



## BALANCE SHEET ANALYSIS IN FUND SURVEILLANCE

June 25, 2015

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**International Monetary Fund**  
**Washington, D.C.**



## BALANCE SHEET ANALYSIS IN FUND SURVEILLANCE

June 12, 2015

### EXECUTIVE SUMMARY

**Balance sheets convey vital information about economic prospects and risks.** Balance sheet analysis captures the role that financial frictions and mismatches play in creating fragility and amplifying shocks. This is key to understanding the macroeconomic outlook, identifying vulnerabilities, and tracing the transmission of potential shocks and policies.

**This paper reviews the use of balance sheet analysis in the Fund's bilateral surveillance and introduces some practical examples of how it can be deepened.** Recent evaluations of IMF surveillance—including the 2014 TSR—have emphasized the importance of strengthening balance sheet analysis and coverage of macro-financial issues. This paper is a first step that highlights useful examples of such analysis conducted by staff over the last decade, documents the data and tools that have been used, and mentions some limitations. In addition, it discusses recent improvements in the coverage and quality of balance sheet data through initiatives launched in the wake of the global crisis, as well as key remaining gaps, addressing which requires international collaboration.

**The paper finds that the Fund has made progress in balance sheet statistics and surveillance over the last decade, although challenges remain.** Use of balance sheet analysis in bilateral surveillance has been nimble in responding to structural change and shocks. However, gaps in data and tools have hindered risk identification, analysis of some sectoral balance sheets, and their inter-connectedness. Country coverage and granularity of data have improved, in part through an integrated approach to collection and Fund-supported initiatives such as SDDS Plus and the G-20 Data Gaps Initiative. Such data are being increasingly used in surveillance, often supported by the range of tools that the Fund has developed, including the Balance Sheet Approach (BSA), techniques for macro-financial stress-testing, and fiscal and external debt sustainability analyses (DSAs).

**Building on this work and reflecting the changing global landscape, the paper suggests focusing additional attention on two broad areas.** First, addressing key data gaps hampering surveillance—especially on non-bank financial institutions, non-financial corporations, governments, and households; and information related to currency and remaining maturity breakdown, counterparties and off-balance sheet exposures. Efforts are also needed to increase coverage of balance sheet data for low-income countries, and better capture increasingly complex financial instruments in more advanced ones. Second, building more tools to help staff analyze balance sheets and deepen the assessment of macro-financial linkages and spillovers. Some new approaches along these lines are briefly introduced in the paper.

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## I. INTRODUCTION

**1. Economic commentary often emphasizes *flows* but *stocks*—that individually make up balance sheets—are key to forming an integrated view of prospects.** *Flow* concepts such as the path of output, consumption, investment and the fiscal and current account balance are at the heart of traditional approaches to economic analysis, including those used at the Fund. But analysis of *stock* variables measuring assets and liabilities at a certain point in time—for example including debt, outstanding credit, and foreign reserves—is crucial to inform our assessment of the evolution of flow variables of interest. Shocks to stock variables can drive economic activity, including for example through the effects of household wealth on consumption, capital on production, debt on government spending, or bank credit on investment. Individual stock variables can be amalgamated into balance sheets at different levels in the economy and of course, the two approaches are related, since the change in the stock of a variable is related to the flow over a given time period.

**2. The global crisis has dramatically illustrated the importance of incorporating balance sheets into assessments of the economic outlook and risks.** As seen in many country cases, booms and busts can be viewed through the prism of balance sheets, with the former often associated with increased private sector debt. Busts feature a decline in wealth, while debt remains. The process of recovery entails a process of deleveraging, as the private sector restructures its balance sheets by increasing savings, curtailing spending, and paying back debt. In this setting, country authorities may need to respond by expanding the fiscal or central bank balance sheet to temporarily support demand.

**3. Balance sheet analysis captures the role of financial frictions and mismatches in creating fragility, amplifying shocks, and generating spillovers within and across economies** (Box 1). Balance sheet mismatches can act as amplifiers around the normal business cycle. In the presence of financial frictions, excess leverage can magnify the traditional interaction between macroeconomic and financial conditions through the financial accelerator. A large body of literature also suggests that a major factor contributing to the incidence and propagation of crises are mismatches in the balance sheet structure of economies—in other words, imbalances in the size and composition of assets and liabilities.<sup>1</sup>

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<sup>1</sup> Allen et al. (2002) provide a detailed review of the literature on the role that balance sheet weaknesses can play in triggering and propagating financial crises. More recently, Tucker and Li (2014) argue that balance sheets can be instrumental in identifying risks and anticipating how shocks could be propagated.

### What is Balance Sheet Analysis?

- The Fund developed the **Balance Sheet Approach** (BSA) in 2002, which compiles all the main balance sheets in an economy using *aggregate* data by sector. The workhorse tool for this approach is a matrix showing asset and liability positions in and between these key sectors. This matrix can serve as a useful starting point to diagnose risks and potential transmission channels of shocks, setting the stage for deeper analysis.
- **Balance sheets in individual sectors** can also be studied using *micro* data. For instance, having identified potential stress-points using the matrix above, such analysis can help hone in on individual sectors for a more in-depth assessment.

**4. Recent reviews of Fund surveillance have underlined the practical importance of balance sheet analysis in anticipating potential risks and spillovers.** Greater focus on national balance sheets could have helped detect fault-lines that caught most observers by surprise during the global crisis—including by demonstrating the increase in leverage in US and European household, corporate and financial sectors, and the extent to which they were inter-connected and dependent on wholesale funding. This suggests that policy frameworks need to understand better the build-up of balance sheet imbalances and how shocks affect and feedback to both flows and stocks, including asset and liability positions and composition:

- The *2011 Triennial Surveillance Review (TSR)* underlined that the Fund has historically focused on risks from flows, partly reflecting the way in which its standard analytical frameworks are set up. It emphasized the need to give more attention to gross asset and liability positions, and risks from leverage and asset price changes.
- The *2011 Independent Evaluation Office (IEO) Report* flagged household and financial balance sheet vulnerabilities as having played a key role in the global crisis. It urged the Fund to improve balance sheet analysis by making it less static, backward-looking, and sanguine during periods of potential excessive asset valuation.
- More recently, the *2014 TSR* reinforced the importance of Fund surveillance of stability risks and the need to devote greater attention to national balance sheets in assessing vulnerabilities. It called for the Fund to develop and adapt its balance sheet analysis using more granular data.

### Box 1. Frictions, Fragilities, and Inter-connectedness: Why Do Balance Sheets Matter?

*The sluggish recovery from the global financial crisis is a stark reminder of the interplay between financial frictions and business cycle fluctuations. Financial imbalances can easily build in a seemingly stable environment, and these imbalances could lead to large and permanent wealth destruction through adverse feedback loops. Debt deleveraging becomes very challenging as a balance sheet recession spills over to the real economy and depresses aggregate demand. Trade linkages and global financial interconnectedness transmit these negative headwinds to other parts of the global economy (Rey (2015)).*

**Financial frictions act through two channels in driving the business cycle—amplification and persistence.** Due to non-linear feedback effects, financial frictions increase the *persistence* of both macroeconomic shocks and financial shocks (Bernanke and Gertler (1989) and Carlstrom and Fuerst (1997)). Negative shocks to net worth exacerbate frictions and lead to lower capital, investment, financial and non-financial wealth in future periods. A balance sheet shock is *amplified* if productive agents are forced to fire-sell their assets; this would depress the price of capital and the resulting loss would wipe out net worth (Kiyotaki and Moore (1997) and Brunnermeier and Sannikov (2010)). In addition, the so called “margin spiral mechanism” (Brunnermeier and Pedersen (2009) and Geanakoplos (2008)) increases margins and haircuts, which leads to deleveraging.

**Balance sheet analysis helps to identify and quantify different fragilities such as liquidity, default, and currency risk.** The composition of balance sheets—namely maturity structure, quality of securitization, and currency composition—affects the stability of the economy. For example, an increase in the maturity mismatch between assets and liabilities can lead to a liquidity spiral which creates financial instability and a bank run. Hand in hand with a deflationary spiral (Fisher (1933)), these would further depress aggregate demand in the economy. Recent studies of financial frictions in advanced economies show that default risk has an immediate impact on potential output and natural interest rates (Rabanal and Taheri Sanjani (2015)). Finally, in emerging markets, an increase in foreign borrowing of non-financial corporates poses a substantial currency mismatch risk, if unhedged. If some of the borrowing is publicly guaranteed, this would also increase sovereign risk.

**An essential complement is a network analysis of balance sheets to understand interlinkages and potential contagion.** Systemic risk builds up during credit bubbles before materializing in a crisis. Interconnected balance sheets of intermediaries and borrowers (Allen and Gale (2000)) can give rise to systemic risk as liquidity shocks in one bank spreads to others via a “*domino effect*”, potentially leading to failures throughout the system. Balance sheet contagion occurs through two mechanisms: the indirect effects that fluctuations in asset prices have on collateral values, and the direct effects that the default on or postponement of debt repayments have when there are interconnected chains of credit (Kiyotaki and Moore (2010)).

**5. Looking ahead, balance sheet analysis can track the emergence of new risks and transmission channels within and across economies.** Balance sheet effects are likely to remain relevant and powerful given increasing financial deepening and inter-connectivity. Key foci will be the global impact of continued deleveraging in many advanced economies; increased foreign exposure of emerging market firms and other sectors following years of ample global liquidity; and the continuing integration of frontier markets into the global financial system.

**6. At the same time, balance sheet information also has some limitations.** Such information is usually published with some lags. Different accounting standards also constrain cross-country comparability. It is important to carefully account for valuation effects, to form an accurate assessment of balance sheet positions. Coverage of balance sheet information for some sectors can have gaps—such as for sovereign wealth funds, non-bank financial sectors, and off-balance sheet and cross-border exposures—or span a relatively short time period. As discussed in the paper, it can be possible to work around some of these limitations by making pragmatic assumptions or using supplementary information from other sources.

**7. Against this backdrop, this paper has a dual objective.** It is both a backward-looking stock taking of Fund surveillance on balance sheets and a forward-looking exercise aimed at helping to deepen the integration of balance sheet analytics into surveillance. The paper also supports the broader Fund-wide effort to strengthen the coverage of macro-financial issues. It is an early contribution to a wider work stream on advancing balance sheet analysis that will support Fund surveillance going forward.

**8. The paper is organized as follows.** Section II reviews experiences with balance sheet analysis in the Fund's surveillance, highlighting useful examples that could be replicated in other countries facing similar analytical issues. Section III documents available balance sheet data, both from within and outside the Fund, describes recent initiatives that have expanded the potential spectrum of balance sheet analysis, and discusses remaining data gaps that would need to be filled. Section IV presents a summary of balance-sheet related tools that have been developed in the Fund. It also introduces some new tools and analytical approaches that could deepen balance sheet analysis and inform issues of current policy interest. Section V concludes.



## II. REVIEW OF BALANCE SHEET ANALYSIS IN FUND SURVEILLANCE

### What Kind of Questions Can Balance Sheet Analysis Address?

- How healthy are the aggregate balance sheets of the household, nonfinancial corporate, bank, nonbank financial, and government sectors?
- Are there pockets of vulnerability within these sectors that are concealed by aggregate indicators?
- Is balance sheet repair constraining the transmission of macroeconomic policies to real activity?
- What balance sheet vulnerabilities could amplify and propagate the macro-financial impacts of systemic risks?
- How would these macro-financial feedback loops operate, and could they constrain the effectiveness of mitigating policies?

