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## BALANCE SHEET ANALYSIS IN FUND SURVEILLANCE—REFERENCE NOTE

IMF staff regularly produces papers proposing new IMF policies, exploring options for reform, or reviewing existing IMF policies and operations. The following documents have been separately released:

- The **Policy Paper** on Balance Sheet Analysis in Fund Surveillance prepared by IMF staff and completed on June 25, 2015.

The report prepared by IMF Staff and was sent to the Executive Board for information. The views expressed in this paper are those of the IMF staff and do not necessarily represent the views of the IMF's Executive Board.

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



## BALANCE SHEET ANALYSIS IN FUND SURVEILLANCE

July 13, 2015

### REFERENCE NOTE

**This note serves as a reference for balance sheet analysis**, which should be read in conjunction with the IMF board paper on [Balance Sheet Analysis in Fund Surveillance](#). It provides a:

- compendium of **good examples of balance sheet analysis** from both bilateral and multilateral surveillance, covering a variety of topics
- full listing of **available balance sheet related macro datasets**, including their relevance for surveillance, remaining limitations, and remedial measures being undertaken
- summary of **data availability for each Fund member**
- compilation of all the **tools for balance sheet analysis** developed by the Fund over the last decade
- toolkit featuring some **new empirical applications** that could help deepen balance sheet analysis in surveillance. These include illustrations of how to construct and use BSA matrices, general equilibrium and reduced form approaches, as well as tools to analyze sectoral vulnerabilities using micro data

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## CONTENTS

<b>BALANCE SHEET ANALYSIS IN FUND MULTILATERAL PRODUCTS</b>	<b>4</b>
<b>GOOD EXAMPLES OF BALANCE SHEET ANALYSIS IN BILATERAL SURVEILLANCE</b>	<b>8</b>
<b>BALANCE SHEET DATA: KEY SOURCES AND INITIATIVES</b>	<b>13</b>
A. Major Data Initiatives	13
B. Key Balance Sheet Related Macro Datasets	15
<b>BALANCE SHEET DATA—CURRENT AVAILABILITY BY ECONOMY</b>	<b>23</b>
<b>EXISTING TOOLS FOR BALANCE SHEET ANALYSIS IN THE FUND</b>	<b>34</b>
<b>TOWARD A TOOLKIT FOR DEEPENING BALANCE SHEET ANALYSIS: SOME NEW EMPIRICAL APPLICATIONS</b>	<b>37</b>
A. Modeling Fragility and Inter-Connectedness using Balance Sheets	37
B. Modeling Macroeconomic Developments with Balance Sheets	69
<b>FIGURES</b>	
1. Building a Balance Sheet Matrix: Example	39
2. Mexico—Network Map of Sectoral Linkages	41
3. Network Map of Euro Area of Sectoral Linkages	48
4. Financial Accounts of United States by	49
5. Growth in HHs Financial Assets and Liabilities by Instrument	50
6. OFC and ODCs External Assets and Liabilities	52
7. ODCs Assets and Liabilities to OFCs, and OFCs Total Assets and Liabilities	53
8. House and Equity Prices	53
9. Network Map—Gross Intersectoral Financial Asset Positions of the United States	55
10. Nonfinancial Corporate Debt Outstanding	56

11. Corporate Debt by Currencies	57
12. Currency Breakdown of Corporate Debt Outstanding in 2014	57
13. Breakdown of Total Corporate Debt	58
14. Breakdown of Total Corporate Income	58
15. Currency Breakdown of Corporate Leverage	59
16. Natural Hedge by Sectors	59
17. Interest Coverage Ratio	60
18. Debt at Risk (ICR <1.5)	60
19. EPFR Implied Allocation	67
20. Model Based Allocations	67
21. Reaction to a 14 percent USD Appreciation over 3 Months	68
22. Conditional Forecast Scenarios	70
23. A 1 Percentage Point Shock to Federal Funds Rate	71
24. A 1 Percentage Point Adverse Shock to Net Worth	72
25. A 1 Percentage Point Adverse Shock to Non-Financial Assets	73
26. A 1 Percentage Point Adverse Shock to Financial Assets	73
27. Stock Flow Nexus between Household Credit and Consumption	76
28. Norway—Projections Under Credit Shock Scenarios	77

## TABLES

1. Balance Sheet Analysis in the Global Financial Stability Report	4
2. Balance Sheet Analysis in the World Economic Outlook Report	6
3. Good Examples of Balance Sheet Analysis in Bilateral Surveillance	8
4. Key Balance Sheet Related Macro Datasets	15
5. Advanced Economies—Current Data Availability	23
6. Emerging Market and Developing Economies (excluding Low-Income Countries)—Current Data Availability	25
7. Low-Income Countries: Frontier Markets—Current Data Availability	30
8. Low-Income Countries: Others—Current Data Availability	31
9. Existing Tools For Balance Sheet Analysis in the Fund	34
10. Mexico Intersectoral Net Positions (2011)	40
11. Mexico Capital Structure (2011)	42
12. Gains/Losses for 20 percent USD Appreciation (2011)	43
13. Euro Area Intersectoral Net Positions (2009)	47
14. Euro Area Intersectoral Net Positions (2012)	47
15. United States: BSA Matrix	54
16. Estimates of Elasticities of Household Consumption	75

<b>REFERENCES</b>	79
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# BALANCE SHEET ANALYSIS IN FUND MULTILATERAL PRODUCTS

**Table 1. Balance Sheet Analysis in the Global Financial Stability Report**  
(since 2004)

Year	Type of document	Title	Coverage	Tools/Models
Apr-04	Chapter	<a href="#">Risk Transfer and the Insurance Industry</a>	US, Japan, UK, Euro Area	
Sep-04	Chapter	<a href="#">Risk Management and the Pension Fund Industry</a>	US, Japan, EU and emerging economies	
Sep-04	Chapter	<a href="#">Emerging Markets as Net Capital Exporters</a>	Countries hit by Asian crisis	Contingent Claims Analysis Approach
Apr-05	Chapter	<a href="#">Household Balance Sheets</a>	US, UK, Germany, Japan, France, Netherlands	
Apr-05	Chapter	<a href="#">Corporate Finance in Emerging Markets</a>	US, Germany, Japan and emerging economies	Corporate Vulnerability Utility.
Sep-05	Chapter	<a href="#">Balance Sheet Developments in Major Mature Economies</a>	Advanced economies	Market and Credit Risk Indicators
Sep-05	Chapter	<a href="#">Aspects of Global Asset Allocation</a>	US, Japan, EU	
Apr-06	Chapter	<a href="#">Structural Changes in Emerging Sovereign Debt and Implications for Financial Stability</a>	Asia, Latin America and EU	Contingent Claims Analysis Approach
Sep-06	Chapter	<a href="#">Household Credit Growth in Emerging Countries</a>	Emerging economies	
Oct-08	Chapter	<a href="#">Assessing Risks to Global Financial Stability</a>	Advanced economies	
Apr-09	Chapter	<a href="#">Detecting Systemic Risk</a>	US, Europe	Contingent Claims Analysis Approach
Apr-09	Box	<a href="#">Cross-border Exposure and Financial Linkages in Europe</a>	Europe	

**Table 1. Balance Sheet Analysis in the Global Financial Stability Report (concluded)**

(since 2004)

Year	Type of document	Title	Coverage	Tools/Models
Apr-09	Box	<a href="#">Network Simulations of Credit and Liquidity Shocks (to banks)</a>	US and Europe	Network analysis to simulate the individual default of each country's cross-border interbank claims and then tracks the domino effects triggered by this event.
Oct-09	Box	<a href="#">Implications of the Changes on Central Bank Balance Sheets</a>	US, UK, Japan, ECB	
Sep-11	Chapter	<a href="#">Macro-Financial Linkages in Emerging Markets and Impact of Shocks on Bank Capital Adequacy Ratios</a>	Emerging economies	Balance sheet based solvency analysis framework and fixed-effects panel VAR to assess the vulnerability of a large group of emerging markets to external shocks such as a sudden reversal in capital flows or a deterioration of the terms of trade.
Sep-11	Chapter	<a href="#">Long-Term Investors and Their Asset Allocation: Where Are They Now?</a>	Selected advanced and emerging economies	
Sep-11	Chapter	<a href="#">Toward Operationalizing Macroprudential Policies: When to Act?</a>	A number of small open emerging economies	Use a DSGE model to study interaction between financial sector and real economy
Apr-12	Chapter	<a href="#">Sovereigns, Banks, and Emerging Markets: Detailed Analysis and Policies</a>	Advanced and emerging economies	Fixed effects, structural panel, vector autoregression (VAR) to study exposure of financial sector in EMs to sudden reversal of bank and portfolio flows/Stress tests as part of the EU deleveraging exercise.
Oct-13	Chapter	<a href="#">The Euro Area Banking, Corporate, and Sovereign Nexus</a>	Euro Area	Corporate Vulnerability Utility
Oct-13	Chapter	<a href="#">Assessing Policies to Revive Credit Markets</a>	Advanced economies	Corporate Vulnerability Utility
Apr-14	Chapter	<a href="#">How Big is the Implicit Subsidy for Banks Considered Too Important to Fail?</a>	EU	Contingent Claims Analysis Approach

**Table 2. Balance Sheet Analysis in the World Economic Outlook Report**  
(since 2004)

Year	Type of document	Title	Coverage	Tools/Models
Apr-04	Box	<a href="#">How Do U.S. Interest and Exchange Rates Affect Emerging Markets' Balance Sheets?</a>	Emerging countries	Financial accelerator model extended to incorporate explicitly a fiscal sector
Apr-05	Chapter	<a href="#">Globalization and External Imbalances</a>	Selected advanced and emerging economies	IMF's multicountry Global Economic Model (quarterly DSGE)
Sep-05	Box	<a href="#">Return on Investment in Industrial and Developing Countries</a>	Selected advanced and emerging economies	
Apr-06	Chapter	<a href="#">Awash With Cash: Why Are Corporate Savings So High?</a>	G7 countries	
Sep-06	Chapter	<a href="#">How Do Financial Systems Affect Economic Cycles?</a>	Selected advanced economies	Financial accelerator model
Apr-07	Box	<a href="#">External Sustainability and Financial Integration</a>	Australia, Spain, United States	
Oct-08	Box	<a href="#">The Latest Bout of Financial Distress: How Does It Change the Global Outlook?</a>	United States and Europe	Default risk and leverage ratios are calculated for individual companies from market data using modified Black-Scholes-Merton option pricing formula
Oct-08	Chapter	<a href="#">Financial Stress and Economic Downturns</a>	United States and Euro Area	Financial Stress Index (FSI)
Apr-09	Box	<a href="#">How Vulnerable Are Nonfinancial Firms?</a>	Advanced and emerging economies	Contingent Claims Analysis Approach
Apr-09	Box	<a href="#">The Case of Vanishing Household Wealth</a>	UK, Euro Area, Japan, United States	
Oct-09	Box	<a href="#">Were Financial Markets in Emerging Economies More Resilient than in Past Crises?</a>	Emerging economies	Emerging Markets Financial Stress Index (EM-FSI)
Oct-09	Chapter	<a href="#">Lessons for Monetary Policy from Asset Price Fluctuations</a>	Advanced economies	

**Table 2. Balance Sheet Analysis in the World Economic Outlook Report (concluded)**  
(since 2004)

Year	Type of document	Title	Coverage	Tools/Models
Apr-12	Spillover feature	<a href="#">Cross-Border Spillovers from Euro Area Bank Deleveraging</a>	World	The impact of deleveraging is simulated using the IMF's Global Economy Model
Apr-12	Box	<a href="#">East-West Linkages and Spillovers in Europe</a>	Europe	Empirical models, including VAR to confirm that growth and trade spillovers are quantitatively important, with a shock in western Europe affecting eastern Europe through many channels
Apr-12	Chapter	<a href="#">Dealing with Household Debt</a>	Selected advanced economies	
Oct-14	Box	<a href="#">Fiscal Balance Sheets: The Significance of Nonfinancial Assets and Their Measurement</a>	Selected advanced economies	
Oct-14	Chapter	<a href="#">Are Global Imbalances at a Turning Point?</a>	Selected advanced and emerging economies	External Balance Assessment/External Sector Report



## GOOD EXAMPLES OF BALANCE SHEET ANALYSIS IN BILATERAL SURVEILLANCE

**Table 3. Good Examples of Balance Sheet Analysis in Bilateral Surveillance**

Theme	Bilateral Surveillance	Main topics covered
<b>Matrix-based Balance Sheet Analysis</b>	<a href="#">Australia, 2003, Annex I in Australia: Article IV Consultation—Staff Report, IMF Country Report No. 03/337, October</a>	Sectoral vulnerabilities
	<a href="#">Thailand, 2004, "Thailand: An Aggregate Balance-Sheet Analysis", in Thailand: Selected Issues, IMF Country Report No. 04/01, January</a>	Transmission of shocks across sectors
	<a href="#">Peru, 2004, "Analyzing a Highly-Dollarized Economy from a Balance Sheet Perspective", in Peru: Selected Issues, IMF Country Report No. 04/156, May</a>	Transmission of shocks across sectors
	<a href="#">Latvia, 2005, "A Balance Sheet Approach to Macroprudential Vulnerabilities in Latvia," in Republic of Latvia: Selected Issues, IMF Country Report No. 05/277, August</a>	Currency and maturity mismatches under dollarization
	<a href="#">Ukraine, 2005, "Assessing Ukraine's Vulnerabilities from a Balance Sheet Perspective" in Ukraine: Selected Issues, Country Report No. 05/20 January</a>	Currency and maturity mismatches under dollarization
	<a href="#">Belize, 2005, "Balance Sheet Currency Mismatch and Liquidity Analysis" in Belize: Selected Issues, IMF Country Report No. 05/353, September</a>	Public sector vulnerabilities and exchange rate peg
	<a href="#">Colombia, 2006, "Sectoral Balance Sheet Mismatches and Macroeconomic Vulnerabilities in Colombia, 1996-2003", IMF Working Paper WP/06/5, January</a>	Currency and maturity mismatches
	<a href="#">Estonia, 2006, "Assessment of Balance Sheet Exposures in Estonia" in Estonia: Selected Issues, IMF Country Report No. 06/419, November</a>	Currency and maturity mismatches
	<a href="#">Lebanon, 2006, "Balance Sheet Analysis of Lebanon's Vulnerabilities" in Lebanon: Selected Issues, Country Report No. 06/200, June</a>	Bank-sovereign links

**Table 3. Good Examples of Balance Sheet Analysis in Bilateral Surveillance  
(continued)**

<b>Bilateral Surveillance</b>	<b>Main topics covered</b>
<a href="#">Croatia, 2007, "External Debt and Balance-Sheet Vulnerabilities in Croatia," in Republic of Croatia: Selected Issues, IMF Country Report No. 07/82, February</a>	Currency and maturity mismatches
South Africa, 2007, "Assessing Macroeconomic Vulnerabilities in South Africa: An Application of the Balance Sheet Approach" in South Africa: Selected Issues, Country Report No. 07/267, July	Sectoral vulnerabilities including stress tests
<a href="#">Mauritius, 2010, "Balance Sheet Vulnerabilities of Mauritius During a Decade of Shocks", IMF Working Paper WP/10/148, June</a>	Currency and maturity mismatches
<a href="#">Croatia, 2011, "An Assessment of Balance Sheet Risks in Croatia," in Republic of Croatia: Selected Issues Paper, IMF Country Report No. 11/160, July</a>	Currency and maturity mismatches
<a href="#">Barbados, 2012, "Barbados: Sectoral Balance Sheet Mismatches and Macroeconomic Vulnerabilities", IMF working paper WP/12/31, December</a>	Stress tests
<a href="#">Guatemala, 2013, "Analytical note IV: Balance Sheets" in Guatemala: Selected Issues and Analytical Notes, Country Report No. 13/248, August</a>	Currency and maturity mismatches, sensitivity to FX shocks
<a href="#">Costa Rica, 2015, Selected issues and Analytical notes, IMF Country Report No. 15/30, February</a>	Currency and maturity mismatches, sensitivity to FX shocks
<a href="#">India, 2015, India: Article IV Consultation—Staff Report, IMF Country Report No. 15/61, March</a>	Vulnerabilities and data gaps

**Table 3. Good Examples of Balance Sheet Analysis in Bilateral Surveillance (continued)**

<b>Theme</b>	<b>Bilateral Surveillance</b>	<b>Main topics covered</b>
<b>Public sector balance sheets</b>	<a href="#">Uruguay, 2001, in Uruguay: 2001 Article IV Consultation and First Review under the Stand-By Arrangement—Staff Report, IMF Country Report No. 01/46, March</a>	Accounting for public sector net worth, including public enterprises and banks
	<a href="#">Ecuador, 2003, in Ecuador: 2003 Article IV Consultation, Request for a Stand-By Arrangement, and Approval of an Exchange Restriction—Staff Report, IMF Country Report No. 03/90, April</a>	Accounting for resource wealth, including proven oil reserves and environmental accounting for biodiversity
	<a href="#">Germany, 2005, "Germany: A Long-Run Fiscal Scenario Based on Current Policies," in Germany: Selected Issues, IMF Country Report No. 06/17, January</a>	Intertemporal analysis, accounting for future pension liabilities
	<a href="#">Switzerland, 2006, "An Indicative Public Sector Balance Sheet for Switzerland," in Switzerland: Selected Issues, IMF Country Report No. 06/203, June</a>	Intertemporal analysis, accounting for future pension liabilities
<b>Financial sector</b>	<a href="#">Sweden, 2008, in Sweden: Article IV Consultation—Staff Report, IMF Country Report No. 08/278, August</a>	Intertemporal analysis, accounting for future pension liabilities
	<a href="#">France, 2009, "French Banks Amid the Global Financial Crisis", in France: Selected Issues, IMF Country Report No. 09/233, July</a>	on balance sheet indicators and risks
	<a href="#">United States, 2010, "US: Article IV Consultation—Staff Report", IMF Country Report No.10/249, July</a>	Derivatives and off balance sheet positions, stress tests as crisis management tool
	<a href="#">United Kingdom, 2011, in "United Kingdom: Financial System Stability Assessment", IMF Country Report No. 11/222, July</a>	Stress test, sectoral interlinkages with network interactions
	<a href="#">Sweden, 2011, in "Sweden Financial System Stability Assessment", IMF Country Report No. 11/172, June</a>	Household indebtedness and banks' risks (DSA combined with CCA)
	<a href="#">Spain, 2012, in "Spain: Financial System Stability Assessment", Country Report No. 12/137, June</a>	Network analysis and spillovers
	<a href="#">Italy, 2013, in "Italy: Financial System Stability Assessment", IMF Country Report No. 13/300, September</a>	Financial sector risks and spillovers
	<a href="#">Turkey, 2014, "Containing Wholesale FX Funding And Risk In The Banking Sector" in Turkey: Selected Issues, IMF Country Report 14/330, December</a>	Financial sector FX leverage and macroprudential policy

