regulators could play an important role in communicating general financial and market conditions that could influence individual lending and borrowing decisions.

The paper from the NBP described the dynamics of the Polish housing market with a focus on demand, supply and prices. In a relatively small economy, housing market conditions can have a large influence on the macro economy; for instance, small changes in interest rates can affect the dynamics of housing supply and demand and potentially cause large shocks in the real economy. The paper showed that micro and macro data could be usefully combined to estimate a forecasting model and help

[5] For issues related to standards such as XBRL (eXtensible Business Reporting Language) and SDMX (Statistical Data and Metadata eXchange), see IFC (2016).

the central bank to anticipate potential developments in the real estate market and their possible financial stability consequences.

The paper from the CBRT used firm-level data to assess the risks posed by the forex liabilities of non-financial Turkish firms. The study analysed the factors driving firms' decisions to issue FX denominated debt (eg exchange rate prospects) and the associated risks in the absence of hedging. One conclusion was that non-exporting firms may be vulnerable to significant losses due to unexpected exchange rate movements, but this would have a limited financial stability impact unless the aggregate size of such debts grows substantially.

The next two papers in the session, from the Bank of Indonesia and the Bank of Malaysia, focused on the development of internal statistical systems that combine micro and macro data. The Indonesian Financial System Statistics (SSKI) comprises firm-level data covering the full range of the financial system, including the banking sector and other financial corporations as well as money markets. This information is combined with various macro aggregates, eg on household finances, government debt, real estate and non-financial corporations. In addition, the SSKI also includes payment and settlement statistics as well as financial inclusion indicators, making it a comprehensive system for supporting the various aspects of financial stability analyses. At the Central Bank of Malaysia, for which macro financial surveillance is a key mandate, granular credit information on financial and non-financial firms as well as households is used to support macroprudential analyses and policies. The related challenges include the management of data gaps, timeliness and quality. The Bank is therefore moving towards an integrated solution to support effective and timely data collection, storage and dissemination.

Discussing the presentations, Laura Vajanne (Bank of Finland) recalled that, for proper macroprudential policymaking, aggregate data were not enough: what was needed was micro-level data and their linkages within a macro framework. She stressed the importance of emerging market countries' long experience in using macroprudential tools. One key lesson was the need to devote attention to specific pockets of risk, such as real estate markets, foreign currency loans etc. Another was that data are often of insufficient quality, as they are gathered for non-statistical purposes, from a large number of sources, and with a wide range of techniques and formats. Last, she emphasised the need for coordination, both within central banks and with other authorities, to be able to get the best out of the existing micro databases. That puts a premium on addressing existing restrictions on data-sharing between competent organisations (IFC (2015b)).

Session 6: Intensifying cooperation between national and international institutions: from a national perspective to the global financial system

The workshop's final session, chaired by Eugeniusz Gatnar (NBP), covered the broader role of international cooperation in closing financial stability data gaps, both for specific areas such as debt securities (Spain), shadow bank and derivatives (ECB), and more generally to make the most of available micro data (BIS).

First, international cooperation can help the integration of domestic and foreign data. An interesting exercise, presented by the Bank of Spain, was the matching of firm-level characteristics with information derived from international issuance in bond markets. The aim was to assess the underlying credit risk of international issuers –

including when they issue though their non-resident affiliates – by constructing a database containing both international debt issuance information (derived from the international debt securities collected by the BIS) and firm-level data from commercial sources.

Second, there is a need to access granular information covering cross-border activities. The shadow banking sector is a case in point from this perspective, as discussed in the first ECB presentation, which highlighted key related measurement issues. Shadow banking activities cannot easily be captured either through the usual prudential reporting framework or the traditional System of National Accounts – the subsector "non-monetary financial intermediaries" can provide only a very rough estimate of the broad trends in the credit intermediation performed outside the regular banking system. Moreover, there are severe limitations in capturing the cross-border dimension of shadow banking, which can obscure the risks emanating from these entities. The way forward, as already envisaged by the international statistical community, particularly in the context of the DGI, was to integrate aggregate "SNA-type" information with more granular data, with the aim of more accurately capturing the scale of shadow banks and their activities. Cross-border issues are also particularly important with regard to the reporting of derivatives transactions by TRs, as analysed in the second ECB presentation. It is challenging for regulators to analyse these data, which are often heterogeneous and collected in a non-standardised framework. Certainly, clear and detailed reporting guidelines and appropriate data quality checks are being introduced in the European Union, but further international cooperation is needed to develop meaningful global data aggregation frameworks. Lastly, the daily reporting of these transactions is posing enormous challenges given the size and complexity of the information collected.[6]

Third, ongoing initiatives by the international community to close the data gaps exposed by the GFC at the global level are proving a key opportunity to make progress on the better integration of micro information into financial stability frameworks. Indeed, many of the G20-endorsed DGI recommendations have a significant micro data dimension. The BIS paper highlighted five key achievements that could be expected from these international efforts: (i) the comprehensive collection of "pure" micro information that is macro-relevant (eg for systemic banks); (ii) the better assessment of the distribution – the "fourth data dimension" – of macro aggregates (eg identification of fat tails); (iii) the improvement of the quality of macro statistics brought about by a better use of micro information (eg production of integrated sectoral financial accounts); (iv) the greater reliance on evidence-based (micro) information when designing, assessing and reviewing public policies (eg Quantitative Impact Studies supporting financial regulation); and (v) the new frontier for economic thinking that is opened up by access to granular data (eg ongoing BIS work to complement (SNA-type) residency-based statistics with nationality-based information to better capture the activities of global corporations).[7]

Wrapping up the session, Pietro Franchini (FSB) recalled the key FSB-led initiatives to intensify statistical cooperation between national and international institutions. Moving on from a national to a global perspective, the main data needs are to assess the structure and interconnections in the global financial system; analyse

[6] On the general issue of big data and central banks' activities in this area, see IFC (2015c).

[7] See Inter-Agency Group on Economic and Financial Statistics (2015).

risk concentrations and funding dependencies; identify spillovers and externalities; and better understand financial innovation and market complexities (FSB (2011b)). To this end, it was essential to develop an integrated framework of micro and macro financial data that are standardised, transparent and globally consistent.

Concluding remarks

In his concluding remarks, Turalay Kenç commended the workshop in presenting ways to combine micro and macro information and integrate them into a comprehensive financial stability framework. He acknowledged that this posed a number of challenges, as highlighted in the various papers presented. But the valuable lessons of these country examples – particularly those from emerging market economies with significant experience in macroprudential policies – suggested that these issues could be addressed effectively.

Another lesson from the workshop was the importance of international cooperation and the progress made in addressing the lacunae in statistical systems and processes. The IFC Chair highlighted the work done under the G20 DGI. He recalled that the implementation of most of the initial recommendations set in 2009 had now been completed. The focus of the second phase developed under Turkey's G20 presidency in 2015 was now to compile and disseminate comparable, accurate, timely and increasingly consistent data. The range of recommendations is broadly comparable with the first phase of the DGI and is expected to be completed on a five-year horizon. The Inter-Agency Group on Economic and Financial Statistics (IAG) has been tasked with coordinating and monitoring the implementation of these recommendations. As the IAG includes the BIS and the ECB, this will mean that the central banking community will be closely involved in this endeavour.

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