### 9. This section reviews the experience with analysis of balance sheets in the Fund's bilateral surveillance over the last decade, using two methods:<sup>2</sup>

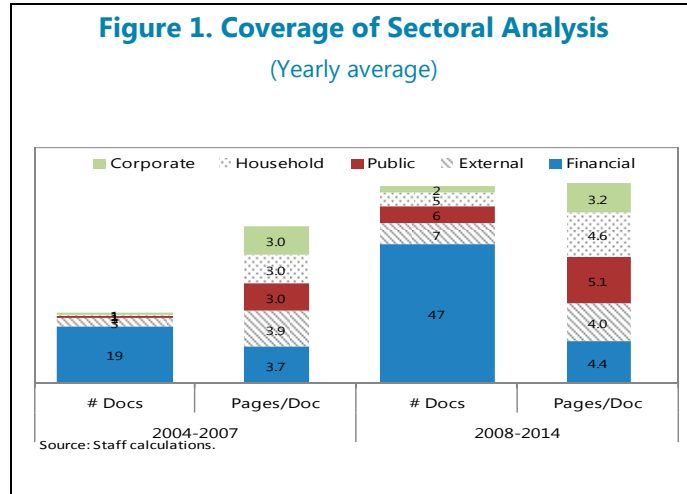
- *Textual analysis*, based on a search engine to extract various key phrases, aimed at gauging the coverage of balance sheet related topics in all staff reports prepared over the last ten years (see the Annex for more details). The emphasis was on extracting information related to analytical themes, sectoral focus, as well as commonly used data sources.
- A *selected review* of balance sheet analysis in a sub-set of staff reports, Financial System Stability Assessments (FSSAs) and selected issues papers (SIPs). The papers chosen were identified as "good examples" in a survey of area departments. The review aimed to distill the issues with using balance sheets that arose in these reports and their evolution over time.

<sup>2</sup> This section focuses on the Fund's country-level surveillance. The textual analysis looked at 1338 reports in total, of which 301 were for advanced economies, 781 for emerging economies, and 256 for low-income countries.

## A. Textual Analysis

**10. Staff report coverage of individual sector balance sheets has increased since the crisis and its focus has expanded** (Figure 1). Emerging market balance sheets received most attention before the global crisis.

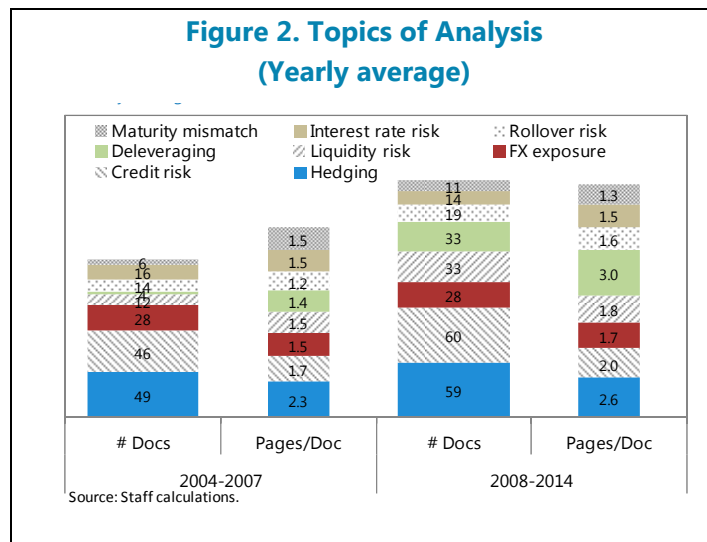
The number of staff reports undertaking some type of balance sheet analysis has almost tripled since the global crisis. The focus has also shifted toward more emphasis on the financial sector, and more recently on non-financial corporations and households, although the coverage of those sectors is still comparatively low. In addition, the depth of coverage, measured by the number of pages



devoted to such analysis has also increased for all sectors. These results, however, mask significant differences across income groups—while balance sheet analysis has expanded markedly over time for advanced and emerging economies, the coverage for low-income economies remains limited.

**11. In terms of topics, deleveraging and credit and liquidity risks have received most attention in the aftermath of the global crisis** (Figure 2). The main policy topics of balance sheet analysis have evolved through time in response to emerging concerns and actual events.

Before the crisis, a broad range of balance sheet themes were analyzed, including foreign currency exposure and interest rate risk, motivated by the Asian and Mexican crises. In its aftermath, the coverage of themes related to deleveraging of various sectoral balance sheets has expanded almost tenfold, together with an increased



emphasis on liquidity and credit developments. These trends were observed for both advanced and emerging economies. For low-income economies, the emphasis on credit developments has also increased compared with the pre-crisis period (Figure 3).

**Figure 3. Textual Analysis by Income Groups**

**Coverage of sectoral analysis** (Yearly average)

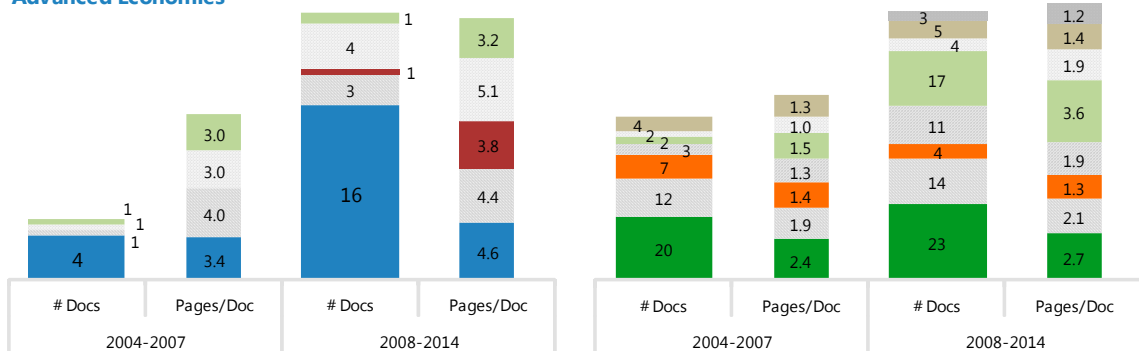
■ Corporate ■ Household ■ Public ■ External ■ Financial

**Topics of analysis** (Yearly average)

■ Maturity mismatch ■ Interest rate risk ■ Rollover risk  
 ■ Deleveraging ■ Liquidity risk ■ Credit risk ■ Hedging

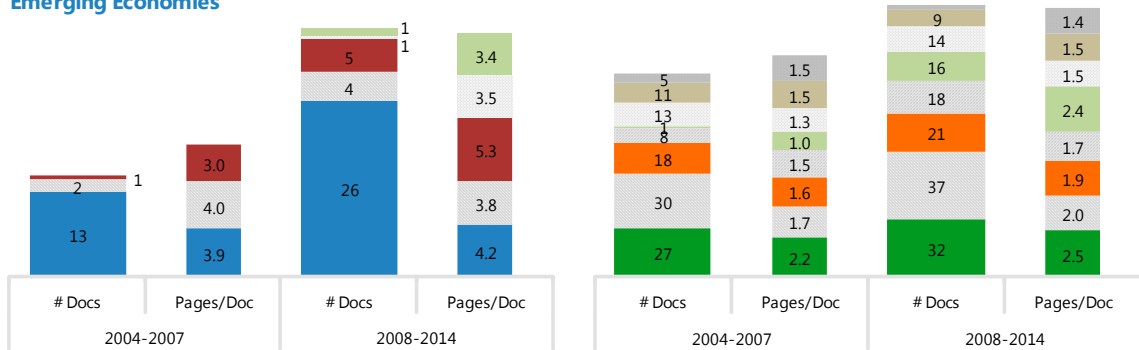
For advanced economies the sectoral coverage increased over time... with more emphasis on liquidity and deleveraging.

**Advanced Economies**



Coverage for emerging economies has become more broadly based... with more attention paid to deleveraging, credit, and liquidity.

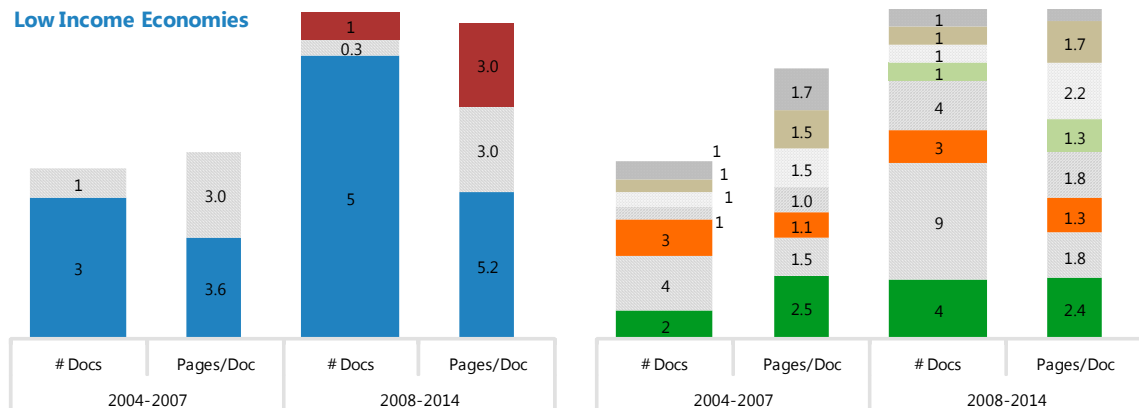
**Emerging Economies**



Analysis for low income economies remains limited...

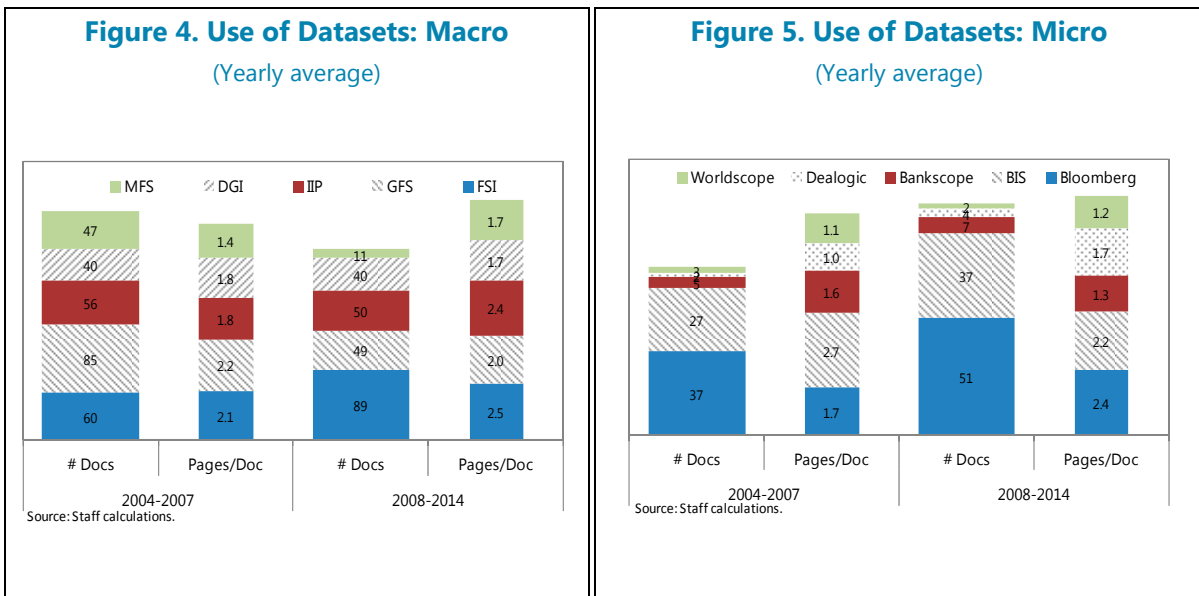
although more papers discuss credit developments.

**Low Income Economies**



Source: Staff calculations.