**Table 3. Good Examples of Balance Sheet Analysis in Bilateral Surveillance (continued)**

<b>Theme</b>	<b>Bilateral Surveillance</b>	<b>Main topics covered</b>
<b>Corporate sector</b>	<a href="#">United States, 2002, "Corporate Balance Sheets and Economic Slowdowns," in United States: Selected Issues, IMF Country Report No. 02/165, August</a>	Corporate sector indebtedness
	<a href="#">France, 2008, "Financing and Risks of French Firms" in France: Selected Issues, IMF Country Report No. 08/74, January</a>	Risk in corporate sector
	<a href="#">Poland, 2014, "Corporate Sector Vulnerabilities" in Poland: Selected Issues, Country Report No. 14/174, June</a>	Corporate sector risks using stress tests
	<a href="#">India, 2014, "India's Corporate Sector: Health and Vulnerabilities" in India: Selected issues, Country Report No. 14/58, February</a>	Corporate sector risks using stress tests
<b>Household sector/ housing prices</b>	<a href="#">Ireland, 2003, in Ireland: 2003 Article IV Consultation—Staff Report, IMF Country Report No. 03/242, August</a>	Housing prices
	<a href="#">France, 2006, "Liquidity Constraints and Mortgage Market Reform in France," in France: Selected Issues, IMF Country report No.06/390, October</a>	Evolution of household balance sheets and housing prices
	<a href="#">Spain, 2011, "How Much Has Spain's Private Sector Rebalanced?" in Spain: Selected issues IMF Country Report No. 11/216, July</a>	Real estate exposures and deleveraging
	<a href="#">Ireland, 2012, "Household Consumption, Wealth, and Saving," in Ireland: Selected Issues, IMF Country Report No. 12/265, September</a>	Household leverage and consumption; econometric panel data analysis
	<a href="#">Netherlands, 2014, "House prices, consumption, and the household debt overhang in The Netherlands" in Netherlands: Selected Issues IMF Country Report No. 14/328, November</a>	Intrasectoral distribution of assets and liabilities
	<a href="#">Denmark, 2014, "Household debt in Denmark" in Denmark: Selected Issues IMF Country Report No. 14/332, November</a>	Intrasectoral distribution of assets and liabilities

**Table 3. Good Examples of Balance Sheet Analysis in Bilateral Surveillance (concluded)**

<b>Theme</b>	<b>Bilateral Surveillance</b>	<b>Main topics covered</b>
<b>Debt and Deleveraging</b>	<a href="#">Spain, 2011, "How Much Has Spain's Private Sector Rebalanced?" in Spain: Selected issues IMF Country Report No. 11/216, July</a>	Deleveraging, private sector rebalancing and external sustainability
	<a href="#">Euro Area, 2013, "Indebtedness and Deleveraging in the Euro Area", in Euro Area: Selected Issues IMF Country Report No. 13/232, July</a>	Multisectoral deleveraging and impact on output
	<a href="#">Montenegro, 2013, "Appendix III. Evolution of Sectoral Balance Sheets and Vulnerabilities" in Montenegro: Article IV Consultation—Staff Report No. 13/271, August</a>	Sectoral vulnerabilities, cross-sector linkages and spillovers

# BALANCE SHEET DATA: KEY SOURCES AND INITIATIVES

## B. Major Data Initiatives<sup>1</sup>

1. **In response to the financial crises of the mid-1990s, the IMF launched the Data Standards Initiatives (DSI) to enhance member countries' data transparency and promote the development of sound statistical systems.** Under the DSI, the IMF Executive Board established the Special Data Dissemination Standard (SDDS) in 1996 to provide guidance to countries that have or seek access to capital markets, and the General Data Dissemination System (GDDS) in 1997 to provide a framework for countries to work toward disseminating comprehensive and reliable data and, eventually, meet SDDS requirements. In February 2012, the Board also approved the SDDS Plus in support of domestic and international financial stability analysis.
  - **The GDDS** helps countries to formulate comprehensive, but prioritized, plans for improvements in four dimensions: data coverage, periodicity and timeliness; data quality; data integrity; and access to data by the public. Countries commit to adopt the GDDS as a framework for their national systems of economic, financial, and socio-demographic data, to designate a country coordinator to interface with the IMF, and to document their statistical practices. Its recommendations are generally less demanding than the corresponding requirements of the SDDS.
  - In May 2015, the IMF Executive Board approved the following enhancements to the GDDS (now **e-GDDS**) in four key areas; (i) align the e-GDDS data categories with those required for IMF surveillance activities; (ii) promote a standardized format for data publication using modern tools; (iii) leverage the IMF's policy dialogue with member countries to elevate statistical issues to the level of policymakers; and (iv) introduce annual monitoring of countries' progress in statistical development. The e-GDDS establishes three thresholds to track progress in countries' capacity to publish the specified data categories. This would allow a better assessment of capacity development needs and prioritization of technical assistance by the IMF and donors.
  - The **SDDS** identifies the same four dimensions of data dissemination as the GDDS, and for each dimension prescribes two to four monitorable elements—good practices that can be observed, or monitored, by users of statistics. Subscription to the SDDS is voluntary, but carries a commitment to observe the standard and to provide information to the IMF about dissemination practices. When the SDDS was established in March 1996, the IMF's Executive Board emphasized that its implementation should be flexible and that the standard should evolve over time. Since that time the Board has reviewed the SDDS eight times, with

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<sup>1</sup> Prepared by Joseph Crowley and Louis Venter (both STA).

modifications since the Seventh Review aimed at broadening financial indicators in response to the financial crisis.

- The **SDDS Plus** was established in October 2012 in support of domestic and international financial stability analysis, focusing on economies with systematically important financial sectors.
- The **Data Gaps initiative (DGI)** was created when, in response to the financial crisis, the G-20 Finance Ministers and Central Bank Governors Working Group #2 called on the IMF and the Financial Stability Forum (the predecessor of the FSB) “to explore gaps and provide appropriate proposals for strengthening data collection.” The IMF and FSB subsequently agreed on a set of recommendations with G-20 economies to better capture the build-up of risk in the financial sector, improve data on international financial network connections, monitor the vulnerability of domestic economies to shocks, and communicate official statistics.

**Table 4. Key Balance Sheet Related Macro Datasets**

<b>Dataset</b>	<b>Data type and coverage</b>	<b>Relevance for the Fund's surveillance work</b>	<b>Data Gaps and Features</b>	<b>Remedial Measures</b>
<a href="#"><u>Sectoral balance sheets</u></a>	<p>Assets and liabilities of all sectors of the economy by type of asset (including nonfinancial assets).</p> <p>Quarterly for financial and annual for nonfinancial.</p>	<p>Sectoral financial strength and risks.</p> <p>A benchmark for understanding relative roles played and risks posed by financial health of subsectors and the rest of the world.</p>	<p>International comparability in terms of sectors and asset classification.</p> <p>Sector and asset classification not detailed enough.</p> <p>Most emerging market economies and some advanced economies do not compile, but have partial data for the financial sector.</p>	<p>Templates have been agreed to guide internationally country efforts.</p>
<a href="#"><u>Monetary and financial statistics (MFS)</u></a>	<p>Monthly balance sheets of central bank and other depository corporations.</p> <p>Quarterly balance sheet of other financial corporations.</p> <p>Asset and liability positions broken down by instrument, domestic/foreign currency, and counterparty sectors.</p>	<p>Monetary/Macroeconomic Policy monitoring and decision making;</p> <p>Open Market Operations;</p> <p>Macroprudential policy analysis.</p> <p>Data on monetary aggregates, liquidity measures, financial sector's balance sheet exposures to domestic sectors and the rest of the world used in Article IV consultations, and GFSR.</p>	<p>Some important G-20 economies do not yet report the MFS standardized reporting forms (SRFs).</p> <p>Currently 142 out of 224 jurisdictions report SRF 1SR for central bank and 2SR for other depository corporations, with the exception of one jurisdiction that reports only SRF. 41 jurisdictions report SRF 4SR for other financial corporations (OFCs).</p>	<p>Actions for improving the framework include technical assistance provision to graduate countries to SRF reporter status. This effort should focus primarily on OFC data.</p> <p>MFS Manual and Compilation Guide are being revised.</p>



Table 4. Key Balance Sheet Related Macro Datasets (continued)

Dataset	Data type and coverage	Relevance for the Fund's surveillance work	Data Gaps and Features	Remedial Measures
<a href="#"><u>International investment position (IIP) and external financial account</u></a>	Quarterly external positions (claims and liabilities) and transactions by functional and instrument classification with some domestic counterparty sectors vis-a-vis rest of the world.	International capital flows and positions. Measure degree of financial openness and indicator of financial stability. Monitor external debt and indicator of external debt sustainability. Useful for measuring rates of return. Analyze economic structure and study relationship to domestic sources of financing.	Data on other flows (revaluation and other volume changes) are yet to be developed for a number of countries and are not available to STA.  New BPM6 IIP report forms allow for the collection of data items of interest for the analysis of spillover risks, such as currency of composition of assets and liabilities, remaining maturity, and short-term reserve-related liabilities.	STA focused on increasing the number of economies reporting IIP. Total number of economies reporting IIP data came from under 40 economies in 1998 to 143 in April 2015. All G-20 economies report IIP data to STA. 95 economies report quarterly IIP, following efforts in the context of the recommendations of the G-20 Data Gaps Initiative (G-20 DGI) and the March 2010 IMF Executive Board decision, which prescribed for SDDS subscribers the quarterly reporting of IIP data by end-September 2014.
<a href="#"><u>Coordinated Direct Investment Survey (CDIS)</u></a>	Global survey that collects data on direct investment (DI) positions for end-year by economy based on the location of the immediate counterpart to a DI position, with net equity investment reported separately from net debt investment.  Annual data for both inward and outward DI positions are sought; for countries where outward is not material, data on inward are sufficient for participation in the CDIS.	Bilateral exposures through international direct investment positions. The CDIS supports the objective of developing from-whom-to-whom cross border data, complementing CPIS and Bank for International Settlements (BIS) International Banking Statistics data, and contributes to a better understanding of financial interconnectedness.	The CDIS is conducted on an annual basis starting with end-2009 data.  Preliminary data and metadata are reported to the IMF within nine months after the end of the reference year and released within 12 months.  The latest CDIS data were disseminated in December 2014, with 90 economies reporting preliminary data for 2013.  Three G 20 economies do not report inward and outward positions.	To further enhance CDIS data quality, STA initiated a project to raise awareness of, and to address to the extent feasible, large bilateral asymmetries.  STA is continuing its efforts to increase CDIS participation and improve data quality and dissemination.

**Table 4. Key Balance Sheet Related Macro Datasets (continued)**

<b>Dataset</b>	<b>Data type and coverage</b>	<b>Relevance for the Fund's surveillance work</b>	<b>Data Gaps and Features</b>	<b>Remedial Measures</b>
<b><u>Coordinated Portfolio Investment Survey (CPIS)</u></b>	<p>The CPIS is the only global survey of portfolio investment holdings.</p> <p>It collects information on cross-border holdings of equities and long- and short-term debt securities classified by the economy of residence of the issuer.</p> <p>The coverage of the CPIS is augmented with information from two other IMF surveys, namely Securities Held as Foreign Exchange Reserves (SEFER), and Securities Held by International Organizations (SSIO).</p>	<p>The results of CPIS are used in the Fund's surveillance papers and documents, such as Global Financial Stability Report (GFSR) and Guidance Note for Article IV Consultations (SM/12/246).</p> <p>The CPIS core dataset provides "from-whom-to-whom" information on portfolio investment positions, which can be used to analyze interconnectedness of individual economies.</p>	<p>74 economies submitted end-December 2013 data.</p> <p>Coverage of other financial corporations is incomplete.</p> <p>Based on the results of these surveys, STA derives liabilities for all economies, not just for those participating in the surveys.</p> <p>Reporting of encouraged items has serious gaps.</p> <p>Two important G-20 economies and some offshore centers do not report CPIS data.</p>	<p>The CPIS covered only end-December holdings in 2001-2012.</p> <p>Starting with end-June 2013 data, a number of enhancements were adopted: (1) Semi-annual frequency; (2) Acceleration in dissemination of results; and (3) Enhancements in the scope of the data collection, including the collection of data on the institutional sector of the nonresident issuers of securities, and on the institutional sector of the resident holder cross-classified by the institutional sector of selected nonresident issuers.</p> <p>IMF staff are working to increase country coverage.</p>

Table 4. Key Balance Sheet Related Macro Datasets (continued)

Dataset	Data type and coverage	Relevance for the Fund's surveillance work	Data Gaps and Features	Remedial Measures
<a href="#">Quarterly External Debt statistics (QEDS)</a>	<p>Quarterly gross external debt statistics (QEDS) position are reported to the World Bank's QEDS database on a voluntary basis by SDDS subscribers and GDDS participants.</p> <p>Prescribed SDDS/QEDS table presents gross external debt statistics (EDS) broken down by institutional sector, maturity, and debt instruments.</p> <p>Supplementary SDDS/QEDS tables present data on domestic and foreign currency breakdown, debt service payment schedule, remaining maturity, public sector debt, arrears, and foreign currency-linked debt positions.</p> <p>GDDS/QEDS tables present less granular gross EDS.</p>	<p>The benefit of bringing together comparable EDS is to facilitate macroeconomic analysis and cross-economy data comparison.</p> <p>The QEDS is a quarterly database, maintained by the World Bank, and is updated within four months after the end of the reference period.</p>	<p>Around 110 countries reports to the QEDS. Gaps exist for data reported on supplementary or additional bases.</p> <p>Few SDDS subscribers/GDDS participants report all supplementary/additional data.</p> <p>Most reported additional data correspond to foreign/domestic currency split and debt service payment schedule.</p>	<p>Increasing participation, improving the coverage and timeliness of EDS, and promoting convergence of recording practices to be aligned to the international statistical standards have been the focus of the IMF and World Bank in the area of EDS.</p> <p>In October 2014, the World Bank in collaboration with the IMF, launched the new QEDS database in line with the classifications and definitions of the 2013 EDS Guide and BPM6.</p>

Table 4. Key Balance Sheet Related Macro Datasets (continued)

Dataset	Data type and coverage	Relevance for the Fund's surveillance work	Data Gaps and Features	Remedial Measures
<b><u>Financial Soundness Indicators (FSIs)</u></b>	FSIs and underlying data, including full balance sheet and income statements for deposit takers, as well as somewhat less detailed data for other financial corporations, non-financial corporations, households, and real estate markets.  Reporting with at least quarterly frequency is encouraged.	Monitor the soundness of the financial system and systemic risk.  Peer group analysis.  Macroprudential policy analysis.  FSIs data used in FSAP reports, Article IV consultations, and GFSR.	Improving the data for existing reporters (in terms of coverage, quality, timeliness, and periodicity of reporting) and providing technical assistance to countries for increasing the number of reporters.  Currently 100 economies report FSIs to the IMF, covering at least deposit takers, on quarterly, bi-annual, or annual basis. All G-20 countries report at least some FSIs.	FSI Compilation Guide is being revised.  Seven FSIs included in the SDDS Plus.  In consultation with national authorities, there is an ongoing pursuit to investigate, develop, and encourage implementation of reporting measures that can provide information on tail risks, concentrations, variations in distributions, and the volatility of indicators over time.

Table 4. Key Balance Sheet Related Macro Datasets (continued)

Dataset	Data type and coverage	Relevance for the Fund's surveillance work	Data Gaps and Features	Remedial Measures
<a href="#">Government Finance Statistics (GFS)</a>	Fiscal aggregates and balances plus transactions, other economic flows, and stock positions in financial assets and liabilities of the consolidated general government and its sub-sectors as relevant to the reporting country.	<p>Provide measures of changes in—and the evolution of—the government's net (financial) worth position over time.</p> <p>Effects of fiscal balances and balance sheet dynamics through the analysis of government's portfolio of assets and liabilities that allow an assessment of the sustainability of fiscal policy vis-a-vis other sectors and rest of the world.</p>	As of April 2015, financial balance sheets, by instrument, available for 63 economies, including all EU member states plus 9 other G-20 economies (Australia, Brazil, Canada, Indonesia, Japan, Russia, South Africa, South Korea, and United States); several of these also report on a quarterly frequency.	<p>Government Finance Statistics Manual (GFSM) 2014 has been finalized.</p> <p>The annual GFS Questionnaire has been enhanced to give greater emphasis to capturing data on remaining maturity and domestic/foreign currency composition of liabilities, as well as data on stock positions in financial assets and liabilities by counterpart sector.</p> <p>Seek to increase number of countries reporting financial balance sheets, close gaps in data and government subsector coverage and enhance comparability with central and general government series in Public Sector Debt data, focusing on 20+ countries that currently only report stocks of liabilities.</p>

Table 4. Key Balance Sheet Related Macro Datasets (continued)

Dataset	Data type and coverage	Relevance for the Fund's surveillance work	Data Gaps and Features	Remedial Measures
<a href="#">Public Sector Debt Statistics (PSDS)</a>	Quarterly debt liability positions for central and general government and public nonfinancial and financial corporations by instrument, remaining maturity, domestic/foreign currency and residency of creditors. Financial assets are not reported.	Provides measures of public sector borrowing as defined in the 2008 SNA, the GFSM 2014, and the Public Sector Debt Statistics Guide (2011).  Complements and expands institutional coverage of debt liabilities included in the GFS balance sheet.  The PSDS is a quarterly database, maintained by the World Bank, and is updated within four months after the end of the reference period.	Currently 53 economies report data covering general and/or central government operations.  Data for general government as well as public corporations (financial and nonfinancial) are available for 17 economies.	Increase number of reporting countries and close gaps in data coverage.  The updated GFSM 2014-based annual questionnaire will facilitate comparing GFS series with PSD series for the general government sector.
<a href="#">FSB Common Data Template for GSIBs (Phase 3/Institution to Aggregate data template)</a>	G-SIBs' exposures to and funding dependencies from national systems, on a consolidated basis with granular information on the counterparty country, sector, instrument, currency and maturity with quarterly frequency.	This unique dataset is expected to serve as an important input for peer review analysis and to the work on financial interconnectedness and associated risks and spillover.  The critical advantages of the data set are: (i) <b>granularity:</b> banking system aggregates may mask vulnerabilities at the more granular level; (ii) <b>coverage:</b> individual G-SIBs may have significant impacts on global financial stability, with repercussions across borders.		FSB Plenary needs to give the go-ahead for regular reporting to start in 2016.  IFIs to have access to selected data, subject to confidentiality constraint.  Further engagement with the industry to fine tune the template and guidelines is taking place in 2015.

Table 4. Key Balance Sheet Related Macro Datasets (concluded)

Dataset	Data type and coverage	Relevance for the Fund's surveillance work	Data Gaps and Features	Remedial Measures
<a href="#">BIS International Banking Statistics (IBS)</a>	Quarterly statistics on international banking activity which includes: cross-border claims and liabilities of banks resident in BIS reporting countries (Locational Banking Statistics-LBS) and worldwide consolidated foreign claims of banks headquartered in BIS reporting countries (Consolidated Banking Statistics-CBS).	Assessment of external credit and funding risks faced by national financial systems and international flows.  IMF uses IBS reports of individual economies as key inputs for global surveillance, including financial sector contagion module of the Vulnerability Exercise (VE), and analysis in the WEO.	Some important G-20 economies do not report to BIS. The Fund does not have access to detailed (restricted) data for some economies.	BIS has enhanced its IBS data and is working with G-20 nonreporting countries to encourage reporting.
<a href="#">BIS Securities Statistics Database</a>	Quarterly issuance of international and domestic debt securities with a breakdown of the four main sectors: banks, other financial corporations, nonfinancial corporations, and general government.  Currently, all G-20 economies report some data for inclusion in the BIS securities statistics.	Analysis of excessive build-up of debt, risks arising from currency and maturity mismatches.  Funding sources and asset diversification.  Securitization and role of shadow banking sector.  Indicators of the financial depth of national financial systems.	Even though all G-20 countries are reporting some data, complete coverage is lacking.  One of the key gaps is data by issuer and holder on from-whom-to-whom basis.	SDDS Plus requires reporting of from-whom-to-whom data for debt security holdings.  One of the items under G-20 DGI.

## BALANCE SHEET DATA—CURRENT<sup>2 3</sup>

### AVAILABILITY BY ECONOMY

**Table 5. Advanced Economies—Current Data Availability**

(All data are as reported officially to disseminated by the IMF, the World Bank, the BIS, and the OECD)

Economy	Sectoral Accounts	Monetary and Financial Statistics (SRFs)	IIP	CPIS	CDIS	External Debt	GFS and PSDS	IBS	FSI
Australia	2	3	2	2	3	3	2	2	2
Austria	3	2	2	3	3	3	3	2	2
Belgium	4	2	2	4	3	3	3	2	2
Bermuda	n/a	n/a	n/a	2	n/a	n/a	n/a	1	n/a
Canada	4	3	2	1	1	3	3	2	2
China, P.R.: Hong Kong	n/a	1	2	1	3	3	2	2	2
Cyprus	n/a	2	2	4	3	3	2	1	2
Czech Republic	4	2	2	2	3	3	3	n/a	2
Denmark	4	2	2	3	3	3	3	2	2
Estonia	4	2	2	4	3	3	3	n/a	2
Finland	4	2	2	4	3	3	3	2	2
France	4	2	2	4	3	3	3	2	2
Germany	4	2	2	4	3	3	3	2	2
Greece	3	2	2	3	3	3	2	2	2
Guernsey	n/a	n/a	n/a	2	n/a	n/a	n/a	1	n/a

<sup>2</sup> Please see explanatory notes at the end of the tables.  
<sup>3</sup> Prepared by Matias Costa Navajas and Lina Yu (both STAs).



Table 5. Advanced Economies—Current Data Availability (concluded)

Economy	Sectoral Accounts	Monetary and Financial Statistics (SRFs)	IIP	CPIS	CDIS	External Debt	GFS and PSDS	IBS	FSI
Ireland	4	2	2	2	n/a	3	3	2	2
Isle of Man	n/a	n/a	n/a	1	n/a	n/a	n/a	1	n/a
Israel	1	1	2	4	3	3	n/a	n/a	2
Italy	4	2	2	3	3	3	3	2	2
Japan	4	3	2	4	3	3	2	2	2
Jersey	n/a	n/a	n/a	2	n/a	n/a	n/a	1	n/a
Korea	3	2	2	3	3	3	2	2	2
Latvia	4	2	2	4	3	3	3	n/a	2
Luxembourg	4	2	2	1	3	3	3	2	2
Malta	n/a	2	2	1	n/a	3	3	n/a	2
Netherlands	4	2	2	3	3	3	3	2	2
New Zealand	n/a	1	2	1	3	3	2	n/a	n/a
Norway	3	1	2	n/a	3	3	2	2	2
Portugal	4	2	2	3	3	3	3	2	2
San Marino	n/a	1	n/a	n/a	n/a	n/a	2	n/a	2
Singapore	n/a	1	2	1	1	3	1	2	2
Slovak Republic	3	2	2	3	n/a	3	3	n/a	2
Slovenia	1	2	2	2	3	3	3	1	1
Spain	4	2	2	3	3	3	3	2	2
Sweden	4	2	2	3	3	3	3	2	2
Switzerland	4	1	2	2	3	3	2	2	2
United Kingdom	4	1	2	2	3	3	3	2	2
United States	3	3	2	2	3	3	3	2	2

**Table 6. Emerging Market and Developing Economies (excluding Low-Income Countries)—Current Data Availability**

Economy	Sectoral Accounts	Monetary and Financial Statistics (SRFs)	IIP	CPIS	CDIS	External Debt	GFS and PSDS	IBS	FSI
Albania	n/a	2	1	n/a	2	2	3	n/a	n/a
Algeria	n/a	3	n/a	n/a	n/a	2	n/a	n/a	2
Angola	n/a	2	1	n/a	n/a	n/a	n/a	n/a	n/a
Antigua and Barbuda	n/a	2	n/a	n/a	n/a	1	n/a	n/a	n/a
Argentina	n/a	1	1	2	n/a	3	n/a	n/a	2
Armenia	n/a	3	2	n/a	3	3	1	n/a	2
Aruba	n/a	1	n/a <sup>1</sup>	2	2	n/a	n/a	n/a	n/a
Azerbaijan	n/a	2	2	n/a	1	n/a	n/a	n/a	n/a
Bahamas, The	n/a	1	n/a	1	n/a	2	n/a	1	n/a
Bahrain	n/a	1	1	2	1	n/a	1	1	n/a
Barbados	n/a	2	1	2	n/a	n/a	2	n/a	n/a
Belarus	n/a	3	2	n/a	3	3	1	n/a	2
Belize	n/a	2	n/a	n/a	n/a	1	1	n/a	n/a
Bosnia and Herzegovina	n/a	2	1	n/a	2	n/a	n/a	n/a	2
Botswana	n/a	2	1	n/a	3	n/a	1	n/a	n/a
Brazil	1	3	2	3	3	3	2	2	2
Brunei Darussalam	n/a	3	n/a	n/a	n/a	n/a	n/a	n/a	2
Bulgaria	n/a	2	2	4	n/a	3	3	n/a	2
Cape Verde	n/a	2	1	n/a	2	n/a	n/a	n/a	n/a
Cayman Islands	n/a	n/a	n/a	2	n/a	n/a	n/a	1	n/a
Chile	3	3	2	2	3	3	1	2	2

**Table 6. Emerging Market and Developing Economies (excluding Low-Income Countries)—Current Data Availability (continued)**

Economy	Sectoral Accounts	Monetary and Financial Statistics (SRFs)	IIP	CPIS	CDIS	External Debt	GFS and PSDS	IBS	FSI
China, P.R.: Mainland	1	1	2	n/a	2	1	n/a	n/a	2
Colombia	n/a	3	2	3	n/a	3	2	n/a	2
Congo, Republic of	n/a	2	n/a	n/a	n/a	n/a	2	n/a	2
Costa Rica	n/a	2	2	4	3	3	2	n/a	2
Croatia	n/a	2	2	n/a	3	3	n/a	n/a	2
Curacao & St. Maarten	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1	n/a
Dominica	n/a	2	n/a	n/a	n/a	1	n/a	n/a	n/a
Dominican Republic	n/a	3	2	n/a	n/a	2	2	n/a	2
Ecuador	n/a	3	1	n/a	n/a	3	n/a	n/a	2
Egypt	n/a	2	2	2	n/a	3	n/a	n/a	n/a
El Salvador	n/a	3	2	n/a	3	3	2	n/a	2
Equatorial Guinea	n/a	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fiji, Republic of	n/a	3	2	n/a	n/a	1	n/a	n/a	n/a
Gabon	n/a	2	n/a	n/a	n/a	1	n/a	n/a	n/a
Georgia	n/a	2	2	n/a	n/a	3	2	n/a	2
Grenada	n/a	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Guatemala	n/a	3	2	n/a	3	2	2	n/a	2
Guyana	n/a	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Hungary	3	2	2	4	3	3	3	n/a	1
India	1	1	2	n/a	3	3	1	2	2
Indonesia	1	3	2	3	2	3	2	1	2
Iran	n/a	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Iraq	n/a	2	1	n/a	n/a	n/a	n/a	n/a	n/a

**Table 6. Emerging Market and Developing Economies (excluding Low-Income Countries)—Current Data Availability  
(continued)**

Economy	Sectoral Accounts	Monetary and Financial Statistics (SRFs)	IIP	CPIS	CDIS	External Debt	GFS and PSDS	IBS	FSI
Jordan	n/a	1	2	n/a	n/a	3	1	n/a	n/a
Kazakhstan	n/a	2	2	3	3	3	1	n/a	2
Kosovo	n/a	3	2	4	3	2	n/a	n/a	2
Kuwait	n/a	3	1	3	3	n/a	n/a	n/a	n/a
Lebanon	n/a	1	n/a	2	n/a	1	2	n/a	2
Libya	n/a	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lithuania	n/a	2	2	4	3	3	3	n/a	2
Macedonia, FYR	4	3	2	n/a	3	3	n/a	n/a	2
Malaysia	n/a	2	1	4	1	3	1	1	2
Maldives	n/a	3	1	n/a	n/a	n/a	1	n/a	n/a
Marshall Islands	n/a	n/a	1	n/a	n/a	n/a	1	n/a	n/a
Mauritius	n/a	2	1	1	3	3	2	n/a	2
Mexico	2	3	2	4	3	3	2	2	2
Micronesia	n/a	1	1	n/a	n/a	n/a	1	n/a	n/a
Montenegro	n/a	1	n/a	n/a	2	n/a	n/a	n/a	n/a
Morocco	n/a	2	2	n/a	2	3	1	n/a	n/a
Namibia	n/a	2	2	n/a	n/a	n/a	1	n/a	2
Oman	n/a	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pakistan	n/a	2	2	4	3	1	2	n/a	1
Palau	n/a	n/a	1	n/a	n/a	n/a	1	n/a	n/a
Panama	n/a	2	2	2	2	1	n/a	2	2
Paraguay	n/a	2	2	n/a	2	2	2	n/a	2

**Table 6. Emerging Market and Developing Economies (excluding Low-Income Countries)—Current Data Availability  
(continued)**

Economy	Sectoral Accounts	Monetary and Financial Statistics (SRFs)	IIP	CPIS	CDIS	External Debt	GFS and PSDS	IBS	FSI
Philippines	n/a	2	2	2	3	3	2	n/a	2
Poland	4	2	2	4	3	3	3	n/a	2
Qatar	n/a	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Romania	n/a	3	2	4	2	3	3	n/a	2
Russian Federation	1	1	2	3	3	3	2	n/a	2
Samoa	n/a	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Saudi Arabia	n/a	1	2	n/a	n/a	n/a	n/a	n/a	1
Serbia	n/a	2	2	n/a	3	n/a	1	n/a	n/a
Seychelles	n/a	3	n/a	n/a	2	n/a	2	n/a	2
South Africa	3	3	1	3	3	3	2	1	2
Sri Lanka	n/a	1	2	n/a	3	2	n/a	n/a	2
St. Kitts and Nevis	n/a	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
St. Lucia	n/a	2	n/a	n/a	n/a	2	3	n/a	n/a
St. Vincent and the Grenadines	n/a	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Suriname	n/a	2	2	n/a	n/a	2	2	n/a	n/a
Swaziland	n/a	2	1	n/a	n/a	n/a	n/a	n/a	2
Syrian Arab Republic	n/a	2	1	n/a	n/a	n/a	n/a	n/a	n/a
Thailand	n/a	3	2	4	3	3	1	n/a	2
Timor-Leste	n/a	2	2	n/a	n/a	n/a	n/a	n/a	n/a
Tonga	n/a	2	2	n/a	n/a	1	2	n/a	n/a
Trinidad and Tobago	n/a	3	1	n/a	n/a	n/a	n/a	n/a	n/a
Tunisia	n/a	1	1	n/a	n/a	3	1	n/a	n/a

**Table 6. Emerging Market and Developing Economies (excluding Low-Income Countries)—Current Data Availability (concluded)**

Economy	Sectoral Accounts	Monetary and Financial Statistics (SRFs)	IIP	CPIS	CDIS	External Debt	GFS and PSDS	IBS	FSI
Turkmenistan	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Tuvalu	n/a	n/a	1	n/a	n/a	n/a	n/a	n/a	n/a
Ukraine	n/a	3	2	4	2	3	2	n/a	2
United Arab Emirates	n/a	1	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uruguay	n/a	3	1	3	n/a	3	2	n/a	2
Vanuatu	n/a	2	2	n/a	n/a	n/a	n/a	n/a	n/a
Venezuela	n/a	2	2	4	2	n/a	n/a	n/a	n/a
West Bank and Gaza	n/a	3	1	n/a	1	3	n/a	n/a	2

Table 7. Low-Income Countries: Frontier Markets—Current Data Availability

Economy	Sectoral Accounts	Monetary and Financial Statistics (SRFs)	IIP	CPIS	CDIS	External Debt	GFS and PSDS	IBS	FSI
Bangladesh	n/a	2	2	n/a	n/a	2	2	n/a	2
Bolivia	n/a	3	2	2	2	2	n/a	n/a	n/a
Ghana	n/a	2	1	n/a	n/a	1	n/a	n/a	n/a
Kenya	n/a	2	n/a	n/a	n/a	2	2	n/a	2
Mongolia	n/a	2	2	4	2	2	2	n/a	n/a
Mozambique	n/a	2	1	n/a	n/a	n/a	n/a	n/a	n/a
Nigeria	n/a	2	1	n/a	2	1	2	n/a	2
Papua New Guinea	n/a	3	n/a	n/a	n/a	2	n/a	n/a	n/a
Senegal	n/a	1	1	n/a	n/a	n/a	n/a	n/a	n/a
Tanzania	n/a	2	1	n/a	n/a	1	2	n/a	2
Uganda	n/a	2	2	n/a	2	1	2	n/a	2
Vietnam	n/a	1	n/a	n/a	n/a	n/a	n/a	n/a	2
Zambia	n/a	3	1	n/a	2	1	n/a	n/a	2



Table 8. Low-Income Countries: Others—Current Data Availability

Economy	Sectoral Accounts	Monetary and Financial Statistics (SRFs)	IIP	CPIS	CDIS	External Debt	GFS and PSDS	IBS	FSI
Afghanistan	n/a	2	1	n/a	n/a	n/a	n/a	n/a	2
Benin	n/a	1	1	n/a	n/a	n/a	n/a	n/a	n/a
Bhutan	n/a	3	n/a	n/a	2	n/a	1	n/a	2
Burkina Faso	n/a	1	1	n/a	3	2	n/a	n/a	n/a
Burundi	n/a	3	1	n/a	n/a	n/a	n/a	n/a	2
Cambodia	n/a	2	2	n/a	n/a	1	n/a	n/a	n/a
Cameroon	n/a	2	n/a	n/a	n/a	1	n/a	n/a	2
Central African Republic	n/a	2	n/a	n/a	n/a	1	n/a	n/a	n/a
Chad	n/a	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Comoros	n/a	3	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Congo, DRC	n/a	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cote d'Ivoire	n/a	1	1	n/a	n/a	1	n/a	n/a	n/a
Djibouti	n/a	1	1	n/a	n/a	n/a	n/a	n/a	n/a
Eritrea	n/a	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Ethiopia	n/a	n/a	n/a	n/a	n/a	2	n/a	n/a	n/a
Gambia, The	n/a	2	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Guinea	n/a	n/a	1	n/a	n/a	n/a	n/a	n/a	n/a
Guinea-Bissau	n/a	1	1	n/a	n/a	n/a	n/a	n/a	n/a
Haiti	n/a	2	1	n/a	n/a	n/a	n/a	n/a	n/a
Honduras	n/a	3	2	n/a	3	1	n/a	n/a	2
Kiribati	n/a	n/a	1	n/a	n/a	n/a	n/a	n/a	n/a
Lao PDR	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lesotho	n/a	2	2	n/a	n/a	n/a	n/a	n/a	2





## Explanatory notes

 = data is not available;  = highest data availability; n/a = data is not available.

**Sectoral Accounts:** 1 = partial annual tables only; 2 = complete annual tables only; 3 = complete annual tables and partial quarterly tables; 4 = complete annual and quarterly tables.

**Monetary and Financial Statistics (MFS):** 1 = Non-SRF Monetary Statistics; 2 = Central Bank and Other Depository Corporations; 3 = Central Bank, Other Depository Corporations, and Other Financial Corporations.

**International investment Position (IIP):** 1 = annual data; 2 = quarterly data.

**CPIS (December 2013 data):** 1 = core and portfolio investment assets tables; 2 = core and sector of holder or currency of denomination tables; 3 = core, currency of denomination, and sector of holder tables; 4 = core, currency of denomination, sector of holder, and other tables.

**CDIS (December 2013 data):** 1 = two or less tables, mainly on inward investment; 2 = three inward investment tables; 3 = inward and outward investment tables.

**External Debt (QEDS 2014Q4 data):** 1 = GDDS tables; 2 = GDDS tables, including Table 6, which is similar to the core SDDS Table 1; 3 = SDDS tables.

**Government Finance sector (GFS and PSDS):** 1 = data on liabilities (by instrument) for the budgetary central government; 2 = annual GFS central government financial balance sheet with similar coverage of liabilities in PSDS for select countries; 3 = annual GFS financial balance sheets for the general and central government, no QGFS; PSDS reporting for select countries; 4 = annual GFS financial balance sheet data for the general government sector plus quarterly general government debt liabilities data in PSDS for select countries; 5 = annual and quarterly financial balance sheet data for the general government sector with corresponding quarterly debt liabilities data from PSDS.

**BIS IBS (data on international banking activity):** 1 = locational banking statistics; 2 = locational and consolidated banking statistics.

**Financial Soundness Indicators (FSIs):** 1 = only core indicators; 2 = core and encouraged indicators.

## EXISTING TOOLS FOR BALANCE SHEET ANALYSIS IN THE FUND

Table 9. Existing Tools For Balance Sheet Analysis in the Fund

Tool	Department	Description
<i>Shock Amplification</i>		
<a href="#"><u>Empirical crisis model</u></a>	RES	The main objective of this model is to help identify advanced economies that face heightened vulnerability to a severe growth slowdown or to financial and fiscal crisis that can ultimately undermine their growth prospects, and quantify countries' overall vulnerabilities to different types of crisis.
<a href="#"><u>Ms Muffet Country Financial Stability Maps</u></a>	MCM	Ms. Muffet generates the Country Financial Stability Map (CFSM) for all IMF member countries along the lines of the GFSR's Global Financial Stability Map (GFSM). The GFSM consists of four categories of macro-financial risks (macroeconomic, inward spillover, credit, market and liquidity) and two conditions (risk appetite, monetary and financial).
<i>Shock transmission</i>		
<a href="#"><u>Bank Contagion Module (BCM)</u></a>	RES	The Bank Contagion Module assesses a country's vulnerabilities arising from banking channels. The module uses data from multiple sources (including BIS IBS, IFS, Bankscope, central bank, and supervisory agency data) to map cross-border banking system exposures and to analyze spillover effects arising from the exposures of international banks. Using scenario analysis, the BCM models the propagation of financial shocks across borders through bank losses and deleveraging, and quantifies their impact on foreign credit availability in more than 200 countries.

**Table 9. Existing Tools For Balance Sheet Analysis in the Fund (continued)**

<b>Tool</b>	<b>Department</b>	<b>Description</b>
<a href="#"><u>Joint Distress Indicators</u></a>	MCM	The set of Joint Distress Indicators (JDI) includes a time-varying measure of joint probability of distress (JPoD) between financial institutions or sovereigns, with nonlinear distress dependence. These indicators can be used to construct a Financial Institutions Stability Index (FISI) reflecting the expected number of financial institutions (FIs) becoming distressed given that at least one FI has become distressed. It can also be used to assess banks' inter-linkages by computing pair-wise conditional probabilities of distress. The JDI provides complementary perspectives of systemic risk and FIs' exposure and contribution to systemic risk.
<a href="#"><u>CoVaR</u></a>	MCM	The CoVaR uses market data to assess the contribution of an individual financial institution to systemic risk. It is easy to use/update and has good in-sample forecasting properties for systemic stress, but does not identify the underlying spillover channels.
<a href="#"><u>Systemic Contingent Claims Approach (SysCCA)</u></a>	MCM	The systemic Contingent Claims Approach (CCA) extends CCA to quantify the system-wide financial risk and government contingent liabilities by combining individual risk-adjusted balance sheets of financial institutions and the dependence between them. It provides forward-looking estimates.
<a href="#"><u>Stress Testing</u></a> – Stress-Tester 3.0 – Solvency Stress Testing Framework – Credit Risk + – Net Stable Funding Ratio – Liquidity Coverage Ratio – Cashflow Liquidity Stress Test	MCM	Stress testing is one of the key tools of IMF financial surveillance. Stress tests are tools to measure the resilience of individual financial institutions and assess the stability of the financial system under adverse scenarios. Stress tests are useful in identifying capital shortfalls and have been recently used in the US and Europe to increase transparency and reduce investors' uncertainty about financial sector vulnerability in a crisis period.
<a href="#"><u>Bank Network 2.0 Module</u></a>	MCM	Models the domino effect of banking crises based on bilateral bank (or banking system) exposures.