**12. This stepped-up balance sheet analysis has been supported by an increased use of Fund-collected and external datasets, including micro data on the financial and corporate sectors** (Figures 4 and 5). In particular, there has been a significant increase in the use of financial soundness indicators (FSI) and International Investment Position (IIP) data, as well as micro databases, particularly financial and corporate data from Bloomberg and bank and credit data from BIS across staff reports, while references to government finance statistics (GFS) databases have declined.<sup>3</sup> This increasingly varied use of data is a healthy feature of surveillance, since there are a variety of different balance sheet data that have become available in recent years—including that collected by the IMF, national authorities, as well as commercial providers. As discussed in section III, these should be exploited based on the surveillance need and potentially combined based on the analytical questions being asked.



<sup>3</sup> For a detailed discussion of datasets on balance sheets, see section III.

## B. Selected Review of Country Studies<sup>4</sup>

### *Pre-Global Crisis*

#### **13. Fund surveillance of balance sheets has responded to shocks and structural change.**

- Prior to the Asian crisis, the Fund probed balance sheets primarily with a focus on public and external debt, especially in the wake of the first large debt restructurings associated with the 1982 debt crisis.<sup>5</sup>
- However, the Asian crisis of the 1990s—which showed that capital account crises could erupt even when fiscal (and in some cases current account) deficits were sustainable and that shocks could quickly be amplified and spread across economies—indicated a need for deeper analysis of public and private sectoral balance sheets, and their interlinkages. In response, the Fund developed the “balance sheet approach” (BSA)—which brings together the balance sheets of an economy’s main sectors in the form of a matrix, with a view to analyzing sectoral weaknesses and their interlinkages (Box 2).

**14. The BSA was used sporadically as a supplement to traditional flow-based analyses in the early 2000s, primarily in surveillance of emerging markets.** Some emerging market studies went beyond compiling the standard balance sheet matrix and indicators of mismatch (Box 3). For example, South Africa (2007) conducted stress tests involving potential shocks for sectoral balance sheets. Others highlighted how country-specific vulnerabilities could affect the assessment, or studied the evolution of balance sheet assets and liabilities through time or using cross country comparisons (e.g., Estonia (2006) and Latvia (2005)). Meanwhile, some country teams continued to analyze risks in individual sectors (e.g., public sector studies for Uruguay (2001) and Ecuador (2003)). The focus of BSAs remained on emerging markets, since advanced economies were thought to be much less vulnerable to the types of risks typically emphasized by the framework, such as rollover or foreign currency risk, or to financial crises more generally. A related problem may have been the perception that a serious crisis was highly unlikely in a large advanced economy (IEO (2011)). Overall, IEO (2011) found that the analysis of macro-financial analysis was typically better in emerging markets than in advanced economies, generally giving more consistent warning on vulnerabilities related to overheating, large current account deficits, credit booms and unsustainable debt build-ups.

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<sup>4</sup> In this section, IMF studies are referred to by the country name and year of publication.

<sup>5</sup> See for example *Fund Policies and External Debt Servicing Problems*, which launched efforts to improve the surveillance of external debt. A first manual on compiling external debt statistics based on a common definition, jointly by the IMF and other international organizations, followed in 1988 (superseded by the 2003 and 2013 manuals).

**Box 2. The Balance Sheet Approach (BSA)**

**Balance-sheet analysis represents an extension of traditional macroeconomic analysis from flows to stocks, helping to inform the macroeconomic outlook and trace the impact and transmission of shocks.** The balance-sheet approach (BSA) compiles balance sheets of each sector of the economy:<sup>1</sup> namely, the government; the financial sector, broken down where possible into the central bank, banks, and other financial corporations; the nonfinancial private sector, broken down where possible into corporations and households; and the external sector (rest of the world). These balance sheets can be represented in a single table in matrix form. The BSA matrix, adapting the traditional flow-of-funds matrix, goes beyond aggregating *sectoral* assets, liabilities and net positions, to estimate also *intersectoral* assets and liabilities—that is, each sector’s position vis-à-vis that of other domestic sectors as well as nonresidents (Figure 1). This allows for an analysis of how shocks in one sector can be propagated to other sectors

**Figure 1. Balance Sheet Matrix**

		Holder of the Liability (Creditor Sector)															
		Government		Central Bank		Banks (OFC)		Financial Sector (incl. Central Bank)		Non Financial Sector (Corporate)		Non Financial Sector (Household)		External		TOTAL	
		A	L	A	L	A	L	A	L	A	L	A	L	A	L	A	L
Issuer of the Liability (Debtor Sector)	Government																
	Total																
	in domestic currency																
	in foreign currency																
	Central Bank																
	Total																
	in domestic currency																
	in foreign currency																
	Banks (OFC)																
	Total																
	in domestic currency																
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	Non-Bank Financial (OFC)																
	Total																
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	Non Financial Sector (Corporate)																
	Total																
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Non Financial Sector (Household)																	
Total																	
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in foreign currency																	
External																	
Total																	
in domestic currency																	
in foreign currency																	
TOTAL																	
in domestic currency																	
in foreign currency																	

### Box 2. The Balance Sheet Approach (BSA) (concluded)

**The BSA allows for a focus on four types of balance-sheet mismatches, all of which can transmit shocks to an economy's capacity to service its debt.** These include:

- *Maturity mismatches.* A gap between short-term liabilities and liquid assets can be vulnerable to rollover and/or interest rate risk.
- *Currency mismatches.* Exposure mismatches in foreign currency can be vulnerable to a change in the nominal exchange rate.
- *Capital structure mismatches.* Excessive leverage can increase vulnerability to revenue risks.
- *Solvency problems.* Solvency risk to the debtor is credit risk to the creditor, and the difficulties of one sector can quickly spread to another (spillovers).

**Large intersectoral BSA matrices can be distilled into useful summary indicators of sectoral exposures, capturing solvency and liquidity positions.** Core summary indicators can include:

- *Net positions for sectors,* broken down into the net external position and/or the net foreign currency position. These can also be broken down into short-term positions; so, for example, the net short-term foreign currency position can be an indicator of both maturity and currency mismatches.
- *Liquidity ratios,* based on *gross* concepts of assets and liabilities. For example, a sectoral ratio of short-term liabilities to short-term assets can indicate maturity mismatches.

**Balance sheet analysis can also help to inform and assess the consistency with the macroeconomic outlook.** For example, could identified balance sheet weaknesses in a sector prevent it from making the assumed contribution to the projected growth path? Consider a banking system under deleveraging pressure owing to weak capital ratios or asset quality which may be unable to provide credit needed to support growth; or, an overleveraged corporate sector which may not be capable of investing at the pace initially assumed in a baseline projection. Or on the other hand one may find structurally rapid credit growth as financial deepening occurs in a household sector with very low initial debt levels. This analysis involves assessing the contribution of each sector to growth and how balance sheet features may modify the view on these contributions:

- First, the flows from each sector needed to achieve the growth projection must be estimated, which can usually be done in the macro framework for the country.
- Second, a judgment must be made whether sector balance sheet issues could constrain/amplify these flows below/above the forecast growth. This involves assessing the impact of each sector's balance sheet condition on flows (i.e. the change in the stock position). This can be done at different levels of sophistication, starting with the macro framework (including the monetary sector) and, then, by drawing on a variety of possible empirical models of balance sheets, as discussed in section IV.

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<sup>1</sup>For an overview of the BSA and the information requirements to implement it, see Allen et al (2002) and Mathisen and Pellechio (2006).

### Box 3. BSA Studies for Emerging Markets: Good Examples

#### *Fragility*

**Currency and maturity mismatches under dollarization and/or heavy external debt.** Ukraine (2005)<sup>7</sup> found that extensive domestic liability dollarization compounded the currency and maturity mismatches in the private non-financial sector. Latvia (2005) highlighted that sizeable and potentially unstable FX-denominated non-resident deposits were contributing to the banking sector's FX-denominated maturity mismatch. A 2006 study compared balance sheets of Estonia with those for Latvia and Hungary, showing that the positive net position of its public sector could serve as a useful buffer in the event of shocks. In Croatia (2006), where external debt had built up rapidly, private non-financial corporations were found to be vulnerable to potential exchange rate and foreign interest rate shocks.

**Fiscal risks.** Uruguay (2001) and Ecuador (2003) endeavored to provide a more complete picture of public sector balance sheets. The Uruguay study introduced public enterprises and state-owned banks to the analysis, while the Ecuador study accounted for non-financial—natural resource—wealth in the framework.

#### *Shock Amplification*

**Stress testing for potential shocks.** South Africa (2007) assessed the strength of the balance sheet of each sector, and conducted stress tests with potential shocks, which confirmed the resilience of the economy's balance sheets.

**Public sector vulnerabilities and exchange rate peg.** Belize (2005) analyzed a potential two-way feedback loop between the currency mismatch and liquidity risks in the public sector balance sheet, and risks to the exchange rate peg (which has since held).

#### *Shock Transmission*

**Transmission of shocks across sectors.** In Thailand (2003), despite progress since the Asian crisis in reducing balance sheet mismatches, potential vulnerabilities in the corporate sector persisted. The study examined how these led to credit risks to the banking sector, and ultimately to potential contingent liabilities to the public sector. Peru (2004) demonstrated how an exchange rate shock could be transmitted within the private sector—from the non-financial sector to the financial sector—given significant currency mismatches in the former and despite otherwise healthy balance sheets in the latter.

**Bank-sovereign links.** Lebanon (2006) analyzed bank-sovereign links—the solvency of the state and the high mutual exposure between the government and the domestic banking system, especially in the context of increasing deposit dollarization and information on interconnectedness.



**15. In contrast, balance sheet analysis in advanced economies remained primarily focused on vulnerabilities in individual sectors.** For example, Ireland (2003) and France (2006) focused on household balance sheets and housing prices.<sup>6</sup> For France, an in-depth view of household balance sheets was complemented by an analysis of potential effects of housing reforms on consumption and the financial sector. To study recession risks emanating from a possible collapse in investment due to high corporate sector indebtedness, US (2002) constructed a Corporate Vulnerability Index (CVI), which outperformed other specifications in predicting recession risks. Another strand of papers attempted to shed light on long term challenges for the public sector, taking into account not only current financial positions, but also the net present value (NPV) of future liabilities (Germany (2005), Switzerland (2006), and Sweden (2008)).<sup>7</sup> With the exception of Australia (2003), the Fund generally did not conduct matrix-based BSA or multi-sectoral analyses for advanced economies, which may have hindered examination of inter-sectoral linkages and cross-border spillovers that manifested during the global crisis.

**16. Data gaps constrained the breadth of analysis.** Such gaps often hindered the compilation of the economy-wide BSA matrix, or limited the depth of analysis. Even studies that did feature BSA matrices, such as Croatia (2007) and Estonia (2007), lacked the data for disaggregating the nonfinancial private sector into the corporate and household sectors. Data gaps also made it difficult to calculate indicators measuring maturity, currency, capital structure, and solvency risks. For Croatia (2006), the maturity breakdown was available only based on original maturity, whereas remaining maturity would have given a better indication of risks. Moreover, the propagation of risks across sectors often had to be assessed qualitatively rather than quantitatively, leading to underestimation of the potential vulnerabilities due to partial information on interconnectedness. In addition, cross-country comparisons were limited in the absence of comparable data (Latvia (2005) and Estonia (2006)), since BSA matrices were compiled primarily using national data. Finally, aggregate sectoral balance sheets concealed variations within sectors, as noted in Peru (2004), where households were holding ample liquid foreign currency deposits, while the highly dollar-indebted construction sector was heavily invested in illiquid assets—micro-data that could have helped assess such variations were largely absent.

### *Post-Global Crisis*

**17. Since the crisis, the use of balance sheet analytics in surveillance has intensified** (Box 4). Greater attention has been devoted to bank and sovereign balance sheets and to more thorough analysis of advanced economy balance sheets more generally. More recently, given the rise of shadow banking globally and increased foreign currency borrowing by firms in emerging markets, focus is shifting to nonbank and non-financial balance sheets.