**Table 9. Existing Tools For Balance Sheet Analysis in the Fund (concluded)**

<b>Tool</b>	<b>Department</b>	<b>Description</b>
<i>Fragility</i>		
<a href="#"><u>Portfolio Simulation Tool (PST)</u></a>	MCM	The Portfolio Simulation Tool (PST) simulates expected and unexpected losses of individual banks and the banking system for financial surveillance and stress testing purposes. It is based on the CIMDO methodology (cross entropy approach) and, under the point-in-time (PIT) criterion, produces robust estimates with restricted data.
<a href="#"><u>Bank Analysis Template (BAT)</u></a>	MCM	The BAT was originally designed for monitoring 115 systemically important financial institutions (SIFIs). It allows the download of standard, comparable and most up-to-date information on individual banks. However, the tool may only be used for any listed bank currently subject to disclosure requirements.
<a href="#"><u>Equity Market</u></a>	MCM	Equity valuation multiples (e.g., price-to-book ratio, price-to-forward earnings ratio): the current values are compared to historical averages to determine the extent of deviation. The Arbitrage Pricing Model (APM): the actual equity price index.
<a href="#"><u>Corporate Vulnerability Utility</u></a>	RES	Provides ready-made vulnerability indicators and represents a consistent framework for corporate surveillance across the Fund. It assesses the quality of data coverage, providing indicators on coverage of listed firms in each country and on the size of the stock market relative to economic activity. It automatically updates indicators every quarter, so that users can use the CVU for ongoing surveillance. It provides a user manual, which lists the indicators and describes their strengths and weaknesses.
<a href="#"><u>Bank Health Assessment Tool (HEAT)</u></a>	MCM	HEAT calculates simple CAMELS-type ratings (in this case, capital adequacy, asset quality, earnings, liquidity, leverage) for each bank in a defined sample and derives an overall Bank Health Index (BHI) from the ratings.

# TOWARD A TOOLKIT FOR DEEPENING BALANCE SHEET ANALYSIS: SOME NEW EMPIRICAL APPLICATIONS

## A. Modeling Fragility and Inter-Connectedness using Balance Sheets

### The Big Picture: Constructing and Analyzing BSA Matrices

#### *How to Build a BSA Matrix*<sup>6</sup>

2. **A balance sheet analysis matrix is a key tool for organizing and displaying sector balance sheet data**<sup>7</sup>. It serves as a starting point for balance sheet analysis that involves a comprehensive assessment of risks originating in balance sheets using a range of data and tools. 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. As demonstrated in the crisis, understanding these interlinkages is vital for surveillance. The data displayed in the matrix can be used for two purposes: (i) to assess balance sheet risks within a sector using traditional indicators, such as leverage ratios; and, (ii) the more novel application of analyzing the distribution of risks across sectors.
  
3. **The matrix is built by combining data from different sources.** This is done in stages, as illustrated in the simplified example of an emerging market G-20 country, which illustrates how these data from different sources can, together, fill the cells of the matrix (Figure 1). Most can be filled with data from IMF sources:
  - Data for the financial sector come from the Monetary and Financial Statistics (MFS) and are disaggregated into separate balance sheets for the central bank, banks and non-bank financial corporations (aggregated for simplicity into a single financial sector in Figure 1). The first panel shows the balance sheet exposure of this sector vis-à-vis other sectors in the off-diagonal cells, which represent channels of shock transmission, and the total financial sector balance sheet as the sum of these exposures on the right hand side of the matrix.
  - The second source of IMF data is the International Investment Position (IIP), second panel, which gives the external position of each domestic sector.

<sup>6</sup> Prepared by Sean Craig (SPR).

<sup>7</sup> See Allen et al (2002).

- The third source of data is Government Financial Statistics (GFS); which, in the third panel, adds government assets and liabilities.
  - The fourth source of data is for the non-financial sector, which encompasses the household and corporate balance sheets. The IMF does not collect these data, which must be obtained from national sources (or from the OECD for its members). Nevertheless, a preliminary estimate can often be constructed using the balance sheet identity (i.e. that the cross-sector exposures and total need to add up), as shown in the fourth panel of the Figure.
  - A note of caution: the reliability of the data in this example and, indeed, in every balance sheet matrix, depends on the quality of what the authorities disseminate to the IMF, which should always be evaluated using available sources. The “shadow” banking sector, for example, may not always be well captured as balance sheet data for some institutions may not be reported (e.g. sovereign wealth funds) or allocated to the wrong sector (e.g. Structured Investment Vehicles (SIVs) in the crisis). These cases need to be identified so adjustments can be made to the matrix.
4. The exact specification of a matrix depends on the availability of balance sheet data for a country from these different sources. In the ideal case, where a country provides the full set of data, the matrix would cover seven sector balance sheets (government, central bank, banks, and non-bank financial, household, corporate and external) and a breakdown of asset and liability positions by currency and remaining maturity for each sector. In practice, no country yet achieves this high standard, but some countries get close and many provide enough data to compile a balance sheet matrix useful for surveillance. Section IV outlined what data are available for different countries. Even in low income countries with limited data, a BSA can be compiled with teams filling in gaps in the matrix with estimates obtained from their country work, allowing a fuller analysis. For those countries, including most LICs, that do not yet disseminate all the data needed to fill in the cells in the matrix (in the example, government assets are not reported), a partial matrix can still be constructed and used to trace the transmission of shocks through cells for which there are data. In the next section, we construct balance sheet matrices for Mexico, The Euro Area and the United States and present some simple ways to focus attention on key vulnerabilities and linkages.

Figure 1. Building a Balance Sheet Matrix: Example

		Monetary Financial Statistics Data									
		Holder of the Liability (Creditor Sector)									
Issuer of the Liability (Debtor Sector)		Government		Financial Sector (CB, Banks, Non-Banks)		Non Financial Sector (Corp. + HH)		External		TOTAL	
		A	L	A	L	A	L	A	L	A	L
	Government										
Total				613	240						
Financial Sector (CB, Banks, Non-Banks)											
Total		240	613			2927	3038			4912	6117
Non Financial Sector (Corporate + Household)											
Total				3038	2927						
External											
Total				1215	329						

		Monetary Financial Statistics Data										International Investment Position Data			
		Holder of the Liability (Creditor Sector)													
Issuer of the Liability (Debtor Sector)		Government		Financial Sector (CB, Banks, Non-Banks)		Non Financial Sector (Corp. + HH)		External		TOTAL					
		A	L	A	L	A	L	A	L	A	L	A	L	A	L
	Government														
Total				613	240			1124	7						
Financial Sector (CB, Banks, Non-Banks)															
Total		240	613			2927	3038	551	1270	4912	6117				
Non Financial Sector (Corporate + Household)															
Total				3038	2927			1703	383						
External															
Total				1215	329	383	1703			1660	3377				

		MFS Data		IIP Data		Govt. Financial Statistics Data							
		Holder of the Liability (Creditor Sector)											
Issuer of the Liability (Debtor Sector)		Government		Financial Sector (CB, Banks, Non-Banks)		Non Financial Sector (Corp. + HH)		External		TOTAL			
		A	L	A	L	A	L	A	L	A	L		
	Government												
Total				613	240			1124	7	2154	1617		
Financial Sector (CB, Banks, Non-Banks)													
Total		240	613			2927	3038	551	1270	4912	6117		
Non Financial Sector (Corporate + Household)													
Total				3038	2927			1703	383				
External													
Total		915	1215	329	383	1703				1660	3377		

		MFS Data		IIP Data		GFS Data		Balance Sheet Identity							
		Holder of the Liability (Creditor Sector)													
Issuer of the Liability (Debtor Sector)		Government		Financial Sector (CB, Banks, Non-Banks)		Non Financial Sector (Corp. + HH)		External		TOTAL					
		A	L	A	L	A	L	A	L	A	L				
	Government														
Total				613	240	417	1370	1124	7	2154	1617				
Financial Sector (CB, Banks, Non-Banks)															
Total		240	613			2927	3038	551	1270	4912	6117				
Non Financial Sector (Corporate + Household)															
Total		1370	417	3038	2927			1703	383	6112	3728				
External															
Total		915	1215	329	383	1703				1660	3377				

Source: IMF Staff



## Exploiting the BSA: Summary Statistics, Network Maps, and Stress Tests

### Mexico<sup>8</sup>

5. **The BSA matrix can be used to provide an overview of vulnerabilities and spillover channels.** 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, a “front end” can be developed<sup>9</sup>, featuring summary indicators and network maps. This is illustrated below using the case of Mexico in 2011.
6. **Summary net positions of intersectoral linkages can provide a useful starting point for balance sheet analysis**, since a complete matrix can be very detailed (Table 10). In the example below, the non-financial corporation (NFC) sector’s net liability to the external sector was particularly large, while the central government had net liabilities to banks (other depository corporations or ODCs), Other Financial Corporations (OFCs), and the external sector. These large net liabilities, particularly to foreigners, provide a basis for deeper analysis of the economy’s vulnerabilities.

**Table 10. Mexico Intersectoral Net Positions (2011)**  
(percent of GDP)

	Central bank	Central gov't	State/Local Gov't	Public Nonfin Corp.	Other depos. corp.	Other financial corp.	Nonfinancial corp.	Other residents	Nonresidents
Central bank		6%	0%	0%	1%	0%	0%	0%	-14%
Central gov't	-6%		0%	0%	12%	10%	0%	0%	13%
State and Local Gov't	0%	0%		0%	1%	0%	0%	0%	0%
Public Nonfinancial Corp.	0%	0%	0%		0%	0%	0%	0%	1%
Other depository corp.	-1%	-12.0%	-1%	0%		-3%	8%	2%	1%
Other financial corp.	0%	-10.1%	0%	0%	3%		-5%	3%	0%
Nonfinancial corp.	0%	0%	0%	0%	-8%	5%		0%	38%
Other residents	0%	0%	0%	0%	-2%	-3%	0%		0%
Nonresidents	14%	-12.5%	0%	-1%	-1%	0%	-38.1%	0%	

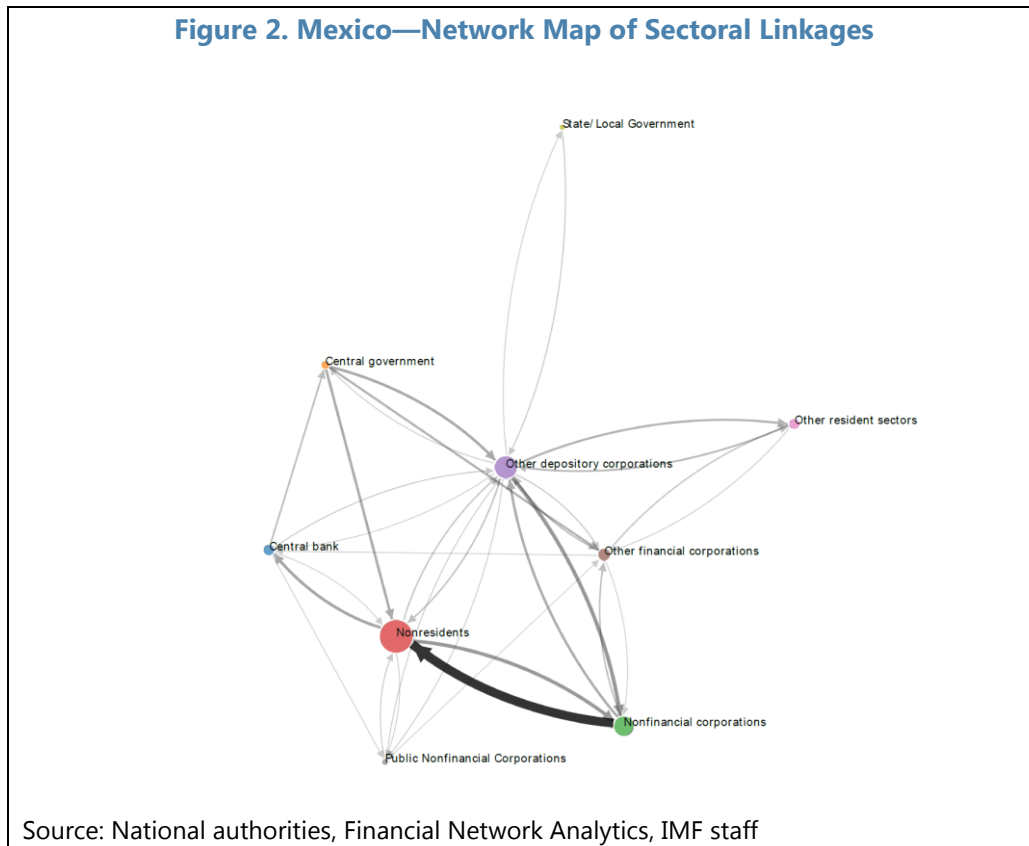
Source: National authorities, IMF

Note: Given data gaps, data not available are also entered as 0s on the BSAs.

<sup>8</sup> Prepared by Sally Chen (SPR).

<sup>9</sup> Currently, network maps presented in the document are from an external web-based tool: <http://www.fna.fi>

7. **A network map is another visually appealing representation of the economy’s intersectoral linkages.** The nodes represent the total size of the sector’s liability exposure – the larger the node, the greater the liability exposure (Figure 2)<sup>10</sup>. The links between nodes outline the direction and size of the gross exposure. For example, the size of central government liabilities to nonresidents (13 percent of GDP) is represented by a moderately thick-line with an arrow pointing from the former to the latter. In addition, the sector in the middle—in this case banks—represents the most central balance sheet in the economy, by virtue of the relative size and number of its inter-connections with other sectors. In other words, this sector can serve as a key propagator of shocks across the economy.



<sup>10</sup> The nodes can be sized to suit the focus of the analysis – e.g. based on asset-to-liability ratio to assess *solvency risks*, debt-to-equity ratios to assess *capital structure imbalances*, or share of liabilities denominated in foreign currency to assess *exchange rate risks*.

### 8. Examining the matrix and network map reveals some some potential

**vulnerabilities.** Both highlighted the nonfinancial corporate sector's large liabilities, and in particular, its dependence on credit from the rest of the world. The NFC's other notable liability in 2011 was to the financial sector – banks ("other depository corporations) and nonbanks ("other financial corporations"). It was a net lender to the banks (see bigger liability from the other depository corporations to nonfinancial corporations in network map), but held net liabilities to the nonbanks. The central government also had sizable liability exposure to the other sectors, though its exposures were more evenly distributed among banks, other financial corporations and nonresidents. The public nonfinancial corporates have the smallest liability exposure. Other residents (largely households) have larger liabilities, but are overall net creditors to the rest of the economy. It is important to note that net positions, as presented here, only offer a starting point for deeper analysis, as the nuance from gross positions and the structures of liabilities may not be entirely evident.

### 9. Once potential liabilities are located, decomposing the structure of liabilities could reveal whether the economy faces currency, capital structure and maturity mismatch risks.

Decomposing the structure of the liabilities reveals potentially sizable currency risks facing the central government—a finding that requires deeper analysis.

Although public entities, financial institutions and NFCs held large foreign-held liabilities, the share of equity in these liabilities is large, suggesting limited vulnerabilities (Table 11). Equity holdings are by definition not FX exposure; they are claims on future profits in Mexican corporations. Indeed, after accounting for the capital structures and focusing on the share of *debt* denominated in foreign currencies, data suggest that it was the public sector – both

central government and public entities – that would be particularly vulnerable to currency shocks (Table 12). That said, the central bank's foreign currency exposure in debt reflects its SDR allocation to the IMF – a nuance not evident without deeper analysis; accounting for this, the sector's FX exposure is limited. Additionally, to fully assess the vulnerability of these sectors, it would be necessary to take the asset side of the balance sheet into consideration. As an aside, the public sectors had no equity cushions, as is typically the case across countries.

**Table 11. Mexico Capital Structure (2011)**  
(percent)

	Total Debt	in FX	Equity
Central Bank	100.0	12.3	0.0
Central Government	100.0	35.6	0.0
State and Local Government	100.0	0.9	0.0
Public Nonfinancial Corporations	53.8	41.4	NA
Other Depository Corporations	100.0	9.1	0.0
Other Financial Corporations	61.4	0.9	38.6
Nonfinancial Corporations	38.0	50.5	62.0
Other Residents	100.0	0.2	0.0
Nonresidents	75.3	95.3	24.7

Source: National authorities, IMF

**10. Sectoral networks allow us to simulate the impact of shocks to different sectors of the economy** both in terms of the size of liabilities and net positions, as well as exposures to other sectors. Different shock scenarios can be analyzed. As an illustration, based on the currency risks identified above, we look at the impact of a sharp *peso* depreciation on the economy's balance sheet, assuming a 20 percent appreciation of the US dollar relative to the domestic currency; both assets and liabilities denominated in foreign currencies would be affected equally, while those items in domestic currencies were unaffected.

**11. The negative effect on the central government sector is expected to be particularly large amid a sharp *peso* depreciation, based on first-round effects.** This is not surprising, given the sector's large

currency exposure in its debt holdings. Relative to the base scenario, the central government's net position could fall by around 2.5 percent of GDP. By contrast, other sectors that had sizable foreign liabilities were little affected (Table 12).

	Original Net Position	Net Position after shock	Gains/Losses
Central bank	6.3	8.9	2.7
Central government	-28.3	-30.8	-2.5
State/Local Government	-1.4	-1.4	0.0
Public Nonfinancial Corporations	-0.8	-0.8	0.0
Other depository corporations	7.3	7.6	0.3
Other financial corporations	8.5	8.5	0.0
Nonfinancial corporations	-35.1	-35.7	-0.6
Other resident sectors	5.0	5.1	0.0
Nonresidents	38.5	38.7	0.1

Source: National authorities, IMF staff estimate

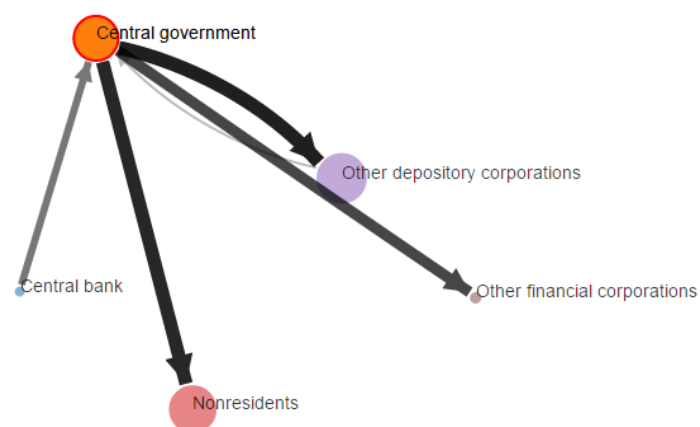
The nonfinancial corporate sector suffered minimal loss in its net position, largely because the bulk of those liabilities were in equities. Notably, the relatively small loss from a permanent *peso* depreciation suggests that the economy's FX exposure, even for its most exposed sector, is small. Indeed, the central bank could realize gains that outweigh losses suffered by the central government, underscoring the need to look at both the asset and liability sides of the balance sheet. As an aside, in late 2011, Mexico did experience a temporary *peso* depreciation that rivaled the magnitude modeled in the exercise; the realized negative impact on the economy at that time was limited<sup>11</sup>.

**12. Scenario analysis can be used to trace the transmission of shocks across sectors and globally.** Based on vulnerabilities and spillover channels identified, staff can develop plausible alternative scenarios for single or multiple shocks and map inward and outward

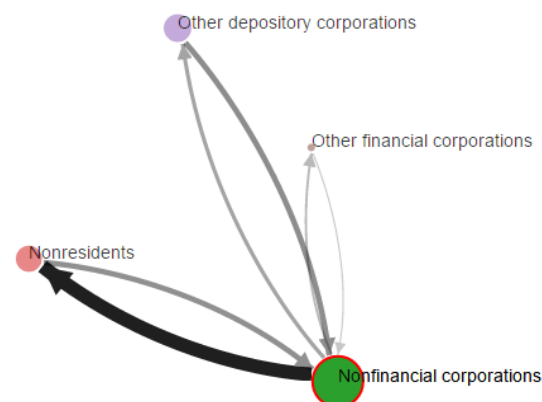
<sup>11</sup> Indeed, during the second half of 2011, the US dollar did appreciate by nearly 20 percent against the Mexican peso. However, capital flows into Mexico remained steady at the time, despite significant exchange rate volatility. Foreign investors responded mainly by covering currency exposures rather than divesting from government paper. Meanwhile, given its strong capital and liquidity buffers, the banking system, including the domestic subsidiaries of Spanish banks, was able to continue the expansion of domestic credit at a healthy pace.

spillover channels. For instance, in the example above, inter-sectoral exposures highlight deep sovereign-financial linkages and the vulnerabilities to financial institution and central government's balance sheets should either come under duress:

- In the **central government's** case, its liability exposure to the external sector, banks and financial institutions suggest that their balance sheets could be adversely affected if external funding to the central government comes under stress. In particular, the second-round knock-on effects on banks, as the centrally-located sector that provides funding to the other sectors in the economy, could result in reduced credit supply economy-wide. Of note, the banking sector provided nearly half of its total credit to the NFC sector, while households ("other residents") and nonresidents received the bulk of the rest of the credit.