<sup>6</sup> For Ireland, the analysis found a significant deviation of house prices from an estimated equilibrium, but concluded that it was unclear whether the increased demand for houses reflected a permanent change in demand behavior or whether there was a bubble. In hindsight, this could have been interpreted as a warning signal.

<sup>7</sup> For Germany (2005) and Switzerland (2006), NPV was negative owing to demographic pressures (findings that were followed by fiscal adjustment soon afterwards in Germany and further debate in Switzerland).

**18. Advanced economies have maintained a focus on individual sectors using micro level data, but with more discussion of cross-sectoral and cross-border linkages.** In the aftermath of the global crisis, several country papers have analyzed the health of corporate and financial sectors vis-à-vis other countries and assessed their vulnerability to further shocks, using micro data. Interlinkages between the balance sheets of the non-financial sectors and banks have become an essential component of the analysis for many advanced economies, particularly in FSAPs. Also, consistent with the findings of the textual analysis, there has been a significant increase in emphasis on the financial cycle—in particular the process of deleveraging—including its impact on the financial sector and the real economy. More recent papers focus not just on sectoral positions vis-à-vis other sectors or other economies but also the intrasectoral distribution of asset and liabilities

**19. Emerging market studies have featured increasingly more extensive and deeper analysis of individual sectors.** With progress in data collection and compilation, more emerging markets have been able to construct the BSA matrix, such as Barbados (2012) and Guatemala (2013). While many others still face data constraints, some have used a partial matrix to identify gaps and shed light on prospective analysis. For example, India (2015) constructed a BSA matrix to illustrate the bank-sovereign linkage and the real and financial feedback loop. While there is usually enough information to identify risks and cross-sector spillover channels qualitatively, data gaps on the currency composition and maturity profile of different sectors' assets and liabilities constrain a deeper and quantitative analysis of spillovers. As discussed in section IV, basic indicators of vulnerability, stress-points, and propagation channels can be identified even in such cases. In the meantime, more analyses are focusing on specific sectors in depth. This may stem from the common risks and vulnerabilities shared by many emerging markets post-crisis, such as volatile capital flows, increasing issuance of corporate external debt, and the need to repair balance sheets damaged by the crisis.

**20. However, low-income countries continue to receive relatively scant attention, mostly reserved for a handful of frontier markets** (Box 5). A 2009 study for Kenya, Tanzania and Uganda used a partial balance sheet matrix derived from monetary and financial sector accounts. The paper analyzed changes in assets and liabilities and foreign exchange exposure of five sectors of the economy: the central bank, the government, the banking system, the corporate sector, and households. Among other things, the paper found that during the crisis, the central banks lost reserves, partly as a result of shocks to the exchange rate, public sector positions deteriorated and the private sector increased its demand for foreign currency as a hedge thereby worsening its net foreign exchange position. Due to data gaps, the non-resident sector was omitted from the analysis and the paper could not examine risks stemming from maturity mismatches.

#### Box 4. Sectoral Balance Sheet Analysis: Good Post-Crisis Examples

##### Fragility

**Assessing resilience to shocks.** France (2008 and 2009) analyzed the health of the corporate and financial sectors, gauging the impact of the global crisis on the main balance sheet indicators. Using cross-country micro-level data, these studies applied a *structural approach* to combine balance sheet analysis with market information and employed an option valuation framework to assess risks.<sup>1</sup>

**Intrasectoral distribution of assets and liabilities.** Netherlands (2014) and Denmark (2014) showed that the distribution of household sector wealth across generations and income groups plays an important role for the consumption outlook. Netherlands (2014) employed a simultaneous equations model of the Dutch economy to study effects of disposable income and net household wealth on private consumption, showing that falling housing prices have a greater impact on the younger generation of households. Denmark (2014) looked at the distribution of household debt and wealth by income groups, finding that high household debt poses risks to macroeconomic stability by dampening consumption.

**Corporate balance sheets.** Poland (2014) and India (2014) used firm-level data to examine corporate sector health, based on firms' interest cover ratio, profitability, liquidity, and leverage. Stress tests assessed not only the overall resilience of the sector, but also the dispersion of risks within the sector. The results not only flagged potential vulnerabilities, but also helped inform financial sector policy advice.

##### Shock Amplification

**Impact of deleveraging on financial conditions and the economic outlook.** Spain (2011) combined an in-depth diagnosis of private sector debt overhang with the forward-looking assessment of banks. Policy implications were derived from both cross-country experiences and Spain-specific characteristics. Ireland (2012) looked at the determinants of household savings, informed by results from a cross-country panel regression, and highlighted a negative (Ricardian) impact from changes in the fiscal balance (i.e. households relax savings during fiscal consolidation, and vice versa). These empirical estimates suggested a gradual medium-term reduction in the household savings rate. The study concluded that the household debt overhang would continue to dampen consumption, though savings would remain sufficiently high to sustain a steady decline in the household debt burden over time. The issue remains topical for Fund surveillance: the 2015 Article IV consultation found that household savings remain elevated, with three-quarters of savings devoted to debt reduction since 2010. Work on the euro area (2013) followed the impact of simultaneous multi-sectoral deleveraging on the economic outlook and growth, showing how feedback loops exacerbate downturns. Montenegro (2013) showed how slow progress on NPL resolution hindered the cleanup of private sector balance sheets, affecting demand and contributing to weak credit growth and subdued economic activity, which in turn caused further deterioration of asset quality. This analysis was then used to support macroeconomic projections.

**Financial sector foreign-currency leverage and macroprudential policy.** Turkey (2014) developed a simple framework to calibrate the impact of alternative macroprudential policies, with a view to recommending measures to curtail rapid buildups in the financial sector's foreign exchange exposures and in banks' external liabilities.

**Box 4. Sectoral Balance Sheet Analysis: Good Post-Crisis Examples (concluded)*****Shock Transmission***

**Balance sheet linkages, stress tests, and spillovers in the financial sector.** In addition to regular solvency and liquidity stress tests, assessments of the financial sector in FSAPs are using more sophisticated tools to assess feedback loops between sectors and spillovers. The FSAP update for the UK (2011) applied a top-down and bottom-up approach to stress-test the banking system, combining the IMF stress tests and the Bank of England's tools and models (RAMSI). The RAMSI model incorporates network interactions and feedback effects arising from both the asset and liability sides of bank balance sheets. The framework also included a network model that captured second-round "contagion" risk stemming from interbank exposures, on both the asset and liability side, and from the interaction between balance sheets and asset prices. The FSAP for Italy (2013) used global vector auto regression (G-VAR) estimates to show that the negative feedback effects from banks to the rest of the economy are lower than the impact of shocks in other sectors on banks.<sup>2</sup> It also analyzed cross-border spillovers (inward and outward), finding that the risks to Italian banks from their foreign exposures is limited, but that Italian banks are systemically important in some CEE countries and that macroeconomic conditions in Italy potentially could serve as a source of shocks from Italy to other countries.

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<sup>1</sup>The structural approach (Black and Scholes (1973), Merton (1973, 1974)) combines market and balance sheet information taking into account the volatility of assets. The volatility of assets is crucial since firms may have similar levels of equity and debt, but very different probabilities of default if underlying asset volatility differs. This approach is built on three principles: 1) the value of liabilities is derived from assets, 2) liabilities that have different seniority result in different risks, and 3) asset values evolve stochastically over time.

<sup>2</sup>Gray et al. (2013).

### Box 5. Balance Sheet Analysis in Low-income Countries (LICs)

**Recent work by the Fund (IMF, 2014) highlights potential financial vulnerabilities in LICs, notably frontier markets.**<sup>1</sup> These stem from rapid credit growth and increased foreign exchange exposures. This work also stresses the potential for asset quality erosion for undiversified low-income economies with excessive financial sector exposure to specific sectors. Meanwhile, frontier markets are increasingly tapping international financial markets and their domestic bond markets are deepening. All of these point to the need for close monitoring of vulnerabilities in the financial sector of low-income countries as well as potential shock transmission to the rest of the economy.

**Balance sheet analysis could be a useful tool to diagnose vulnerabilities and potential shock transmission in LICs.** To date, there has been one Fund BSA study on LICs,<sup>2</sup> which looks at the evolution of the financial sector in Uganda, Tanzania, and Kenya between 2001 and 2008 as well as how sectoral balance sheets adjusted during the global crisis. The study uses both monthly and annual balance sheet data reported by authorities in their monetary survey of the banking system to construct partial balance sheet matrices.

**One of the reasons for the lack of BSAs in LICs is the existence of significant data constraints.** Indeed, while more than half the LICs report monetary and financial sector data as presented in the IMF's Standardized Report Forms (SRF), very few report the additional data needed to conduct a comprehensive economy-wide balance sheet analysis. This suggests a need to encourage more LICs to collect and report the needed data (see Section III for further details on data gaps in LICs).

**However, even with the limited data available in LICs, there is scope to conduct useful balance sheet analyses.** A partial balance sheet matrix can be derived from the SRF data and used to monitor key indicators of vulnerability, including net financial position, net foreign exchange position and net short-term positions. These can then be used to track solvency, credit and liquidity risks, foreign exchange exposure and multi-sectoral linkages, as was done in the study cited above.

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<sup>1</sup>Frontier markets are those countries closest to resembling emerging markets in the depth and openness of financial markets and access to international sovereign bond markets. The frontier markets as defined in the 2014 LIDC report are: Bangladesh, Bolivia, Cote d'Ivoire, Ghana, Kenya, Mongolia, Mozambique, Nigeria, Papua New Guinea, Senegal, Tanzania, Uganda, Vietnam, and Zambia.

<sup>2</sup>See [IMF \(2009\)](#).

## C. Key Messages

**21. Balance sheet analysis has been a significant component of Fund surveillance over the years, which has evolved in response to crises.** Balance sheet studies have fallen broadly into two categories, economy-wide and sector-specific. Economy-wide studies, generally based on BSA matrices, have been prepared almost exclusively for emerging market economies. Studies focusing on specific sectors have been the mainstay of balance-sheet analyses in advanced economies and are also used increasingly in emerging market economies since the global crisis. With very limited exceptions, balance sheet surveillance in low-income countries has largely comprised debt sustainability analyses.

- **Multi-sectoral balance-sheet analysis has been useful for diagnosing sectoral vulnerabilities and their potential inter-sectoral propagation.** In studies for emerging markets, application of the BSA matrices has helped shed light on the potential impact and propagation of shocks in the presence of currency and maturity mismatches. This approach proved to be particularly useful in periods of economic booms, when flow indicators can understate the build-up in vulnerabilities associated with high gross liabilities across sectors. In some other cases, such as Montenegro (2013) multiple sectors were analyzed without a full BSA matrix. Good-practice studies used such matrices to highlight inter-sectoral linkages and inform the assessment of vulnerabilities and appropriate policy responses.
- **Where teams have priors of potential vulnerabilities, sectoral balance-sheet analysis has been the more common approach.** This type of analysis often relies on sophisticated models and on more granular micro-level data that can allow quantitative assessment of concentration of risks, and, in some cases, their distribution within the sector.

**22. There is scope to increase the use of BSA matrices in country-level work.** Data gaps have deterred the wider usage of the BSA framework. Some examples, however, show that even with limited data (such as pre-crisis case studies for central and eastern Europe, or more recently the 2015 analysis for India) BSA matrices can help to highlight inter-sectoral linkages and data gaps, and suggest next steps for analysis. Other impediments are the relatively high “fixed-cost” of compiling a complete matrix, which is a labor-intensive process and requires some learning for country teams, and hitherto long lags in the data. However, lags have now become shorter and building more user-friendly tools and applications to construct balance sheet matrices and providing some training would facilitate the broader use of the BSA framework in country-level surveillance.