- In the **NFC's** case, its FX-related losses not only could affect its payments to nonresident creditors, but also the balance sheets of banks and financial institutions and in turn, credit provision to the rest of the economy. Financial institutions' ("other financial corporations") credit to NFCs made up about 30 percent of total credit outstanding from the sector, with credit to the central government taking up another half.



**13. Tools could be developed to estimate these diverse effects quantitatively.** Of course, these are only diagnostic devices that suggest potential stress-points. Having identified these, teams should bring to bear other information on relevant sectors to arrive at a more comprehensive risk assessment. In the next section, for instance, we offer some tools using commercial data that could be used to hone in on vulnerabilities uncovered in corporate and external balance sheets.

### **Euro Area**<sup>12</sup>

**14.** Consolidated balance sheet matrices and network maps from 2009 and 2012 for the Euro Area highlight several developments underfoot during that time (Tables 13 and 14).

- First, the central government sector relied heavily on the central bank and the external sector.
- Second, the banking sector's reliance on central bank funding had been high.
- Third, the NFC sector had also been highly dependent on the external sector for funding.
- Comparing developments in 2012 against those in 2009 suggested that the importance of external funding for the central government and NFC grew. Meanwhile, banks' reliance on funding from the central bank increased sizably over the period. Moreover, their credit provision to NFCs fell over the same time, with the NFC sector shifting its funding source from banks to the rest of the world.

**15. Increased external funding of NFCs over the period is notable.** Indeed, intra-European banking flows had fallen heading into the sovereign debt crisis. The reliance on external funding was likely dominated by large (and export-oriented) companies that were able to tap into corporate bond markets and raise equity. It was unclear whether such positions were hedged—and the BSA does not provide such data—thus the extent of true vulnerabilities facing large NFCs could be less than presented. Additionally, increased cross-border intra-company lending within the Euro Area could be yet another factor behind NFCs' external financing, though the exact share of such financing is not clear. Still, the shift from domestic bank-oriented to external funding underscores the challenges of falling credit supply in the Euro area, even as the region attempted to overcome the aftermath of debt overhang. Indeed, SMEs, which are likely to have relied on domestic or self-funding, continue to be trapped in a cycle of reduced credit supply and low growth.

**16. Other developments highlighted by the BSA, in the context of the ECB's active QE programs, suggest less vulnerability.** The end of 2012 (for the second BSA) coincided with the peak of the 3-year LTRO. Banks' increased reliance on the central bank underscored the appropriate role of the ECB as the lender of last resort. Meanwhile, increased external funding of central governments in the Euro Area likely reflected borrowing by program countries, another appropriate response as countries looked to reduce their vulnerabilities to

<sup>12</sup> Prepared by Sally Chen (SPR).

market funding. Notably, a majority of non-Euro Area bond holdings are by other central banks. Although aggregate statistics suggest the central government's increased reliance on nonresidents (Figure 3), risks stemming from non-EA holdings of government bonds could well be different from those of EA holdings.

**Table 13. Euro Area Intersectoral Net Positions (2009)**  
(percent of GDP)

	Central bank	Central gov't	State/Local Gov't	Public Nonfin Corp.	Other depos. corp.	Other financial corp.	Nonfinancial corp.	Other residents	Nonresidents
Central bank		-12.3%	-2.6%	0%	-13%	0%	0%	0%	-4%
Central gov't	12%		0%	0%	14%	0%	0%	0%	19%
State and Local Gov't	3%	0%		0%	9%	0%	0%	0%	0%
Public Nonfinancial Corp.	0%	0%	0%		0%	0%	0%	0%	2%
Other depository corp.	13%	-13.9%	-9%	0%		2%	-8.7%	15%	0%
Other financial corp.	0%	0%	0%	0%	-2%		0%	0%	0%
Nonfinancial corp.	0%	0%	0%	0%	9%	0%		0%	16%
Other residents	0%	0%	0%	0%	-15%	0%	0%		0%
Nonresidents	4%	-19.0%	0%	-2%	0%	0%	-16.5%	0%	

Source: National authorities, IMF

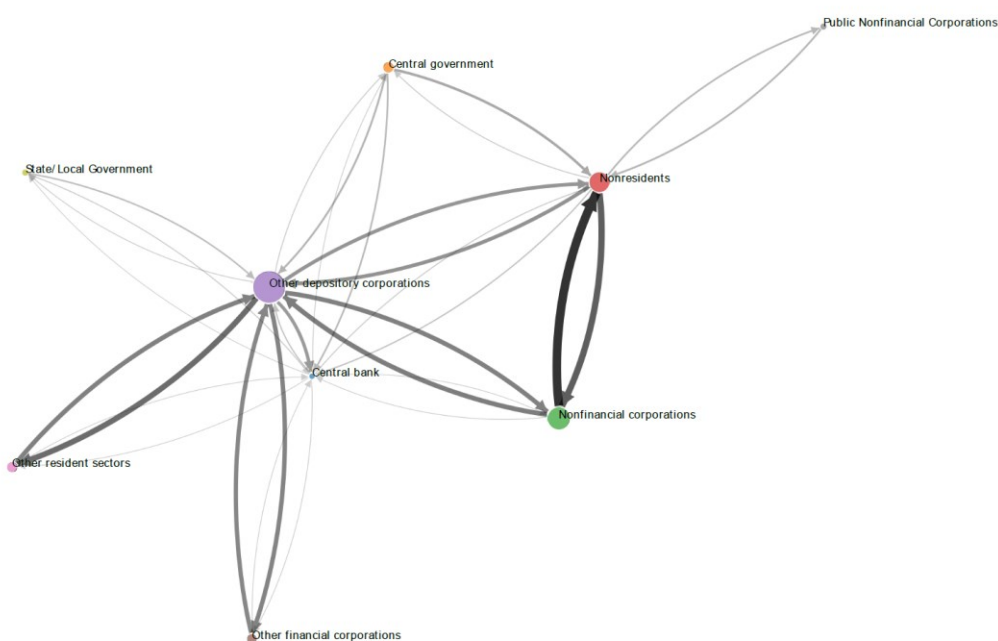
**Table 14. Euro Area Intersectoral Net Positions (2012)**  
(percent of GDP)

	Central bank	Central gov't	State/Local Gov't	Public Nonfin Corp.	Other depos. corp.	Other financial corp.	Nonfinancial corp.	Other residents	Nonresidents
Central bank		-12.6%	-3.2%	0.0%	-28.0%	0.3%	0.0%	0.0%	-4.5%
Central gov't	12.6%		0.0%	0.0%	14.3%	0.0%	0.0%	0.0%	22.2%
State and Local Gov't	3.2%	0.0%		0.0%	9.5%	0.0%	0.0%	0.0%	0.0%
Public Nonfinancial Corp.	0.0%	0.0%	0.0%		0.0%	0.0%	0.0%	0.0%	1.4%
Other depository corp.	28.0%	-14.3%	-9.5%	0.0%		2.0%	-2.2%	14.3%	-1.8%
Other financial corp.	-0.3%	0.0%	0.0%	0.0%	-2.0%		0.0%	0.0%	0.0%
Nonfinancial corp.	0.0%	0.0%	0.0%	0.0%	2.2%	0.0%		0.0%	31.3%
Other residents	0.0%	0.0%	0.0%	0.0%	-14.3%	0.0%	0.0%		0.0%
Nonresidents	4.5%	-21.9%	0.0%	-1.4%	1.8%	0.0%	-31.3%	0.0%	

Source: National authorities, IMF



**Figure 3. Network Map of Euro Area of Sectoral Linkages**  
(2012)



Source: National authorities, Financial Network Analytics, IMF staff

## United States<sup>13</sup>

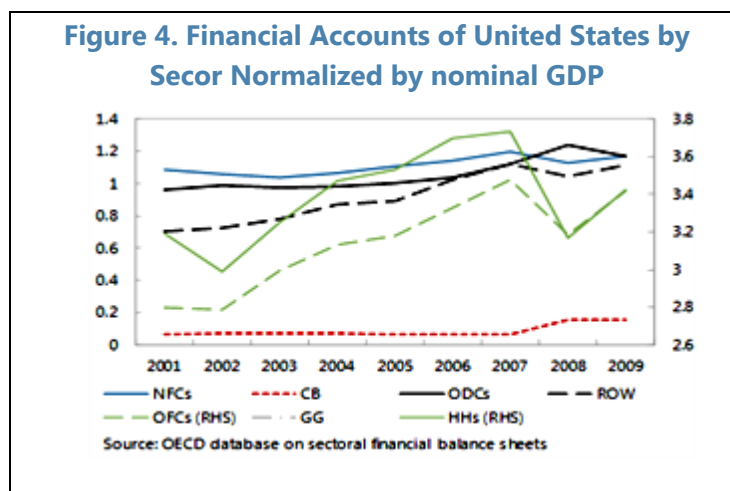
### Deconstructing the Global Crisis: A Balance Sheet Perspective using U.S. Flow of Funds data

- 17. Detailed analysis of aggregate sectoral balance-sheets could have been helpful in identifying pressure points for the U.S. economy pre-crisis.** The challenge is to show that highly aggregated sectoral balance sheet data for the U.S. (on whom-to-whom basis), supplemented by the disaggregated information on the type of investors and instruments from the FoF database (and other databases, i.e. IMF CPIS, CDIS, and BIS databases), could have been useful to point to increasing vulnerabilities pre-crisis. This is not the first attempt to utilize the U.S. Flow of Funds (FoF) data to shed some light on the buildup of the Global Financial Crisis. Bhatia and Bayoumi (2012) used the detailed FoF data to decrypt the fact that the use of ill-suited collateral in the secured funding operations of U.S.-based investment banks was the fatal link between the collapse of structured finance and the global malfunctioning of funding markets. For the purpose of this exercise, the total economy financial assets and liabilities from the FoF database are grouped into seven sectors: U.S.

<sup>13</sup> Prepared by Yevgeniya Korniyenko (SPR).

households and nonprofit organizations (HHs); U.S. non-financial businesses (NFCs); the consolidated U.S. government (GG); the rest of the world (RoW); and the U.S. Fed (CB), U.S. other depository corporations (ODCs)<sup>14</sup>, and U.S. other financial corporations (OFCs)<sup>15</sup>. These data are complemented by the information from the OECD database on sectoral financial balance sheets, IMF IIP and GFS databases, and presented in the balance sheet matrix (BSA) to examine sectoral vulnerabilities and interlinkages.

- 18. Balance sheet data for HHs and OFCs were indicating a build-up of vulnerabilities,** while standard vulnerability (financial soundness) indicators for the U.S. were not recording “red flags” pre-crisis. Using BSA, it is possible to show that financial assets of HHs, the predominant owners of wealth in the economy, and OFCs, were expanding particularly rapidly during 2001-07 (Figure 4). Household assets grew from about 300 percent of GDP in 2001 to 373 percent in 2007; similar in magnitude was the increase observed for OFCs—total assets of OFCs grew from 280 to 350 percent of GDP. By contrast, the total assets of the ODCs as a share of GDP grew only moderately over the period.

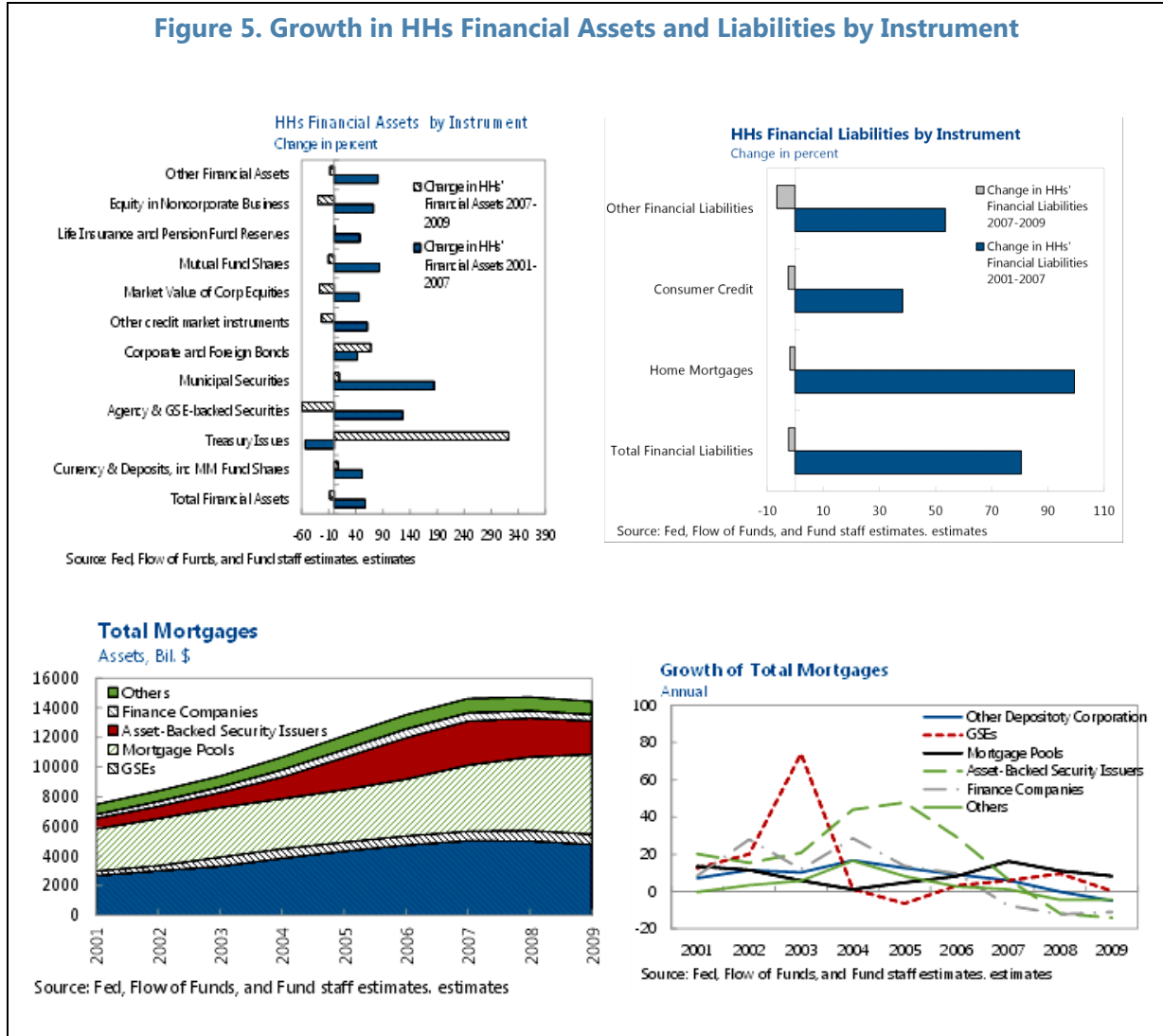


<sup>14</sup> Data for ODCs are compiled from the data contained in the FoF in the SRF format using the concepts and definitions of the Monetary and Financial Statistics Manual (MFSM) (for more information see the U.S. IFS notes). The ODCs include commercial banks, savings institutions, credit unions, and money market mutual funds. Commercial banks include U.S.-chartered commercial banks, foreign banking offices in the U.S., bank holding companies (until 2009), and banks on U.S.-affiliated areas and exclude international banking facilities. Savings institutions include savings and loan associations, mutual savings banks, federal savings banks, and Massachusetts cooperative banks.

<sup>15</sup> The OFCs include property-casualty insurance companies, life insurance companies, private pension funds, state and local government employee retirement funds, federal government retirement funds, mutual funds, closed-end and exchange-traded funds, government-sponsored enterprises (GSE), agency- and GSE-backed mortgage pools, issuers of asset-backed securities, finance companies, mortgage companies, real estate investment trust, security brokers and dealers, and funding corporations. Beginning in March 2009, they also include holding companies.

**19. Information on the instrument breakdown of HH liabilities reflected the mortgage boom.** While HH financial assets saw a cumulative growth of up to 57 percent over the 2001-07 period (Figure 5), their liabilities increased even faster, at 80 percent. This increase was for the most part explained by an increase in mortgage borrowing, as the stock of housing mortgages doubled.

**Figure 5. Growth in HHs Financial Assets and Liabilities by Instrument**



**20. Detailed data on the type of investors demonstrated the growing importance of Asset-Backed Security (ABS) issuers and non-residents in financing the boom.** Increased mortgage debt (about \$7 trillion) was financed by ODCs and ABS issuers in equal amounts, and by mortgage pools. The ODCs and ABS issuers each increased their issuance of mortgage related debt by \$2.3 trillion over the period 2001-07. The increased issuance of ABS was primarily absorbed by non-residents, ODCs, and OFCs. Over 2001-07, non-US investors increased their exposure to the U.S. economy considerably. Non-residents invested about \$3 trillion into US Agency & GSE-backed Securities, Municipal, and U.S. Corporate

Securities. In addition, securities repurchase transactions (REPOs) with non-resident participation increased more than 6-7 times since 2001<sup>16</sup>. These developments were the main reasons behind the sharp expansion of OFC and ODC balance sheets with nonresidents, as shown in Figure 6.

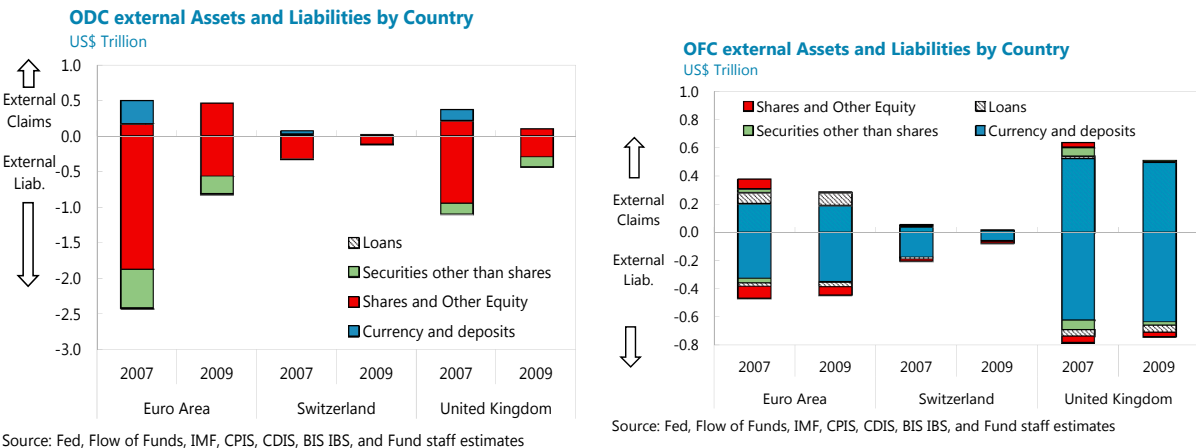
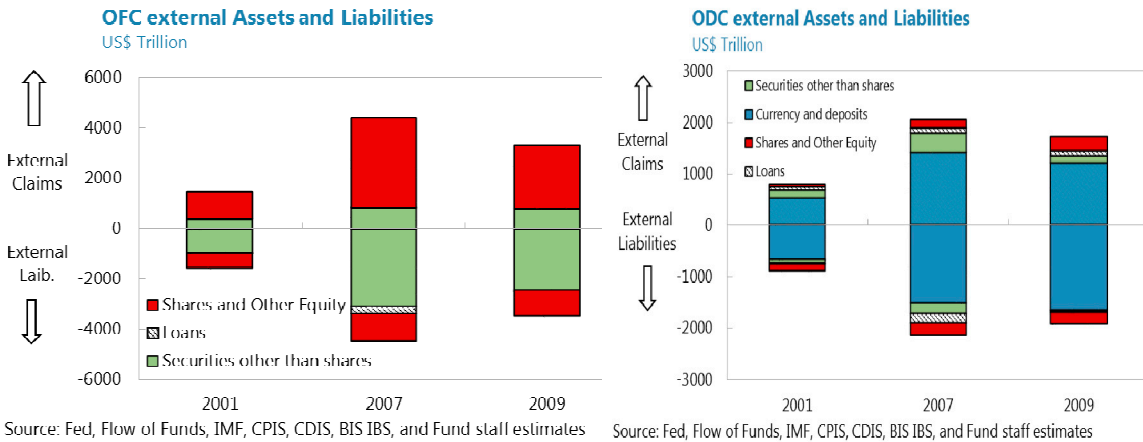
- 21. Combining the BSA data with detailed information on non-resident counterparties would have shown increased links with Europe.** Supplementing the information on OFCs and ODCs from the FoF database with the information from the IMF CPIS, the CDIS and the BIS databases, it is possible to show that the Euro Area, the UK and Switzerland together were responsible for the majority of the increase in the non-resident investments to the US in 2007, and served as primary destinations for US investors.<sup>17</sup> Cross-border securitization and REPO transactions were the important international link between increased US HH borrowing and European investors' search for lucrative profits.