**23. Combining the BSA with more granular data would allow not only the quantification of some important risks and vulnerabilities but also track their propagation across sectors, including in advanced economies.** The BSA provides a useful starting framework for mapping inter-sectoral linkages and identifying stress-points and spillover channels using comparable data across countries. Even if more data become available, the BSA does have limitations that constrain its “stand-alone” use as a sufficient framework to assess and

quantify risks. It does not include non-financial assets and off-balance sheet exposures, which may affect a sector's vulnerability to crisis. It is typically static by focusing on one point in time, and should be complemented by some flow analysis, particularly to form forward-looking assessments and forecasts. Finally, in some cases, aggregate data obscures important details about intrasectoral distribution of assets and liabilities (e.g. Netherlands, 2014). To address such limitations, the BSA matrix-type approach could be complemented with micro-level data to "zoom-in" on sectoral vulnerabilities.

**24. Despite significant progress since the global crisis, data gaps continue to constrain balance sheet surveillance.** Many countries have limited or missing sectoral data, in particular for household and non-financial corporate sectors, and the availability of currency and maturity composition for balance sheet data remains an issue (e.g., Costa Rica (2015) and India (2015)). Going beyond balance sheets, sparse information on off-balance sheet data and derivatives is recognized as limiting the analysis of complex financial and corporate sectors, where such information can be critical. For example, US (2010) discusses the importance of assessing bilateral derivative and off-balance sheet positions between the United States and the euro area. In addition, data on offshore financial centers and shadow banking remains partial, constraining assessments of cross-border and intersectoral linkages and exposures (e.g., Mauritius (2010)). Furthermore, cross-country comparison of various balance-sheet related indicators is limited, with several studies, including France (2008) and Poland (2014), pointing to significant tradeoffs between using more detailed national data and limited cross-country databases. Finally, while the usage of existing Fund databases has increased, there is scope for greater dissemination, something which this paper could facilitate. These databases are showcased in the next section.

### III. BALANCE SHEET DATA: WHAT IS AVAILABLE AND WHAT IS MISSING?

**25. This section discusses the existing state of play of balance sheet data,** documenting data availability from different sources, gaps in these data, and improvements resulting from key statistical initiatives launched in the aftermath of the global crisis. Over a number of years the Statistics Department has been working with member countries to enhance the availability of balance sheet data and ensure methodological consistency so that data can be compared across sectors within an economy and across economies. More recently, data gaps have been addressed through the G-20 Data Gap Initiative (DGI) as well as the Fund's Special Data Dissemination Standard Plus (SDDS Plus). Efforts are also being made to use data from external sources to address gaps in corporate sector balance sheet data and in micro-level data on bank balance sheets.

## A. Data Availability

**26. Financial globalization has been one of the fundamental economic driving forces behind greater focus on balance sheet data.**<sup>8</sup> As credit and capital flows have been liberalized with the lifting of financial repression and exchange controls, the past two decades have overseen greater interest in the collection and standardization of a range of economic and financial statistics related to balance sheets. This has come from a recognition that while liberalization has brought many benefits it has also created new financial stability risks, both domestic and cross-border. However, due in part to the absence of a clear analytical framework for analyzing financial stability, these advances have largely arisen from responses to crises and data needs have not yet settled.

**27. The overarching framework for balance sheet analysis are the sectoral balance sheets of the System of National Accounts (SNA).** These balance sheets contain financial assets and liabilities of resident sectors and sub-sectors, including the financial sector (FC), non-financial corporates (NFC), general government (GG), and households and non-profit institutions (HHNPISH). Figure 6 outlines the data framework and data sources (such as monetary and financial statistics (MFS), GFS, and various cross-border datasets) that can be used to compile balance sheet matrices with a full set of intersectoral linkages. In addition, disaggregated information for the non-resident sector or the rest of the world (ROW) is available through cross-border datasets.

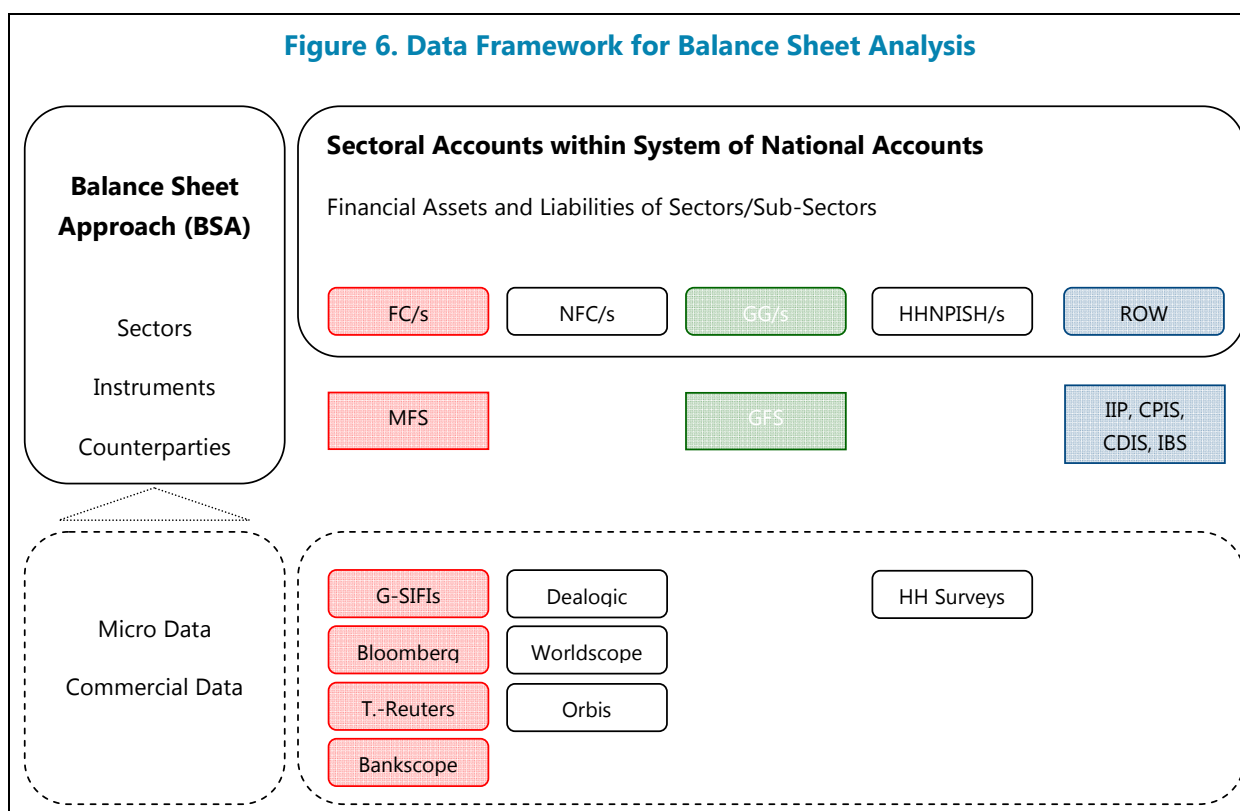
**28. Nonetheless, data gaps remain a key constraint on balance sheet analysis. They are being addressed by a number of initiatives.**<sup>9</sup> The resulting improvements in data availability make balance sheet analysis feasible for many countries, but, as the 2014 TSR underscored, additional efforts by the Fund and its members are needed to address the substantial remaining gaps. Data gaps arise from incomplete reporting by countries, in which case the missing data should be approximated or estimated using other data sources, such as micro and commercial data or data from national authorities.

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<sup>8</sup> See Heath (2015) for more details on implications of such developments for macroeconomic and financial statistics.

<sup>9</sup> Most recently, the global crisis “revealed significant deficiencies in the data available to measure financial activity and monitor the financial system. Financial data were too aggregated, too limited in scope, too out of date, or otherwise incomplete” (FSOC (2015)).





Notes: FC stands for financial sector; NFC – non-financial corporations; GG – general government; HHNPISH – households and non-profit institutions serving households; ROW – rest of the world; IIP—International Investment Position; CPIS – Coordinated Portfolio Investment Survey; CDIS – Coordinated Direct investment Survey; IBS – International Banking Statistics; MFS – Monetary and Financial Statistics; GFS – Government Finance Statistics; GSIFI – global systemically important financial institutions; and HH – households.

## 29. Efforts to integrate balance sheet analysis into Fund surveillance have over the years been supported by statistical and transparency initiatives.

- Prior to the global crisis, enhanced reporting requirements for several important sectoral data sets helped improve the availability, accuracy, and comparability of balance sheet data. In the mid-1990s, the Data Standards Initiative introduced the General Data Dissemination System (GDDS) and Special Data Dissemination Standard (SDDS), to help countries improve the dissemination of data needed for the BSA (Table 1). Coordinated efforts of international organizations also led to improvements in the quality and comparability of cross-country data.
- Since the crisis, additional data initiatives—such as the IMF/FSB G-20 Data Gaps Initiative (DGI)—further deepened information sources on balance sheet structures and inter-linkages in G-20 countries and beyond. Recently, the IMF has strengthened its Data Dissemination Standard Initiative by introducing the SDDS Plus, which builds on the SDDS to support domestic and international financial stability analysis, with a particular emphasis on economies with systemically important financial sectors.

**Table 1. Development of Major Balance Sheet Data**

Data Categories	GDDS <sup>1</sup>		SDDS		SDDS Plus <sup>2</sup>	DGI <sup>3</sup>
	1997	2015 <sup>4</sup>	1996	2015	2015 <sup>4</sup>	2015
<b>Data Categories</b>						
Sectoral Balance Sheets				Q <sup>5</sup>	Q	Q
Government Financial Balance Sheet						Q
Central Government Debt	Q	Q	Q	Q	Q	Q
General Government Gross Debt				Q <sup>5</sup>	Q	Q
Depository Corporations Survey	M	M	M	M	M	
Central Bank Survey	M	M	M	M	M	
Official Reserves Assets	M	M	M	M	M	
Template on International Reserves and Foreign Currency Liquidity				M	M	
External Debt		Q		Q	Q	
International Investment Position (IIP)		A		Q	Q	Q
Coordinated Portfolio Investment survey (CPIS)					H	H
Coordinated Direct investment Survey (CDIS)					A	
Securities Statistics					Q	Q
G-SIBs						Q
International Banking Statistics (IBS)						Q
Financial Soundness Indicators (FSIs)		Q <sup>5</sup>		Q <sup>5</sup>	Q	Q
<b>Number of countries participating/subscribing economies</b>						
	15 <sup>6</sup>	112	43	64	8	19

*Note: 13 GDDS participants have moved to SDDS, and eight subscribers of SDDS have moved to the SDDS Plus.*  
 "A" stands for annual data; "H" - semi-annual data; "Q" - quarterly data; and "M" - monthly data.  
<sup>1</sup> Enhanced in 2015, now called e-GDDS.  
<sup>2</sup> Launched in 2014.  
<sup>3</sup> Launched in 2009.  
<sup>4</sup> Some data categories were introduced in between the inception year and 2015.  
<sup>5</sup> Encouraged.  
<sup>6</sup> By end-2000.