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<sup>16</sup> In 2005, mortgages and interests in mortgages, including mortgage-backed securities and CDOs, were added to the list of repo collateral that is given a "safe harbor" in the Bankruptcy Code. Safe harbor means that when a repo borrower goes bankrupt, the repo lender can immediately exercise its right on collateral and does not have to join the other creditors dividing up the remains.

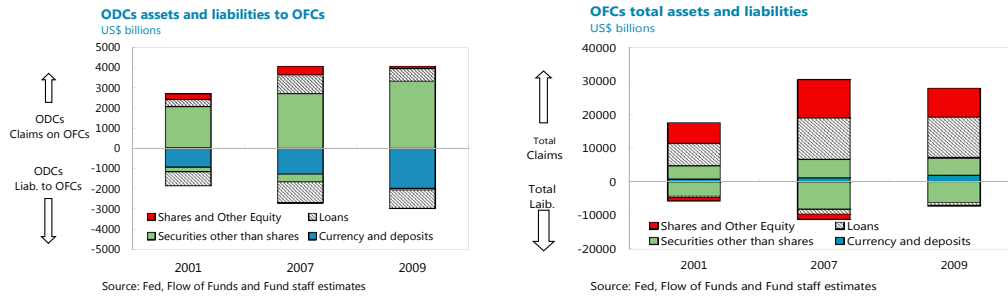
<sup>17</sup> The split between OFCs and ODCs is very loose, as it is based on the individual countries' definitions of the OFCs and ODCs sectors.

**Figure 6. OFC and ODCs External Assets and Liabilities**

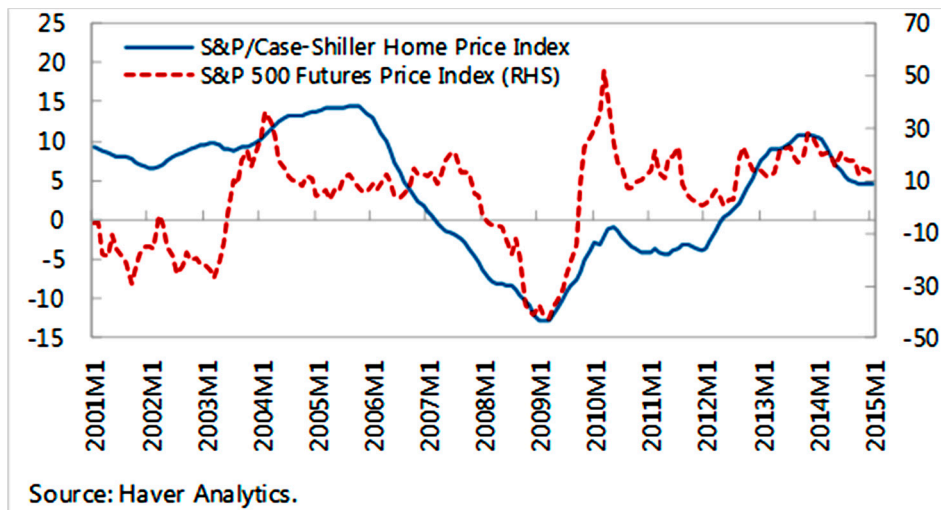


**22. Detailed data from the BSA matrix would also have captured increased domestic interconnections.** Earlier it was mentioned that the US ODCs also significantly grew their exposure to OFCs and ABS in particular (Figure 7). OFCs and HHs, as well as non-residents significantly increased their holdings of US non-financial corporate equities and MMFs shares (feeding the financial assets bubble), while OFCs engaged in cross-lending to ODCs. As such, when house and equity prices collapsed (Figure 8) the OFCs, the ODCs and European Investors took the losses and became liquidity constrained, which spiraled back due to significant interlinkages through securitization and REPO transactions, as well as interconnected lending channels.

**Figure 7. ODCs Assets and Liabilities to OFCs, and OFCs Total Assets and Liabilities**



**Figure 8. House and Equity Prices**  
Annual Growth, year-on-year in percent



## Post-Global Crisis

**23. Comparing the BSA matrix for the United States in the first half of 2014 to that in 2007 suggests several interesting developments (Table 15):**

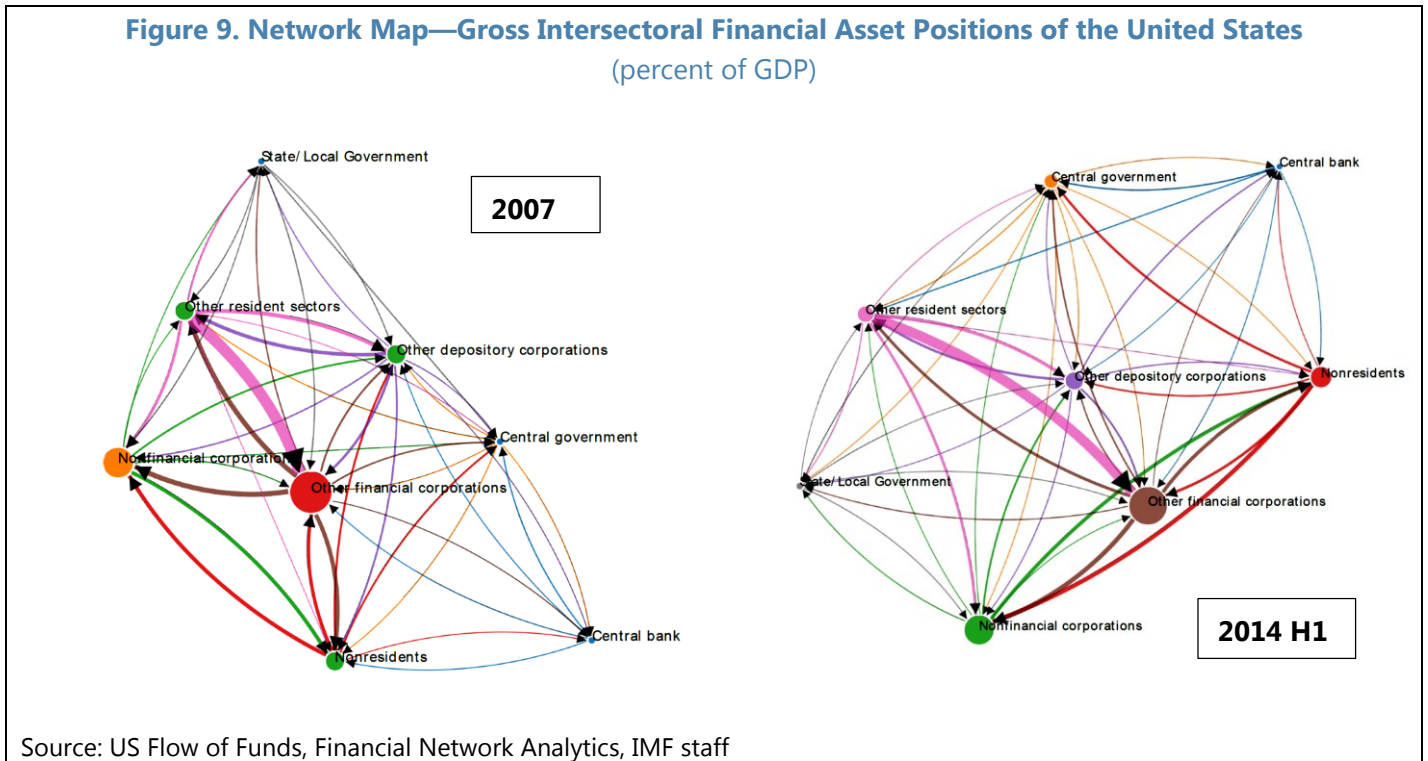
- a significant increase in government debt liabilities, in particular to non-residents and the Federal Reserve System
- a material increase in debt obligations of nonbank financial institutions (OFCs) and non-financial corporates (NFCs)
- deleveraging of banks (ODCs) vis-à-vis the rest of the world and a significant increase in their liquid assets (cash)
- rising leverage of OFCs, in particular vis-à-vis households
- despite an increase in their total financial assets, the NFC sector remains the largest net borrower in the economy
- significant increase in NFC assets and liabilities vis-à-vis non-residents
- a decrease in household debt (mainly due to the decrease in mortgages), counterbalanced by a pick-up in consumer credit.

**Table 15. United States: BSA Matrix**  
(change 2007-2014Q2 in percent of GDP)

Issuer of liability (debtor)	Public sector									Financial Sector						Nonfinancial Private Sector						Rest of the World		
	Central bank			Central government			State and Local Government			Other depository corporations			Other financial corporations			Nonfinancial corporations			Other resident sectors			Nonresidents		
	A	L	Net pos.	A	L	Net pos.	A	L	Net pos.	A	L	Net pos.	A	L	Net pos.	A	L	Net pos.	A	L	Net pos.	A	L	Net pos.
Central bank				1%	9%	-9%	0%	0%	0%	16%	0%	16%	0%	1%	-1%	0%	0%	0%	0%	10%	-10%	1%	0%	1%
Central government	9%	1%	9%				-1%	0%	-1%	2%	0%	2%	8%	0%	8%	0%	0%	0%	3%	4%	-2%	20%	0%	20%
State and Local Government	0%	0%	0%	0%	-1%	1%				0%	0%	0%	1%	-2%	2%	5%	3%	2%	-8%	0%	-8%	0%	0%	0%
Other depository corporations	0%	16%	-16%	0%	2%	-2%	0%	0%	0%				-4%	-4%	0%	7%	-3%	10%	1%	-10%	11%	0%	-1%	1%
Other financial corporations	1%	0%	1%	0%	8%	-8%	-2%	1%	-2%	-4%	-4%	0%				-1%	12%	-13%	33%	-23%	56%	-1%	7%	-8%
Nonfinancial corporations	0%	0%	0%	0%	0%	0%	3%	5%	2%	-3%	7%	-10%	12%	-1%	13%				7%	0%	7%	26%	13%	13%
Other resident sectors	10%	0%	10%	4%	3%	2%	0%	-8%	8%	-10%	1%	-11%	-23%	33%	-56%	0%	7%	-7%				0%	1%	-1%
Nonresidents	0%	1%	-1%	0%	20%	-20%	0%	0%	0%	-1%	0%	-1%	7%	-1%	8%	13%	26%	-13%	1%	0%	1%			
Total	20%	18%	2%	6%	41%	-36%	0%	-2%	6%	0%	4%	-4%	1%	26%	-25%	24%	45%	-21%	37%	-19%	56%	46%	20%	26%

Source: IMF SRFs, IIP, GFS, and the U.S. Fof, and Fund Staff estimates

Figure 9 shows the high and increased exposure of households to the OFC sector, and increased inter-connections between NFCs and non-residents. It also suggests the increased importance of banks since the crisis, as shown by the change in the centrality position within the network (from OFCs in 2007 to ODCs in 2014 H1).

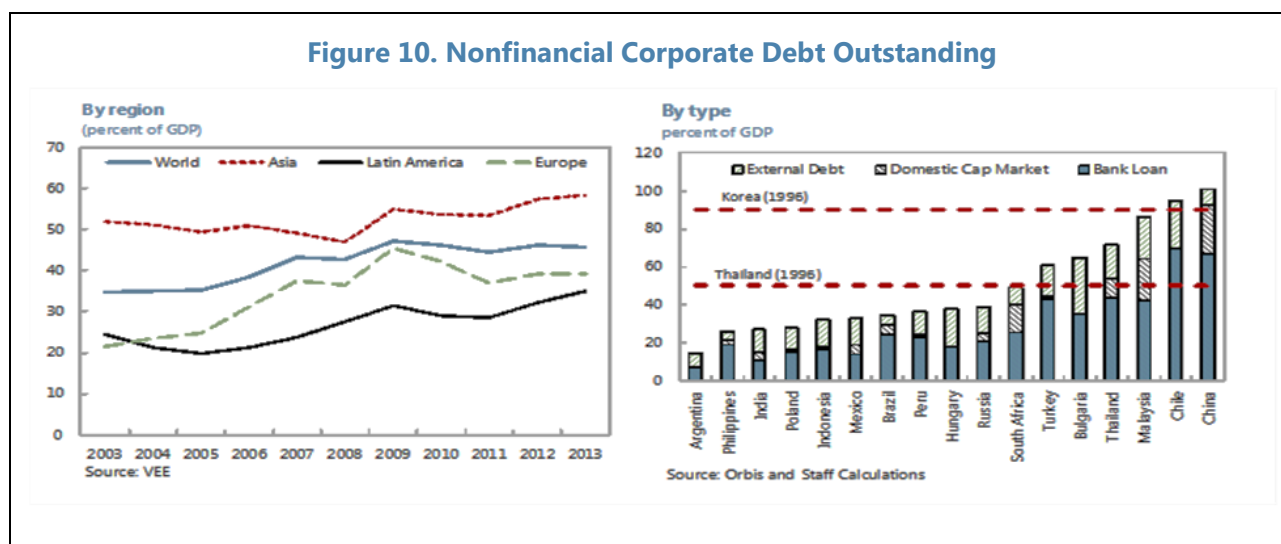




## Drilling Down: Stress-testing Sectoral Balance Sheets using Micro Data

### Corporate Vulnerabilities<sup>18</sup>

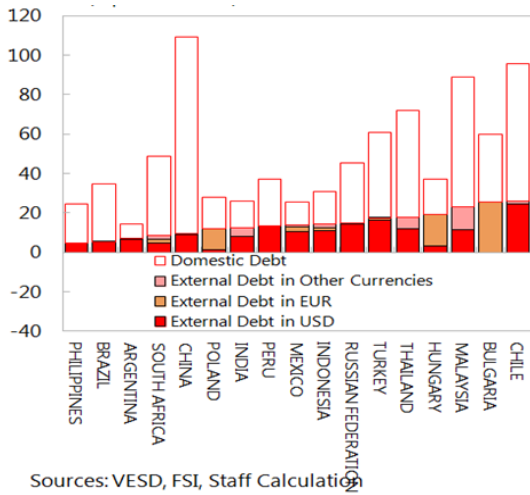
24. **The recent sharp rise of corporate debt issuance in major emerging market countries is giving rise to concerns amid slowing growth and potential financial market volatility from asymmetric exit.** Corporate debt has risen most rapidly in Asia and Latin America since the global financial crisis while European corporations have been deleveraging (Figure 10). Along with the rise in corporate bond issuance, borrowing from banks has also increased. In aggregate, this has led to higher levels of corporate leverage, which in some countries has risen close to levels seen during the Asia financial crisis. Meanwhile, slowing growth in emerging markets is putting pressure on firms' profitability, which has declined relative to its five-year averages across most economies, with broad-based weakness across sectors.



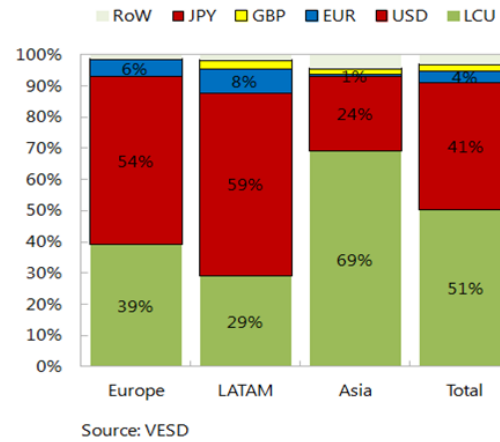
25. **The corporate sector's balance sheet position has significant implications for vulnerabilities and potential spillovers to the banking and government sectors.** At the country level, nonfinancial corporate sectors are most leveraged in China, Chile, Malaysia, Thailand, and Turkey (Figure 11). Including China, many countries in Asia have higher debt in local currencies than countries in Europe and Latin America (Figure 12). Chile, Malaysia, Thailand, Turkey and Hungary have sizable FX debt as a share of GDP. In most countries, FX debt is largely denominated in US dollars, especially in Asia; while in Europe, e.g. Hungary and Poland, the Euro and other currencies account for a larger share of total FX debt.

<sup>18</sup> Prepared by Sophia Zhang (SPR) and Julian Chow (MCM).

**Figure 11. Corporate Debt by Currencies**  
(percent of GDP)

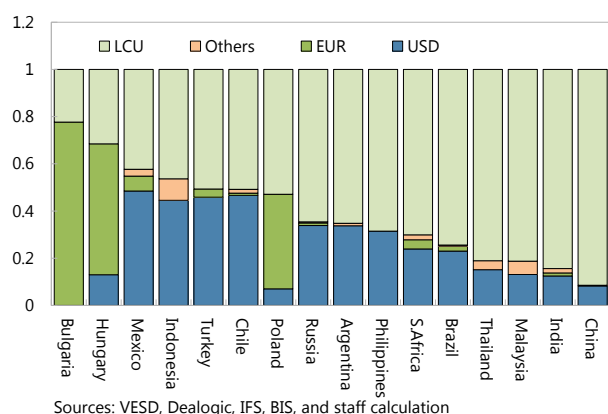


**Figure 12. Currency Breakdown of Corporate Debt Outstanding in 2014**  
(16 EM Countries)

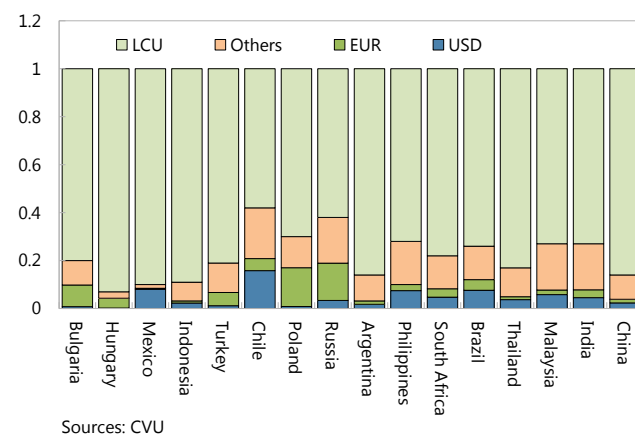


**26. The corporate sector’s net exposure to FX risk depends on the level of hedging, and the currency composition of debt and hedges.** For example, a country is most vulnerable to dollar appreciation shock if it has a large stock of dollar debt while its income stream is largely in domestic currencies or Euro (Figures 13 and 14). Bulgaria and Hungary have a large share of corporate debt in FX, but their debt is largely denominated in Euro, so their vulnerability to a dollar shock is relatively contained. Mexico, Indonesia, and Turkey have a high level of dollar debt, but corporate income is mostly denominated in domestic currencies; hence they could potentially be more vulnerable to dollar appreciation shocks. Yet, corporates in these countries can be actively hedging through derivatives, especially the tradable sectors, e.g. Mexican commodity exporters, which would leave them less exposed to FX risks. Most Asian corporates face very little FX risk thanks to their naturally hedged FX debt position.