Source: IMF Staff

**30. A wealth of balance sheets data are collected by the IMF, and can be combined with data from the OECD and the BIS:**

- *Financial sector asset and liability positions* for central banks, other depository corporations and non-bank financial institutions are from the MFS, and collected through the standardized report forms (SRFs).
- *Cross-border financial positions* give domestic sectors' exposures to the rest of the world and, thus, capture cross-border financial linkages. The data used in the BSA matrix is the international investment position (IIP), with further bilateral detail provided by the coordinated portfolio investment survey (CPIS) and coordinated direct investment survey (CDIS); and international banking statistics (IBS) compiled by the BIS, Also used are the data from quarterly external and public debt statistics (QEDS and PSDS).
- *Balance sheets for the general government sector* are collected within the framework of government finance statistics manual (GFSM) and emphasize both the stocks of non-financial assets and financial assets and liabilities. The data on positions in government liabilities are complemented by the Public Sector Debt Statistics database, maintained by the World Bank based on IMF recommendations

- *Data on balance sheets of non-financial corporations and households* only give the assets and liabilities by instruments without the counterparty information. Counterparty information is available for most of the other sectors of the economy so providing “mirror” data on positions vis-à-vis the corporate and household sectors. The OECD disseminates sectoral balance sheet data for its member and select partner countries (IMF re-disseminates on the Principal Global Indicators website), and more detailed sector balance sheets are available in the national accounts of quite a few countries.

**31. No country reports all data necessary to construct a complete balance sheet matrix with intersectoral linkages and positions broken down by currency and maturity.** However, much can be done with available data, filling in gaps with estimates and approximations. For many countries, even a partial BSA matrix—complemented by estimation (by desk economists)—could provide a sufficient basis for analyzing the propagation of relevant risks. More granular analysis could be enabled by using micro data to help identify risks concentrated in specific sectors.

## B. Addressing Data Gaps

**32. Over the last fifteen years, financial crises spurred efforts to compile balance sheet data for all domestic sectors and vis-a-vis the external sector.** This involved compiling the relevant datasets using a common methodology, which can be combined in a country’s balance sheet matrix. There remain several common gaps in the current data: a lack of counterparty details (“from-whom-to-whom” data), particularly for the government, non-financial corporations, and households, and limited reporting of currency mismatches and remaining maturity.

**33. Progress on closing data gaps varies across datasets.** The timeframe for addressing data gaps will vary depending on country circumstances and complexity of datasets. It has been slow for government balance sheets, non-bank financial institutions (or other financial corporations, OFCs), non-financial corporations, and households. In contrast, progress has been much better for banks and for the IIP, CPIS and CDIS data with more countries now participating and providing data on encouraged items. This uneven progress has slowed development of integrated sectoral balance sheets, which combine all these data sources.

**34. There remain a number of important gaps in sectoral balance sheet data where efforts need to be focused:**

- *Country reporting of government (GFS) balance sheet data is not widespread and coverage by the three recognized subsectors of the general government (e.g., central government, state, and local government) as relevant to the reporting country remains uneven.* Going forward, collection of GFS data needed for the BSA should improve owing to recent changes made to the annual and quarterly GFS questionnaire, which now requests additional details, including

the maturity structure, currency composition, and counterparty information on debt liabilities.

- *Non-bank financial institutions are under-reported in monetary statistics.* Countries need to expand this coverage but, at the same time, more can be done to exploit other data sources to fill the gap. These include the BOP/IIP data, which in some cases provide data on capital flows and external positions for non-bank financial institutions, and CPIS data, which include cross-border portfolio investment positions of non-bank financial institutions, although coverage is still limited.
- *Coverage of non-financial corporations and households is more limited than for other sectors.* However, partial balance sheet data can be obtained from counterparty exposures to them reported for other sectors. These gaps can also be partly filled from surveys, published business accounts, and other sources. In addition, FSI data can be used to fill in some gaps in balance sheets for these sectors as an alternative data source.
- *Progress has been made in collecting disaggregated data on the linkages among G-SIBs and their main counterparties, and on their exposures to national financial systems.*<sup>10</sup> The FSB is developing a template for collecting data on cross-border exposures for G-SIBs on a consolidated basis and an agreement on selected access to these data by IMF staff has been reached.
- *Data on non-financial assets are less complete than for financial assets and liabilities.* They are usually only available annually and mainly for 25 OECD countries.<sup>11</sup>

**35. In addition to sectors and instruments, an ideal full balance sheet analysis should cover four dimensions—currency, maturity, bilateral counterparty, and off-balance sheet data.** Achieving this is a long term goal that would be difficult in the foreseeable future. At present, sectoral balance sheets provide very partial data on currency and maturity and do not adequately cover off-balance sheet data. Specifically:

- *Currency composition* constitutes one of the most significant data gaps. Until recently, only the monetary and external sector data have provided a partial currency breakdown for financial assets and liabilities. The collection of foreign currency data by the IMF was set out in a paper submitted to the G20 in September 2014.<sup>12</sup> SRFs provide positions by domestic and foreign currency, though without further breakdown by currency of denomination.<sup>13</sup> The IIP aims to collect data on currency breakdown for three major currencies in the new BPM6 memorandum tables. In addition, the CPIS includes a breakdown of portfolio assets by five

<sup>10</sup> [Recommendations 8 and 9 in the G-20 DGI](#).

<sup>11</sup> See Bova et al. (2013) for discussion of the analytical value of this enhanced information.

<sup>12</sup> For details, see the report on "[Advancing the Work on Foreign Currency Exposures](#)," IMF (2014b).

<sup>13</sup> A framework to report data on currency and maturity breakdown has been implemented in the revised Monetary and Financial Statistics Manual, forthcoming in late 2015.

major currencies, and the BIS international banking statistics (IBS) provide a currency breakdown, recently expanded to six major currencies under enhancements to these data under the G-20 Data Gaps Initiative. Foreign currency external debt data are provided for a limited number of countries in the Quarterly External Debt Statistics (QEDS) database. Finally, the GFS revised questionnaire (2014) asks for data on liabilities in domestic and foreign currency.

- Data on *remaining maturity* is a major data gap for all datasets but is being partially addressed. The SRFs do not include remaining maturity information but staff has developed a supplementary report form that covers this characteristic, although at this juncture there are no plans to introduce this form yet. In the IIP, supplementary tables provide information on the remaining maturity of long-term debt to non-residents, with a breakdown by sector. Also, the QEDS database includes a remaining maturity table for SDDS reporters. In the GFS, the revised questionnaire (2014) includes a remaining maturity breakdown of liabilities. The BIS currently reports by remaining maturity the outstanding amounts of debt securities due within one year for 36 countries.
- Data on *bilateral counterparty exposures* can be improved.<sup>14</sup> Data on bilateral cross-border financial positions cover direct investment, portfolio investment, partially reserve assets, and loans and deposits within other investment. The IMF collects annual data on the CDIS (since 2010) and semi-annual data on the CPIS (including securities held as reserves). These datasets provide information on bilateral exposures to other countries<sup>15</sup> and broader participation should be encouraged. The BIS IBS data provide information on international banking activity by counterparties. Reporting using the revised GFS questionnaire (2014) includes counterparty information for about 40 countries. SDDS Plus countries should start providing information on holdings of debt securities with counterparty sectors and the rest of the world.
- *Off-balance sheet data* gaps are difficult to address due to the absence of a framework for compiling these data, notably contingent assets and liabilities, such as guarantees and lines of credit, and hedging using financial derivatives. However, some progress has been made for the public sector, notably for contingent liabilities, with the 2014 GFS questionnaire including several off-balance sheet items<sup>16</sup>, while the new *BPM6* supplementary table on currency composition includes the notional value of financial derivatives. Also, some off-balance sheet exposures at the banking sector level are available for a small sample of advanced economies in the IBS. Although derivative data is hard to obtain, the FSB is working to develop a mechanism to aggregate and share OTC derivatives data from trade repositories

<sup>14</sup> Efforts to develop “from-whom-to-whom” financial positions and flows are discussed in Shrestha (2014).

<sup>15</sup> Data on securities held as reserves are provided for each country of issuer, but on an aggregated creditor basis; that is individual country holdings of securities held as reserves by country of issuer remain confidential.

<sup>16</sup> These include concessional loans, explicit contingent liabilities, and net implicit obligations for social security benefits. Similarly, some of these items have been a part of the 2001 GFS questionnaire.

to make these data usable for risk analysis by supervisors and regulators (or macroprudential authorities).

**36. The best country coverage is by the advanced economies, where most report the main datasets** (Figure 7). Emerging market countries consistently report MFS and cross-border data. Frontier markets have been improving their data but other low-income countries are lagging behind. For these countries, even partial data for domestic sectors is often enough to permit valuable analysis, as sector linkages are narrower. Nevertheless, data gaps also arise in advanced countries because of the greater complexity of their financial products.

**37. The quality of reporting also varies by income groups** (Table 2). Advanced economies have better quality of reporting across all datasets. All income groups report MFS data, although reporting of the data for non-banking financial institutions lags behind that for central banks and banking sector. Not surprisingly, low income countries are at the lower end of the quality of the reporting, with not a single country reporting sectoral accounts.

**Table 2. Data Quality by Country Groups<sup>1</sup>**

	Sectoral Accounts	Monetary and Financial Statistics (SRFs)	IIP	CPIS	CDIS	External Debt	GFS and PSDS	IBS	FSI
Total									
Advanced Economies									
Emerging and developing economies/excluding LICs									
LICs: Frontier Markets									
LICs: Other									

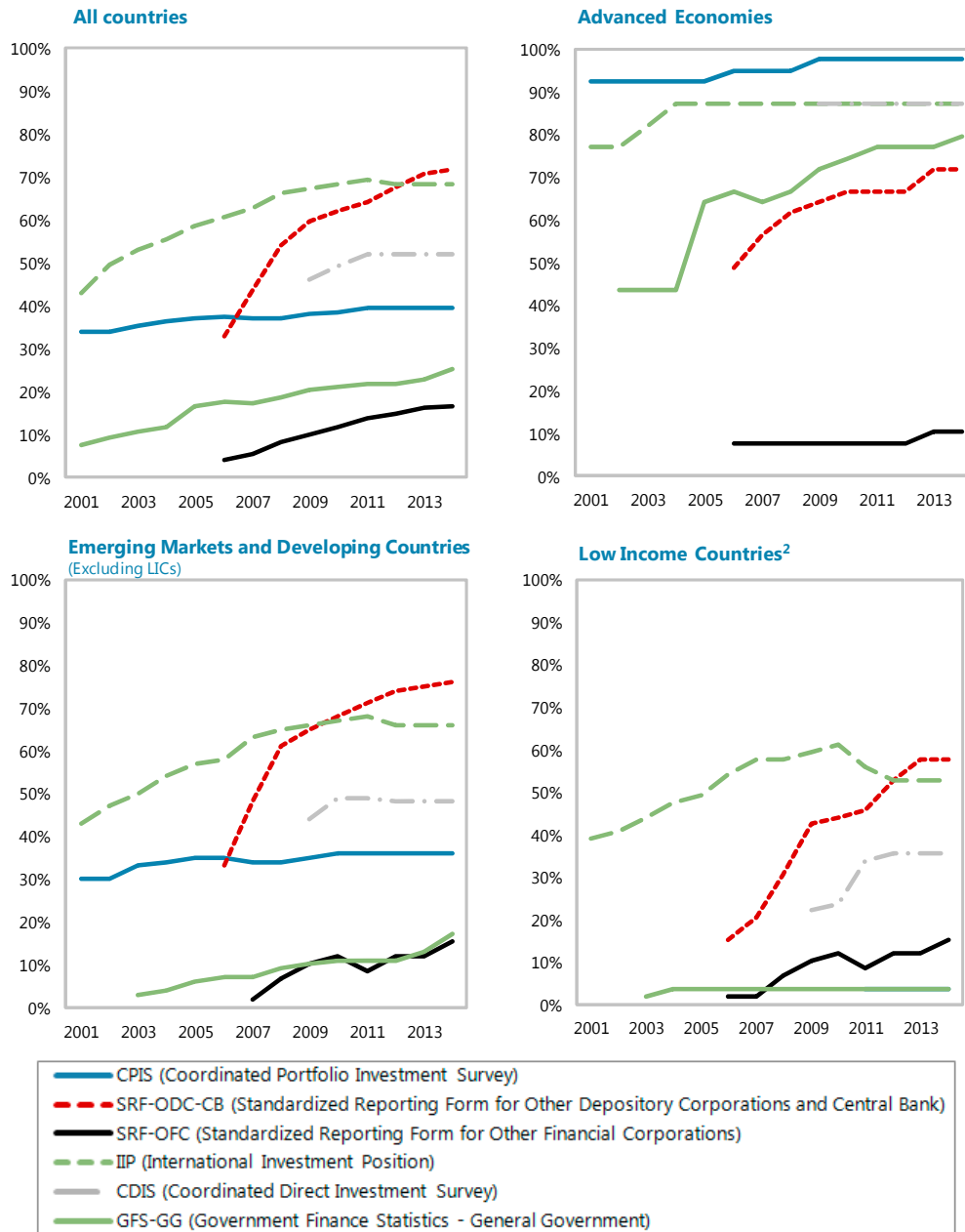
Average scaled scores by country groups mapped into quartiles

N/A	0 - 25	25 - 50	50 - 75	75 - 100

<sup>1</sup>Country data provision quality (in terms of coverage and frequency) is rated using internal scores. IIP and IBS data is rated on a 0-2 scale; SRF, CDIS, and external debt data on scale of 0-3, sectoral accounts and CPIS data on a 0-4 scale, and GFS/PSDS on a 0-5 scale. Average scores by country group on these scales are mapped into percentages for illustrative purposes in this table. For example, for advanced economies, the unweighted average score on sectoral accounts data is 1.7, which places them at around 60 percent of the maximum possible score of 3.

**Figure 7. Country Coverage in Major Balance Sheet Datasets, 2011-14<sup>1</sup>**

(number of reporting countries as percent of total)



<sup>1</sup>This figure is prepared by Matias Costa Navajas, Plapa Koukpaou, and Lina Yu (all STA). For 2013-14, figures for IIP, CPIS, and CDIS are estimates since smaller countries report these surveys with a long lag.

<sup>2</sup>For LICs, the line for the CPIS overlaps with that for the GFS. Therefore, the CPIS data are not visible on the figure.

Source: Staff calculations.

### C. A Way Forward for Promoting Balance Sheet Data

**38. IMF member countries have made significant progress in reporting balance sheet data to the IMF over the past decade.** Most notably over 140 economies report SRFs and IIP data to STA, basic datasets for compiling a Balance Sheet matrix, while the coordinated exercises on portfolio and direct investment provide a wealth of information on bilateral financial positions.

**39. Nonetheless, data gaps remain, some of which may be closed within a relatively short time period, while others require longer term engagement.** For example, improving availability of data on foreign currency positions and on remaining maturity will take time as these are not breakdowns that have traditionally been compiled. On the other hand, a concentrated effort by countries along with enhanced technical assistance and training can result in significant improvements in data availability, as highlighted for instance by the over 100 countries that report external debt data to the World Bank/IMF QEDS.

**40. Addressing data gaps will depend on efforts by country authorities, the Fund and partner institutions.** Priorities must be based on need and the capacity of countries but there is general recognition that developing integrated sectoral balance sheet information is important for surveillance both nationally and internationally. To achieve this outcome requires a continued coordinated effort including a pro-active role by STA and ICD. It would also be essential for area departments to encourage countries to develop and report to the IMF data that are needed for the BSA, including by raising statistical matters in the context of policy dialogue with authorities. Support from the Executive Board is vitally important. Nonetheless for low-income countries in particular there may be significant resource constraints.

**41. Some of the challenges in this area are partially addressed for the largest economies through the G-20 DGI, encompassing as it does many of the data sets needed for the balance sheet approach.** The G-20 Finance Ministers and Central Bank Governors in reviewing the Fifth Progress report of the G-20 DGI in September 2014, called for a proposal for a second stage of the G-20 DGI to be presented to them in the second half of 2015. Staff is working to ensure that closing data gaps in balance sheet information is reflected in the proposals

**42. However, even if all initiatives are implemented and all countries start reporting full data sets, some data gaps will likely still remain.** In addition to still-evolving frameworks for thinking about financial stability risks, remaining gaps can largely be attributed to the limitations of data availability, confidentiality, and collection cost. Nevertheless, some of these can at least partly be alleviated by making pragmatic assumptions, as discussed below.

**43. As sector balance sheet data cannot capture all key sources of risks, micro data from individual institutions is also needed.** Further data from private vendors are essential, particularly higher frequency and more timely data than available from official sources. Micro data can be useful in constructing independent estimates of inter-institutional and sectoral



exposures, and hence could offer a cross-check of macro estimates. In other words, apart from allowing us to go more granular (and look within sectors), micro-data can be used to explore and double-check patterns suggested by macro data. It may also be important to probe linkages within sectors. This would allow development of more granular indicators of risk concentration in a sector. For example, it would be beneficial to augment BSA matrices to analyze links within the banking sector—links among foreign-owned banks, domestic private banks, and domestic public banks. Some private databases, such as the Bankscope database, provide data on balance sheets of individual banking sector institutions.

**44. Another challenge arises from risks that are hidden off-balance sheet or offshore.**

These can be located in the shadow banking system, from where they could be transferred onto banks' balance sheet (as occurred in the global crisis,) or in borrowing by offshore subsidiaries.<sup>17</sup> Here, surveillance needs to monitor shadow banking system balance sheets and offshore borrowing, consolidating such risks onto bank balance sheets as appropriate. Off-balance sheet exposures also arise from derivative exposures, which are captured on balance sheet to a very limited extent. Surveillance can monitor these exposures and compute potential losses under various scenarios (especially for systemic institutions). Scenario analysis can help assess both these sources of off-balance sheet risks by estimating their impact were they to materialize as liabilities on a sector's balance sheet. For this, as well as for balance sheet analysis more generally, a variety of tools have been developed by the Fund, as discussed in the next section.

## IV. FUND TOOLS FOR BALANCE SHEET ANALYSIS: WHAT EXISTS AND WHERE TO FROM HERE?

**45. This section briefly reviews the range of balance sheet tools used in Fund surveillance and introduces some potentially useful new directions.** Despite limitations, balance sheet data can yield important insights into the channels through which shocks could be transmitted and amplified and the nature of vulnerabilities within and across sectors. This section presents a compendium of available tools to analyze this data developed over the years by the Fund. Looking forward, it offers some new applications of existing and new tools developed in this paper, together with data from a mix of public and private sources that combine market data and balance sheet information. The new tools introduced here are in the process of being standardized and made accessible to country teams on a new balance sheet analytics link on the Fund's intranet that will also provide access to the library of existing tools. This will provide teams with a Fund-wide one-stop shop for exploring analytical options for balance sheet analysis.

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<sup>17</sup> Efforts to measure off-balance sheet leverage are discussed in Breuer (2000).

**Applying Balance Sheet versus Market-Price Data**

- Market-based price information is very timely and of key importance because of its forward looking nature and because it represents assessments made by a wide range of agents.
- In principle, price data should map into quantity positions illustrated by balance sheets, e.g. concerns about net worth should show up in low asset prices or “too-big-to-fail” issues should be reflected in lower risk premia relative to otherwise similar institutions.
- However, prices do not always fully reflect underlying balance sheet positions, as demonstrated in low sovereign yields across Europe in the lead up to the crisis. In such cases looking at balance sheets can be useful to pick up stresses that are building up but not adequately reflected in price information. They can point to mispricing or the likelihood of multiple equilibria and jumps in states associated with frictions and mismatches.

**A. Existing Tools**

**46. Successive waves of crises over the decades have driven innovations in the Fund’s analytical toolkit**, including:

***Tools to understand shock amplification***

- Macro models, like the Global Macrofinancial Model (GFM) and the empirical crisis model. The former is a structural macroeconomic model of the world, disaggregated into forty national economies, each represented by interconnected real, external, monetary, fiscal, and financial sectors. International spillovers are transmitted via trade, financial, and commodity price linkages. Financial linkages encompass cross-border bank lending, portfolio debt and equity investment exposures, as well as contagion effects. The latter helps identify advanced economies that face heightened vulnerability to a severe growth slowdown or to financial and fiscal crisis, and quantify countries’ overall vulnerabilities to different types of crisis.
- GVAR/BVAR approaches. A variety of such approaches have been developed, including in both the WEO and GFSR.

***Tools to understand fragility and sustainability***

- *Prior to the global crisis.* The BSA and a standardized framework for public and external debt sustainability analysis became operational in 2002, although as noted above the BSA was only used sporadically. Financial soundness indicators were developed and are used in many

staff reports, and stress tests linking macroeconomic variables to banks became more widely used, especially in FSAPs.

- *In the wake of the crisis, the breath of tools has increased substantially*, with greater attention to bank and sovereign balance sheets, and to advanced economy balance sheets more generally. The standard Debt Sustainability Analysis (DSA) was combined with the Contingent Claims Approach (CCA) for Sweden (2011) and Greece (2014) to provide more forward-looking estimates of the impact of shocks on sovereign risk. FSAPs for advanced economies have also started covering sovereign and nonbank risks, using new tools such as balance sheet data-based liquidity and solvency stress tests<sup>18</sup>, a CCA-GVAR framework (Italy (2013)) and other models developed by the Fund.
- Most recently, tools have been developed to assess external sector sustainability (EBA/ESR), sectoral vulnerabilities (Vulnerability Exercise<sup>19</sup>), and the consistency between real and financial forecasts.

### **Tools to understand shock transmission**

- Network models were used to assess cross-border spillovers among financial systems or institutions in the case of Spain (2012).<sup>20</sup>
- The Fund started work on Spillover Reports from 2010, to capture the impact that countries' policies and economic trends could have on the rest of the world, using a variety of tools including network analysis and VARs.

**47. The range of available tools is suitable for addressing many analytical questions but further work is needed over time.** In particular, efforts are needed to combine existing tools into an integrated, economy-wide toolkit. Development of some relatively standardized stress-test toolkits that could be combined with BSA analysis would be useful for teams. The toolkit needs to be flexible enough to incorporate a wide range of available information from public and private databases, including on individual firms. Finally, as a longer term goal, consolidating the frameworks for stocks (balance sheets) and flows (financial programming) would lead to considerable improvements in the consistency of forecasts.<sup>21</sup> As discussed below, a BSA matrix can be a useful starting point for deeper analysis. For example, if liabilities of various sectors look

<sup>18</sup> These techniques build on a next generation stress testing framework initiated by Schmieder et al. (2011).

<sup>19</sup> The Vulnerability Exercise (VE) is an internal cross-country exercise, which is part of the IMF's bilateral and multilateral risk assessment toolkit.

<sup>20</sup> Two network models were developed at the Fund: the *Bank Contagion Module (BCM)* and *Bank Network 2.0 Module*.

<sup>21</sup> The *BPM6* framework for the international investment position (IIP) shows conceptually how this could be done, by decomposing changes in IIP into transactions, other volume, and revaluations due to exchange rate changes and other price changes.

large or concentrated, then other tools need to be used to see if the situation is unusual and/or poses risks to other parts of the economy. The applications introduced below follow this train of thought, with BSA matrices being developed and analyzed, and stress points explored further using balance sheets to examine portfolio responses to shocks and to connect the balance sheets to forecasts of economic variables.

## B. Toward New Tools and Empirical Applications<sup>22</sup>

**48. A BSA matrix is a useful starting point for organizing and displaying sector balance sheet data.** The matrix captures a key feature of the data: the linkage between sector balance sheets in an economy that can be used to trace out the transmission of shocks across sectors. Much of it can be put together using data from IMF sources, notably MFS, IIP, GFS, as well as balance sheet identities. The exact specification of the matrix depends on the availability of balance sheet data for a country from these different sources, but even a partial one can help to provide a picture of the economy and its interlinkages.