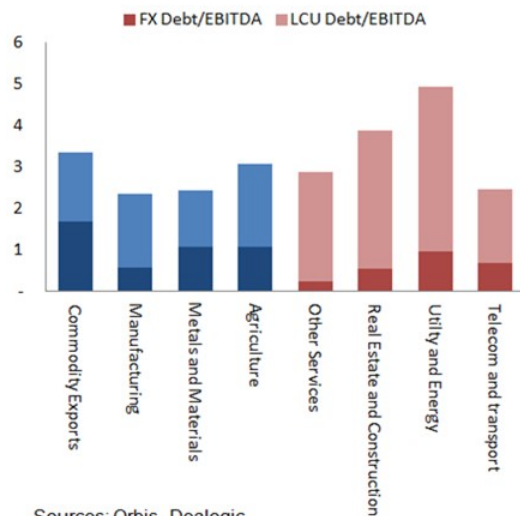
**Figure 13. Breakdown of Total Corporate Debt**  
(in share of total debt)



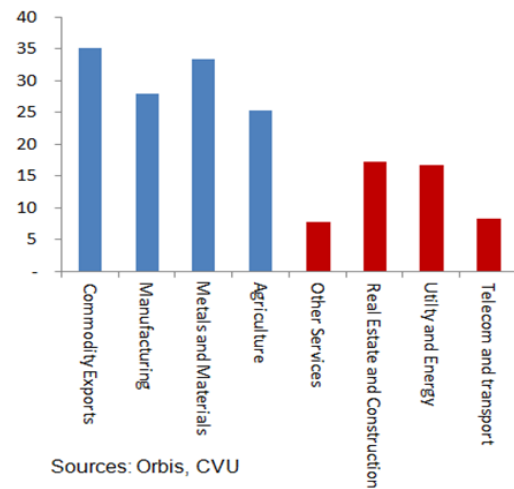
**Figure 14. Breakdown of Total Corporate Income**  
(in share of total income)



**27. Corporate leverage at the country-level masks differentiation across companies and sectors.** Capital-intensive sectors such as utility, energy, commodity exporters, and real estate/construction sectors are more leveraged than other sectors (Figure 15). Non-tradable sectors' gross FX exposure (FX debt/EBITA) is lower than tradable sectors, but they tend to generate less income in FX to serve as a natural hedge (Figure 16). Accounting for natural hedges, net FX leverage (FX debt/FX EBITDA, in chart) is much higher in some non-tradable sectors, e.g. utility/energy and real estate/ construction sectors, and hence they are more vulnerable to exchange rate movements.

**Figure 15. Currency Breakdown of Corporate Leverage by Sector**

Sources: Orbis, Dealogic

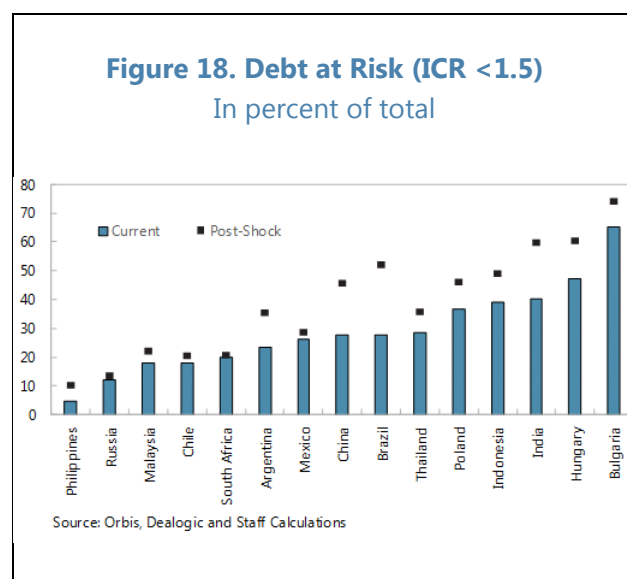
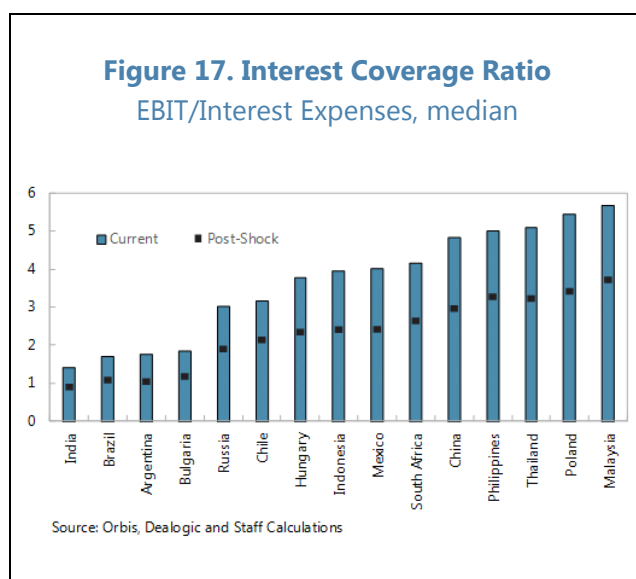
**Figure 16. Natural Hedge by Sectors (FX share of total sales)**

Sources: Orbis, CVU

- 28. Corporate bonds issued by emerging markets have a relatively long term maturity structure, with some exceptions.** Debt maturing in the next two years as a share of total bond outstanding is highest in China, Thailand and Russia and lowest in Peru, Philippines, and Chile. While Hungary, Argentina and Indonesia have the highest share of FX debt maturing by 2016, most debt maturing in Asia are in local currency. Except Poland and Hungary whose bonds maturing in the next two years are in Euro, other countries' maturing FX bonds are largely in USD.
- 29. Despite the growing exposure to foreign currency debt, comprehensive firm-level data on foreign currency liabilities, the currency breakdown of these liabilities, and their maturity structure remain sparse.**<sup>19</sup> The size of foreign currency debt may be underestimated, particularly in instances where firms issue debt abroad through special purpose vehicles (SPVs) or affiliates and do not consolidate these exposures in their balance sheets. Moreover, data on "natural" hedges from foreign currency revenue are not granular to the level of detailed currency breakdowns and data on financial hedges from derivatives are extremely limited. Unless the collection of financial data on corporates improves, data limitations will continue to complicate monitoring and risk management.

<sup>19</sup> The effectiveness of these financial hedges are also a concern as some derivative hedges are undertaken for the short term, and derivative instruments with knock-out features will terminate once the exchange rate depreciates beyond certain thresholds, thus rendering the hedge worthless.

- 30. We develop a tool to assess the vulnerability of emerging market corporates.** The tool we present here puts together micro data<sup>20</sup> from different sources covering corporates' total asset and liabilities, FX debt, FX income and detailed currency breakdown of both, as well as maturity structure. It aims to assist teams in monitoring development of domestic and international corporate bond markets, their currency breakdown and maturity structure; as well as 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. oil shock in commodity sector. Users can also make different assumptions on the currency breakdown of debt and hedges.
- 31. The tool suggests that a large shock could have significant consequences for some emerging markets.** Higher debt loads and lower debt-servicing capacity increase the corporate sector's sensitivity to macroeconomic and financial shocks. Exchange rate depreciation exposes firms to losses from the revaluation of FX debt service. At the same time, tighter external financing conditions could precipitate a rise in borrowing costs, and a further slowdown in economic growth could reduce earnings. In a scenario where borrowing costs rise by 30 percent, earnings decline by 20 percent, and local currencies depreciate by 30 percent against the US dollar and appreciate by 15 percent against the euro (in the context of asymmetric exit), interest coverage would fall and debt at risk rise, especially in countries with high shares of external debt and low natural hedges (Figures 17 and 18). These results are, of course, only indicative and do not adequately capture the important shock absorbing role that financial hedges could play (due to data limitations).



<sup>20</sup> Mostly firm level, but natural hedge information is only available at the sector level.

## Technical Details

### 32. The toolkit makes use of multiple firm level databases complemented by assumptions using aggregate data.

- First, we use annual firm-level balance sheet information from Orbis covering 15 countries across Asia (China, India, Indonesia, Philippines, Malaysia, Thailand), Latin America (Argentina, Brazil, Chile, Mexico) and EMEA (Poland, Hungary, Bulgaria, Russia, South Africa). Within this sample, there are close to 40,000 firms that include public and private, large and small companies, though they vary between countries. The coverage of firms' total assets is around two thirds of the total GDP of these sample countries.
- Second, the currency breakdown of corporate debt is obtained from the VESD database where we assume that corporate bonds and bank loans have the same FX breakdown.
- Third, the size of the natural hedge is measured by FX sales as share of total sales, as computed from CVU (Worldscope), and the detailed currency breakdown is approximated on the basis of trading partners using DOTS.

Sources of Corporate Borrowing	Data
External Debt	<a href="#">Vulnerability Exercise Securities Database (VESD)</a>
Domestic Banks	Banking system data from "Financial Soundness Indicators"
Domestic Capital Markets	Bloomberg

**33. The sensitivity analysis shows how vulnerable corporates could be to exchange rate movements, and in combination with earnings and interest rate shocks. We assume the following:**

- Exchange rate depreciation of 30 percent against the dollar based on dollar appreciation of late 1990s, and 15 percent appreciation against the Euro to take into account asynchronous exit from UMP. We recognize that some currencies are pegged, or are in a heavily managed regime. This sensitivity analysis examines what could potentially happen in an adverse scenario.
- 30 percent increase in borrowing costs, derived from an average of the country median increase in firms' borrowing costs during the Global Financial Crisis. Country medians ranged from 3 percent to 69 percent.
- 20 percent decline in earnings, based on an average of the country median decline in firms' EBIT during the global crisis. Country medians ranged from an increase of 12 percent to a decline of 106 percent.

**34. Potential exchange rate losses from foreign currency debts could emanate from two sources:** (i) interest payments due in the current year; and (ii) revaluation of loan and bond principal<sup>21</sup>. In the absence of information on the maturity structure of bank loans, we are only able to account for the FX loss on foreign currency interest expense, which is computed as:

$$\text{Share of External Debt} \times \text{Borrowing Cost} \times \text{Total Debt} \times \left[ \left( \frac{\text{Share of USD Debt} \times \text{Nominal Exch. Rate Depreciation vs USD}}{\text{Depreciation vs USD}} \right) + (\text{Share of EUR Debt} \times \text{Nominal Exch. Rate Depreciation vs EUR}) \right]$$

**35. The net loss from exchange rate movement accounts for both natural and financial hedges:**

**Natural Hedges**

FX losses from interest expense and revaluation of foreign currency debt principal are offset by FX gains from overseas earnings, computed as:

$$\text{Share of Foreign Sales} \times \text{EBIT} \times [(\text{Share of USD Revenue} \times \text{Nominal Exch. Rate Depreciation vs USD}) + (\text{Share of EUR Revenue} \times \text{Nominal Exch. Rate Depreciation vs EUR})]$$

<sup>21</sup> In line with IFRS 13 (fair valuation of liabilities).

Assumptions underlying this estimation are:

- Foreign sales are assumed to be in foreign currencies.
- The share of FX revenues is derived from partner country trade weights.
- The multiplication by EBIT (operating profit) effectively takes into account of foreign currency costs as it assumes that the share of these costs are in proportion to foreign currency incomes.

It is worth noting that the effectiveness of natural hedges is an approximation as it may fall short of expectations. Past episodes have demonstrated that overseas revenues declined in tandem with the depreciating currencies during turbulent periods.

### **Financial Hedges**

Currency hedging of foreign currency debts could also mitigate potential FX losses. Offset from financial hedging of foreign currency debt principal and interest is computed as:

$$\text{Hedge Ratio} \times (\text{FX losses from interest and principal revaluation})$$

As information on financial hedging is sparse, this analysis assumes that 50 percent of foreign currency debts are hedged, on an aggregate basis.

**36. A firm's capacity to service debt hinges on its interest coverage ratio (ICR),** computed as EBIT/Interest Expense, where EBIT is earnings before interest and taxation<sup>22</sup>. The lower the ratio, the more the company is burdened by debt expense relative to earnings. An ICR of less than 1 implies that the firm is not generating sufficient revenues to service its debt without making adjustments, such as reducing operating costs, drawing down its cash reserves, or borrowing more. This analysis uses an ICR threshold of 1.5 times to take into account the potential vulnerabilities to funding risks, in addition earnings risks, that could emanate in a scenario when funding liquidity thins, particularly during times of heightened global risk aversion. This is also a benchmark used widely by analysts as an early warning signal, as firms with ICR below 1 may have already been in distress<sup>23</sup>. Hence, debt at risk for each country is computed as:

<sup>22</sup> EBIT (also known as operating profit/loss) is used as a measure of earnings instead of EBITDA (earnings before interest, taxation, depreciation and amortization) to account for the need for investment and replacement of assets.

<sup>23</sup> Analysts often use an interest coverage ratio threshold of 1.5 as an indication that a firm's ability to meet interest expense could be questionable. Countries that were most affected during the Asian Financial Crisis (Korea, Thailand and Indonesia) had median interest coverage ratios below 1.5.



$$\frac{\sum \text{Debt of Firms with ICR} < 1.5}{\sum \text{Debt of All Firms}}$$

### External Vulnerabilities<sup>24</sup>

- 37. A gap in balance sheet analysis relates to modeling the behavioral responses of investors to shocks.** In this context, we develop 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. The tool 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. In addition, we place constraints on their portfolio choice so that they cannot hold a short position in any bond and that their choices are influenced by the historical allocations in the benchmark JP Morgan EM global bond index. They do not strictly track the index, but limit their allocations to the range of those observed in the past. The portfolio is then 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 projections of the capital account and for the liability side of sovereign balance sheets in emerging markets.
- 38. This tool is part of the more granular examination that can be performed following the detection of potential balance sheet vulnerabilities in a BSA matrix analysis.** In particular, we drill down on the asset choices of international mutual funds and their implications for the liabilities of EM sovereigns. Since the global crisis, EM countries received a significant amount of capital flows, driven by both favorable global push factors and improving domestic pull factors. These investments were concentrated primarily in bond portfolio investments and focused on about 8 to 10 countries.<sup>25</sup> This has led to record holdings by foreigners of EM local currency sovereign bonds. The potential sudden stop or reversal in these holdings has been the subject of significant amounts of research since the “taper tantrum” in the spring of 2013. The tool focuses on sovereign bonds given their importance for government financing.
- 39. Mutual funds and other asset managers are playing an increasing role in global financial markets.** The April 2014 Global Financial Stability Report examined in more detail the risks from EM fund investments, and the April 2015 edition looked at risks from the asset management industry more broadly. The former chapter found that the new mix of global portfolio investors in EMs is likely to make overall portfolio flows more sensitive to global

<sup>24</sup> Prepared by Phil de Imus and Federico Diaz Kalan (both SPR).

<sup>25</sup> [IMF Staff Discussion Note 14/09](#)

financial conditions. This is particularly important given the changing global financing climate, with an appreciating US dollar and expectations of the beginning of the normalization of US interest rates. Moreover, domestic pull factors have also changed with the drop in commodity prices and a number of EM countries already experiencing slowdowns. The potential spillover effects of shifting global financing conditions could have profound effects on investments in EM sovereign bonds and currencies.

**40. Our analysis asks to what extent a simple mean-variance portfolio optimization framework can explain observed allocations of mutual fund investors.**<sup>26</sup> Mutual fund

investor behavior is imitated by constraining the optimization exercise, using the known behaviors of no short sales and index following. While we acknowledge that individual and classes of funds face a variety of portfolio objectives and strategies, we make a number of simplifying assumptions to make the analysis feasible and operational:

- The portfolios are constructed using weekly data of JP Morgan’s total return indices for local currency sovereign bond markets for 10 emerging market countries (Brazil, Colombia, Hungary, Indonesia, Mexico, Malaysia, Poland, Russia, South Africa, and Turkey) from 2005 to the end of February 2015.<sup>27</sup> Time-varying, two-year rolling-window variances and co-variances are calculated from the sample returns. The assumption here is that fund managers construct their expectations about future risk and correlations between the different bond indices based on past behavior.
- A mean-variance optimization tool is applied to the return, variances, and co-variances to calculate the portfolio weights of the optimal portfolio. The Markowitz approach appears natural, simple to understand, and remains the starting point for professional portfolio managers. However, in practice its outcomes are not robust or stable. So we use constraints to both better mimic the behavior of mutual funds and to achieve more stable allocations consistent with the observed mutual fund data. We apply a no short position constraint given that most funds cannot take short positions via derivatives or underlying bonds. We assume that in aggregate mutual funds are guided by the benchmark allocations in JP Morgan’s GBI-EM index. We do not assume that there are only index-tracking funds, but that country allocations are limited by the range of historical weights in the benchmark. Lastly, we use a statistical technique called resampling, which is used by portfolio managers to help achieve more stable allocations.

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<sup>26</sup> This is in the same spirit as Disyatat and Gelos (2001) who analyzed emerging market equity mutual funds in the aftermath of the emerging market crisis of the late 1990s.

<sup>27</sup> A few of the members of JP Morgan’s Emerging Market Government Bond Index (GBI-EM) were not included either due to our data limitations or due to the relatively low foreign participation in those markets.

- 41. We compare the results of our optimization model to mutual fund data from Emerging Portfolio Fund Research (EPFR).** The advantage of this data is that it lets one examine the high frequency dynamics of mutual fund allocations, and it has been used in the literature to study push and pull factors in capital flows to emerging markets<sup>28</sup>. We use the data on fund allocations both for dedicated and non-dedicated mutual funds and assume that in aggregate they follow the constraints of long only positions and the benchmark allocations of the GBI-EM index.
- 42. Baseline results indicate that the model does a relatively reasonable job of following the EPFR fund allocations (Figures 19 and 20).** The model also maintains relative stable allocations over time, overcoming the well-known problems of unconstrained mean-variance optimization. Theil coefficients<sup>29</sup>, a measure of goodness-of-fit, on the level of allocations are relatively low for each country. An important takeaway in building the model and considering the constraints is how important a role the benchmark index plays. The benchmark following constraint we applied was important in achieving the stability of allocations in the model and its fit to the EPFR allocations.

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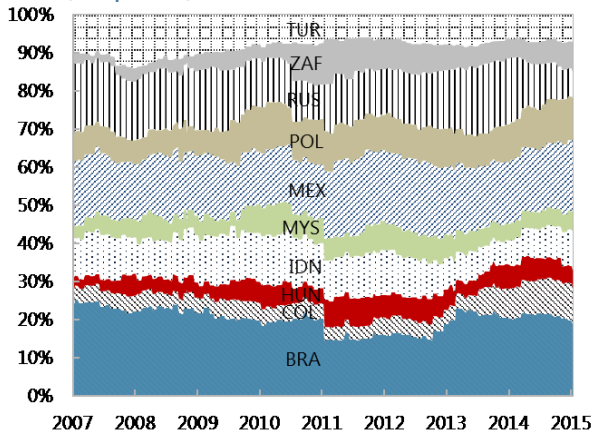
<sup>28</sup> Such as Fratzscher (2011).

<sup>29</sup> Theil coefficient =, 
$$U = \frac{\sqrt{\frac{1}{n} \sum_t (X_t - Y_t)^2}}{\sqrt{\frac{1}{n} \sum_t X_t^2 + \frac{1}{n} \sum_t Y_t^2}}$$

where n is the number of periods, X is the predicted weight of a country in the model-based portfolio and Y is the weight of a country in the EPFR portfolio. The coefficient is between 0 and 1, with lower numbers indicating a higher accuracy of the model.