**49. Once the BSA matrix is constructed, summary net positions of intersectoral linkages and network maps can provide a useful initial snapshot.** Balance sheet matrices provide a useful over-arching framework to identify risk concentrations and sectoral inter-connections that give rise to network effects and systemic risk. To make them more tractable, we are developing a “front end”, featuring summary indicators and network maps, which can help hone in on key balance sheet positions and interlinkages. Examining the matrix and network map can reveal some potential vulnerabilities, including different kinds of mismatches, and scenario analysis can be used to trace the transmission of shocks across sectors and globally. Finally, the balance sheet positions of key sectors can be used to inform and assess the consistency of projections for key economic variables such as growth, credit, investment and consumption.

**50. Once the matrix has provided an initial diagnostic, other data and tools can be used to drill down on sectoral balance sheets,** for instance:

- **Stress-testing corporate sector balance sheets.** Despite the growing leverage and exposure to foreign currency debt in many emerging markets, comprehensive firm-level data on currency and maturity mismatches of corporate balance sheet remain sparse. We have constructed a tool which puts together micro data from different sources covering corporates’ total asset and liabilities, FX debt, FX income and detailed currency breakdown of both, as well as maturity structure. The tool aims to assist teams in monitoring the development of domestic and international corporate bond markets; in assessing the currency and maturity structure of corporate balance sheets; and in stress-testing corporate balance sheets to earnings, interest rate and exchange rate shocks through various indicators including interest coverage ratios and debt at risk. The stress test can be customized to a particular sector and different size and combination of shocks, e.g. an oil shock in the

<sup>22</sup> These new directions are further fleshed out in IMF (2015) forthcoming.

commodity sector. Users can also make different assumptions on the currency breakdown of debt and hedges. The tool is especially topical given the changing financial environment that is likely to be associated with asynchronous exit from unconventional monetary policy.

- **Assessing external vulnerabilities.** A gap in balance sheet analysis relates to modeling the behavioral responses of investors to shocks. In this context, we have developed a bond allocation tool to simulate the behavior of mutual fund investors in EM sovereign bonds. The tool helps examine asset choices of international mutual funds and their implications for the holdings of EM sovereign debt. It combines simple constrained portfolio optimization techniques with actual mutual fund allocation and flow data. We assume that mutual fund investors hold 10 EM bonds in a single EM sovereign bond portfolio. They then optimize the share of each bond that they hold using a Markowitz mean-variance approach. The portfolio is re-optimized when a shock to returns is introduced. The tool can be used to inform country teams about the potential direction and magnitude of bond portfolio capital flows under a stress scenario, with attendant implications for the liability side of sovereign balance sheets in emerging markets. It is also topical, given record holdings by foreigners of emerging market local currency sovereign bonds, with mutual funds and other asset managers playing an increasing role in generating these flows. A potential sudden stop or reversal in these holdings has been a key surveillance concern, especially since the “taper tantrum” in the summer of 2013.

**51. Finally, a variety of empirical approaches can help directly inform how balance sheets can affect—and be affected by—economic developments, including:**

- **A BVAR Based Tool.** How do balance sheets of households and nonfinancial corporations affect the economic outlook? To address this question, we have developed an analytical framework that could be implemented by Fund staff based on the Bayesian estimation of a Large Vector Auto Regression (LVAR) model. Using the estimated model, conditional out-of-sample forecast scenarios are first computed to assess whether balance sheet variables contain any additional information content. Impulse response functions (IRFs) to shocks to sectoral balance sheets as well as monetary policy shocks are then estimated and compared. For illustrative purposes, the model has been applied to the United States and shows that using balance sheet information improves the forecast of aggregate activity. In addition, shocks to balance sheets are also found to have significant and differentiated economic impact.
- **Credit, Housing Wealth and Consumption.** Household consumption is linked to balance sheets of banks and households through the financial accelerator as well as wealth and collateral effects. Housing wealth—tied in large part to property values—has a notable balance sheet effect on household consumption. At the same time, the availability of mortgage financing affects property values. Both the wealth and collateral channels thus affect consumption, and estimating these relationships can help improve the accuracy of consumption projections. The strength of these effects depends in part on institutional and structural settings that may vary across countries. Modeling these using a structural vector

error correction model and applying them to a set of European countries, we find a strong effect of credit on house prices, and a high elasticity of consumption with regard to housing wealth.

## V. CONCLUSION

### **52. Balance sheet analysis is an important prism for operationalizing surveillance of financial frictions and linkages and their implications for economic prospects and risks.**

Notwithstanding some limitations, surveillance informed by such analytics is key to better understanding the macroeconomic outlook, identifying vulnerabilities, and tracing the transmission and impact of potential shocks. As noted in recent reviews of Fund surveillance, gaps in such analysis contributed in part to blind-spots ahead of the global financial crisis.

**53. This paper reviews the Fund’s surveillance using balance sheet analytics and provides some practical examples of how to deepen this focus.** Recent evaluations of IMF surveillance have emphasized the importance of strengthening balance sheet analysis and coverage of macro-financial issues. This paper is an early contribution to this ongoing work stream. First, it highlights good examples of surveillance using balance sheet analysis conducted by staff over the last decade, while also documenting the data and tools that have been used. Second, it discusses recent improvements in balance sheet data as well as key remaining gaps. Third, it introduces some new balance sheet tools and empirical applications that could be relevant for policy analysis at the current juncture.

**54. The Fund has made progress in both balance sheet statistics and surveillance over the last decade, although challenges remain.** The use of balance sheet analysis in surveillance has been nimble in responding to structural change and shocks. However, gaps in data and tools have hindered risk identification, analysis of some sectoral balance sheets, and their inter-connections. On the data side, country coverage and granularity have both improved, in part through an integrated approach to collection and Fund-supported initiatives (e.g. SDDS Plus, DGI, etc). These data are being increasingly used in surveillance, often supported by the range of tools that the Fund has developed, including the Balance Sheet Approach (BSA), techniques for macro-financial stress-testing, FSIs, and DSAs.

**55. Going forward, there is scope for further developing and using balance sheet analysis in the Fund’s surveillance.** As argued in this paper, balance sheet matrices—even if partial—can be a useful starting point for assessing potential stress-points and transmission channels. Deciding on the level of precision and disaggregation necessary will involve staff judgment, but such an approach could be useful for all types of economies, including low-income countries. In many cases where data gaps exist, pragmatic assumptions can be used to fill in some of the blanks. Having used such matrices to identify key areas of focus, micro data could be used to dig deeper, including within sectors to gauge the dispersion of risks that might be masked by aggregate data. Combining the quantity information embedded in balance sheets

with market-based price data can also serve as a useful cross-check on economic and financial developments.

**56. Given this existing work and the conjunctural setting, important areas for focus ahead include the following considerations:**

- *First, addressing key data gaps that are hampering surveillance, especially on so-called shadow banks, non-financial corporations, governments, and households. Better information is also needed on the composition and interconnectedness of balance sheets (e.g. currency/maturity breakdown, counterparties, and off-balance sheet exposures, derivatives, and hedges). Efforts are also needed to increase coverage of balance sheet data for low-income countries, and better capture increasingly complex financial instruments in more advanced ones. Addressing these key gaps will need continuing efforts of country authorities as well as the Fund and other partner institutions.*
- *Second, providing additional tools targeted at helping staff construct and analyze balance sheets, assess the interaction between key balance sheets in the economy and the real outlook and especially to further analyze global and domestic inter-connectedness of balance sheets to better understand shock propagation and financial fragility.*

## Annex. Implementing Textual Analysis

The textual analysis presented in the main paper relies on a simple search engine to extract the number of times balance sheet-related key words and phrases have been used in a particular country Article IV staff report in order to estimate the overall coverage of balance sheet analysis (Table 1).<sup>1</sup> In addition, the search engine is also used to find key words related to the use of different balance sheet-related datasets, both micro and macro.

Technically, the search is performed simultaneously on multiple documents, using Boolean queries in Adobe Acrobat XI that allows to combine keywords with logical operators like AND/OR to produce more relevant results. The search results are then processed in STATA to compute summary statistics. The keywords and key phrases were carefully chosen with the aim of exploiting the search engine facility to extract maximum information in the most systematic manner.

It should be acknowledged that such textual analysis using search engines has advantages and disadvantages. On the positive side, it provides a powerful method of targeting a large and comprehensive universe including all the country staff reports in the past eleven years when assessing balance sheet coverage. In addition, the responses from the more structured review provide a useful cross-check to the results of the textual analysis. On the negative side, it cannot assess the quality or relevance of the words searched and cannot by itself identify contexts.

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<sup>1</sup>For coverage of sectoral analysis, a cut-off of at least three mentions of the keywords per staff report was used to ensure that the treatment of the issues was sufficiently extensive to be characterized as balance sheet analysis.



**Table 1. Keywords for Textual Analysis**

<b>Broad search areas</b>	<b>Category</b>	<b>Key words and phrases</b>
<b>Coverage of sectoral balance sheet analysis</b>	Corporate	Corporate balance sheet, corporate assets, corporate liabilities, corporate leverage, corporate net worth, corporate wealth, corporate net financial position, corporate net foreign currency position, corporate net short-term position, corporate debt to equity, corporate debt to income
	Household	household balance sheet, household assets, household liabilities, household leverage, household net worth, household wealth, household net financial position, household net foreign currency position, household net short-term position, household debt to equity, household debt to income, households balance sheet, households assets, households liabilities, households leverage, households net worth, households wealth, households net financial position, households net foreign currency position, households net short-term position, households debt to equity, households debt to income
	Public	public balance sheet, public assets, public liabilities, public leverage, public net worth, public wealth, public net financial position, public net foreign currency position, public net short-term position, public debt to equity, public debt to income, sovereign balance sheet, sovereign assets, sovereign liabilities, sovereign leverage, sovereign net worth, sovereign wealth, sovereign net financial position, sovereign net foreign currency position, sovereign net short-term position, sovereign debt to equity, sovereign debt to income
	External	external balance sheet, external assets, external liabilities, external leverage, external net worth, external wealth, external net external position, external net foreign currency position, external net short-term position, external debt to equity, external debt to income
	Financial	financial balance sheet, financial assets, financial liabilities, financial leverage, financial net worth, financial wealth, financial net financial position, financial net foreign currency position, financial net short-term position, financial debt to equity, financial debt to income, bank balance sheet, bank assets, bank liabilities, bank leverage, bank net worth, bank wealth, bank net financial position, bank net foreign currency position, bank net short-term position, bank debt to equity, bank debt to income, banks balance sheet, banks assets, banks liabilities, banks leverage, banks net worth, banks wealth, banks net financial position, banks net foreign currency position, banks net short-term position, banks debt to equity, banks debt to income

**Table 1. Keywords for Textual Analysis (concluded)**

<b>Topics of analysis</b>	Hedging	Hedging, hedge, derivatives
	Credit risk	Credit risk, Solvency risk
	FX Exposure	Foreign currency exposure, foreign currency risk, FX exposure, FX risk, net foreign currency position
	Liquidity risk	Liquidity mismatch, liquidity risk
	Deleveraging	Deleveraging
	Rollover risk	Rollover risk
	Interest rate risk	Interest rate risk
	Maturity risk	Maturity mismatch, maturity risk
<b>Use of datasets: Micro</b>	Bloomberg	Bloomberg
	BIS	Bank of International Settlements, BIS, International Banking Statistics
	Bankscope	Bankscope
	Dealogic	Dealogic
	Worldscope	Worldscope
<b>Use of datasets: Macro</b>	FSI	Financial Soundness Indicators, FSI
	GFS	Government Finance Statistics, GFS
	IIP	International Investment Position, IIP
	MFS	Monetary and Financial Statistics, MFS

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