**Figure 19. EPFR Implied Allocation**  
(percent of portfolio)

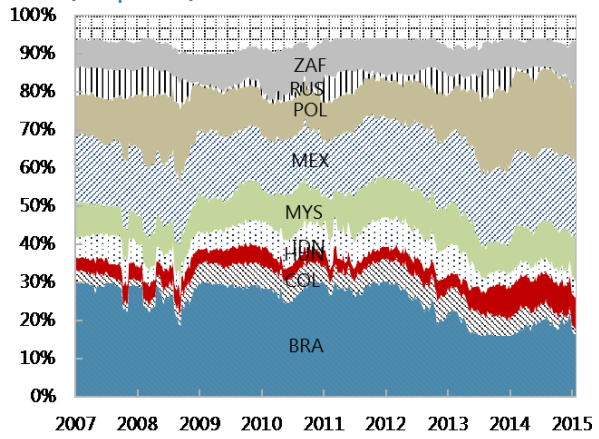
**EPFR Implied Allocations**  
(% of portfolio)



Sources: EPFR Global and staff calculations.

**Figure 20. Model Based Allocations**  
(percent of portfolio)

**Model-Based Allocations**  
(% of portfolio)

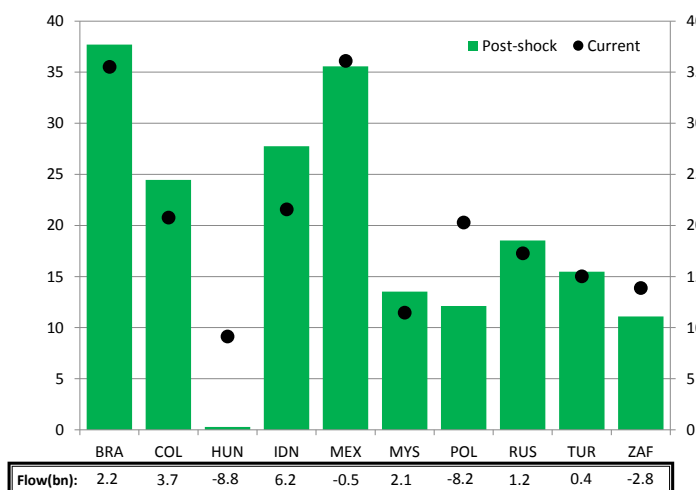


Sources: Staff calculations.

**43. The tool is used to analyze a stress scenario of rapid US dollar appreciation.** The scenario for the dollar appreciation is chosen by examining actual events of dollar appreciations over a twelve week (one quarter) period using the historical data over the whole sample (i.e. from 2005). For illustrative purposes the most extreme appreciation is chosen, which is the period between August 6, 2008 and October 22, 2008, corresponding to a 14 percent appreciation of the US dollar trade-weighted broad market index. After choosing this particular scenario, the coinciding returns on the EM sovereign bond indices are also chosen. This is done to preserve the covariances across the returns over the specific twelve week

**Figure 21. Reaction to a 14 percent USD Appreciation over 3 Months**

EPFR allocations - USD billions



Source: IMF Staff

period. The collection of returns are then appended to the last available data in the sample (i.e. the end of February 2015), replicating the same pattern of returns over the stress scenario. The optimization tool is then applied over the simulated sample, using the same two-year rolling variances and covariances. From the results, we are able to calculate the change in the portfolio weights and the total return of the whole portfolio over the twelve weeks.

**44. Under a stress scenario of rapid US dollar appreciation, there could be a significant reduction in the overall position of mutual fund investors in emerging market sovereign bonds** (Figure 21). The scenario is chosen by examining actual dollar appreciation events over a twelve week (one quarter) period using the historical data over the whole sample, which starts from 2005. Under the scenario of the largest appreciation of the US dollar in one quarter, the entire portfolio's value drops by about 2.3 percent from its starting level, likely encompassing valuation effects, portfolio reallocation, and actual outflows from funds. Positions among the different countries shift, with some countries experiencing notable declines but others experiencing gains. Not surprisingly, under such a scenario, some emerging markets could see sizable capital outflows and valuation losses, exacerbating negative shocks to economies at a time when their sensitivities to external financing are particularly high.

## B. Modeling Macroeconomic Developments with Balance Sheets

### A BVAR Based Tool<sup>30</sup>

*How do balance sheets of households and nonfinancial corporations affect economic developments? To address this question, we present an analytical framework that could be implemented by desks 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.*

- 45. We study the interaction between the real business cycle and balance sheets of households and nonfinancial corporates.** Balance sheet composition and leverage are the central links between credit markets and the real economy. Changes in the balance sheet and their economic implications are key to understanding the health of corporates and household sectors. How does the balance sheet channel affect the forecast of aggregate macroeconomic variables and shock transmission? Importantly, how does economic policy, in particular, monetary policy, affect the balance sheet position of agents in the economy, namely assets and net worth? These are the key questions that we aim to address.
- 46. To do so, we estimate the impulse response functions (IRF) implied by a class of models—Large Vector Auto Regression (VAR) models<sup>31</sup>, using a Bayesian method, which offers greater accuracy.** In this way, we can trace out the effect of policy, as well as that of real and financial innovations, on the economy. We also compute conditional out-of-sample forecast scenarios in order to assess whether balance sheet variables improve the forecasting exercise. Our methodology<sup>32</sup>, which hinges on using large information set, allows for having a full picture of economy, thus enhancing the accuracy of the results.
- 47. For illustrative purposes, the model is applied to the United States and shows that using balance sheet information improves the forecast of aggregate activity.** We estimate the model on US data from 1973Q1 to 2014Q4 and consider two sectors for the balance sheet block, households (HH) and non-financial corporations (NFC). Conditional forecast scenarios<sup>33</sup> show that the out-of-sample forecast of real GDP, consumption and

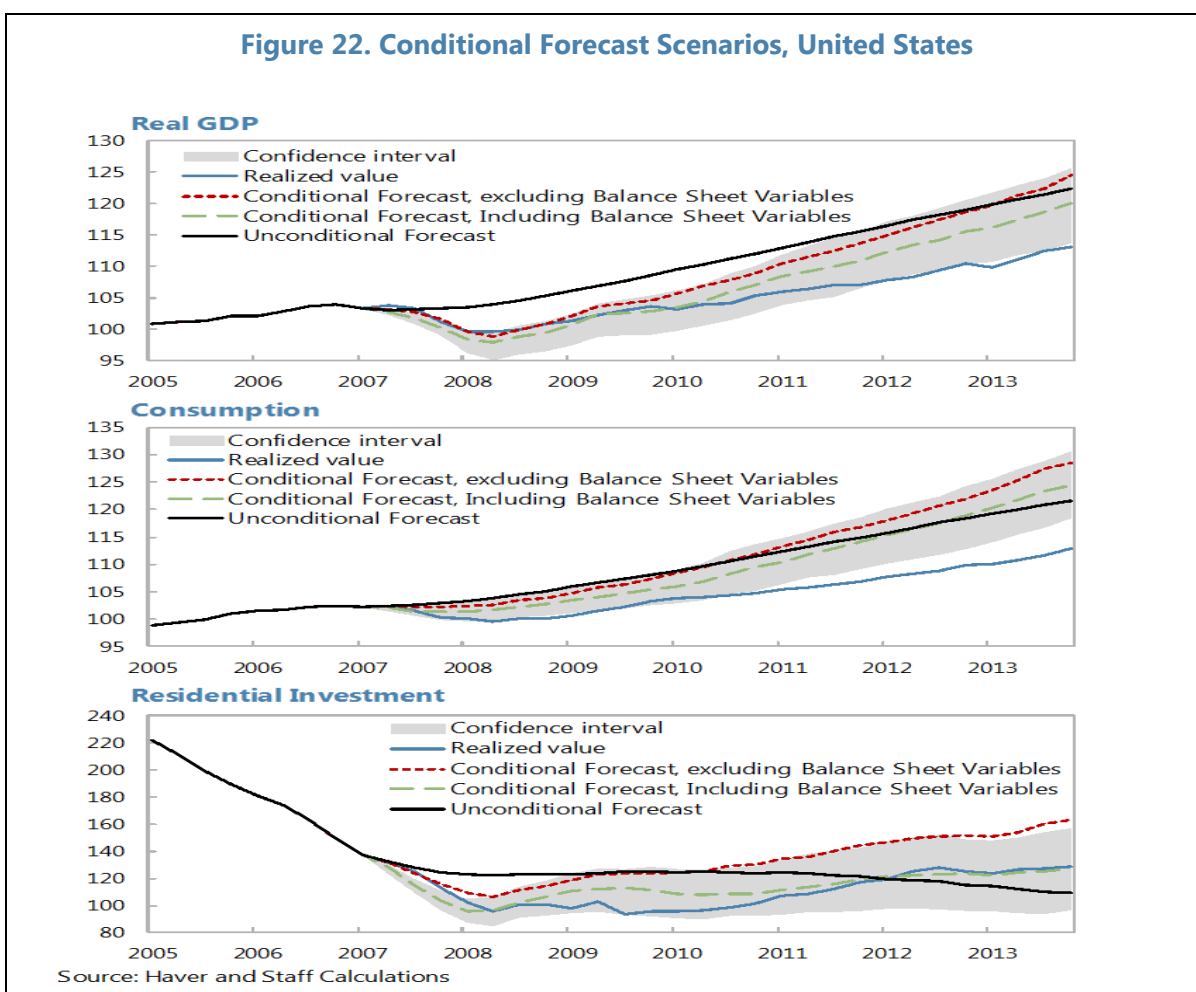
<sup>30</sup> Prepared by Marzie Taheri Sanjani (SPR).

<sup>31</sup> This work is related to the strand of literature on large BVAR (see, Taheri Sanjani (2014), De Mol, Giannone, and Reichlin (2008) and Banbura, Giannone, and Reichlin (2010), Giannone, Lenza, and Primiceri (2012), Giannone and Reichlin (2006), Bernanke, Boivin, and Elias (2005), Giannone, Lenza, and Reichlin (2012)).

<sup>32</sup> We estimate the priors using Bayesian shrinkage. Under this shrinkage technique, the model's coefficients shrink toward a parsimonious naive benchmark and hence reduce estimation uncertainty. The degree of priors' informativeness is chosen to maximize the marginal likelihood (Giannone, Lenza, and Primiceri (2012)).

<sup>33</sup> The model parameters are estimated prior to the crisis.

residential investment improve when we account for balance sheet variables (Figure 22). To compute the forecast, we estimate the model up to beginning of the crisis 2007Q3 and consider three scenarios. The black lines present the unconditional scenario, where we do not take into account the future path of the variables in the model for simulating the forecast; the red line demonstrates the conditional forecast when we use the information on the future path of the variables in the model, except the balance sheet variables and the variable of interest which we are forecasting. The green line shows the conditional scenario when we use the path of all the variables in the model except the variables of interest, which we are forecasting. Forecast scenarios that include balance sheet variables (green curves) suggest a more sizable and persistent downturn in housing investment, broadly in line with actual developments (blue curves), which those that exclude the balance sheet channel (red curves) far more greatly underestimate the extent of the downturn. By contrast, the model adds relatively less to forecasts of non-residential investment, which could reflect the fact that it was household balance sheets that were at the center of the crisis (and subsequent deleveraging pressures) in the United States. In future planned extensions to the Euro where corporate sector balance sheets played more of a role.



## Impulse Response Functions

48. **First, we investigate monetary policy transmission to the real economy, incorporating balance sheet channels.** Given the data rich structure of our analysis one can also simulate other shock scenarios such as oil shocks, commodity or house prices shocks, corporate yield shocks, along with the shocks that originate in the balance sheet of households and nonfinancial corporations.

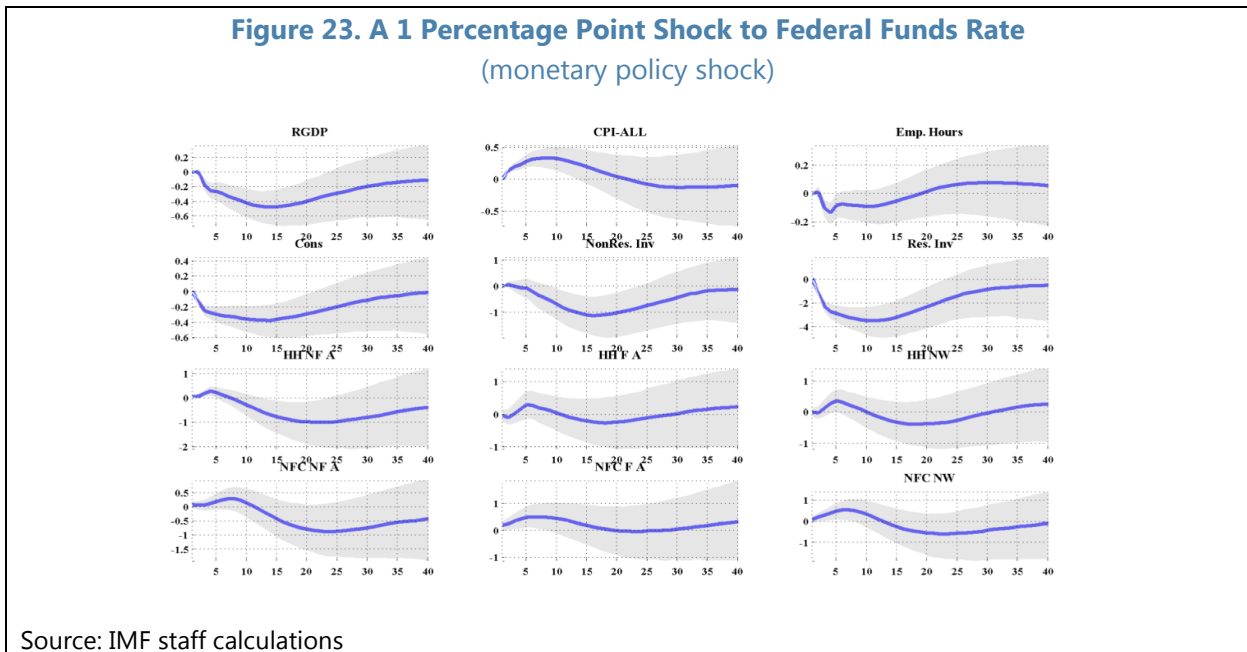


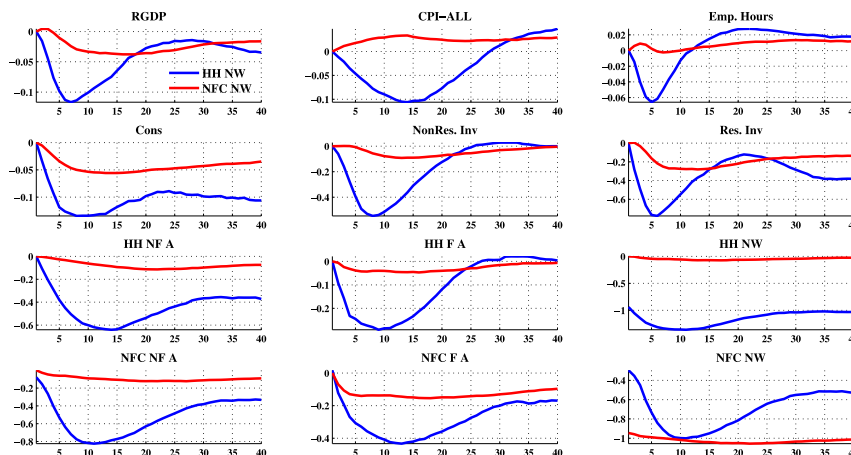
Figure 23 reports the median as well as the 16th and 84th percentiles of the posterior distribution of the impulse responses to a 1 percentage point monetary policy shock within the large-scale VAR model, for a selected sample of variables. A contractionary monetary policy generates a downturn. GDP, consumption, investment, and employment, and other variables related to real economic activity, substantially contract. Prices decrease with a lag. Monetary aggregates, M1 and M2, also decrease, indicating liquidity effects. Moreover, the long rates jump upon impact, although less in degree than the short-term rate (for more on the sticky response of interest rates at longer maturity, see Peersman and Smets (2001)). The exchange rate and corporate bond yields appreciate. Nonfinancial assets in both household and non-financial corporation sectors go down sluggishly but they start recovering after around 6 years. The response of financial assets and net worth is more muted.



**49. Shocks to balance sheets are also found to have a significant though heterogeneous economic impact** (Figure 24). Those with origins in household balance sheets have a more pronounced impact on activity as compared with similar shocks to the nonfinancial corporate sector. This likely reflects the fact that household balance sheets in the United States—as in many other economies—are much larger than corporate balance sheets overall (four times in the case of the US). Furthermore, the channels through which they manifest are also different. Shocks to household balance sheets are found to impact on the demand channel, while those to NFC balance sheets work as supply shocks, as corporates cut back on investment. The implied monetary policy response to these shocks—and respective channels—are therefore different. Together, these findings underscore the importance of gathering data on the household and corporate sector—both to enhance the accuracy of macroeconomic forecasts and to fine tune policy responses.

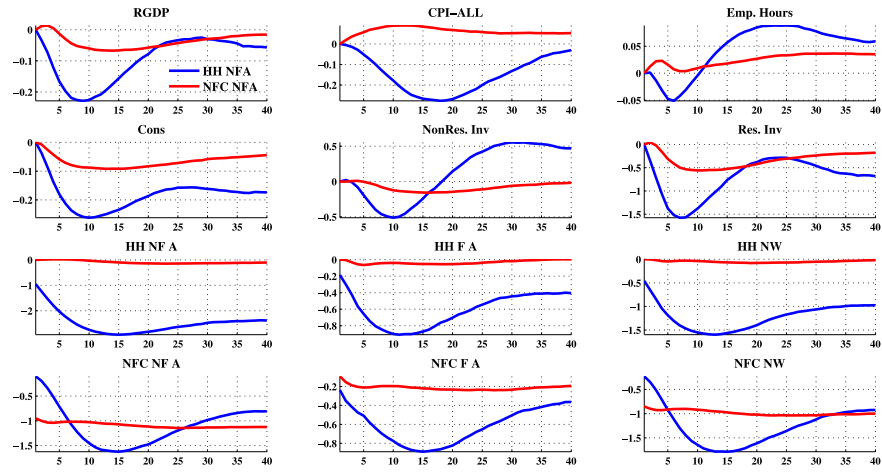
Figures 24, 25, and 26 present the median as well as the 16th and 84th percentiles of the posterior distribution of the impulse responses to 1-percentage point adverse shock in net worth, non-financial assets and financial assets, respectively, within the large-scale VAR model, for a selected sample of variables.

**Figure 24. A 1 Percentage Point Adverse Shock to Net Worth**



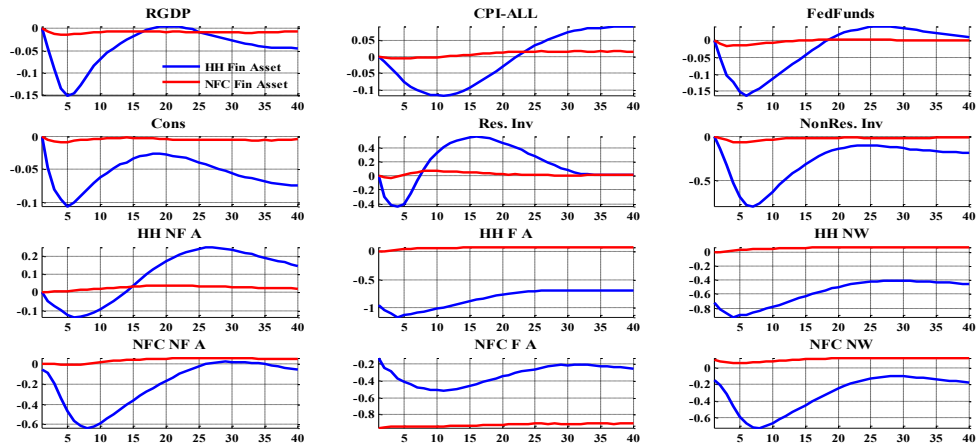
Source: IMF staff calculations

Figure 25. A 1 Percentage Point Adverse Shock to Non-Financial Assets



Source: IMF staff calculations

Figure 26. A 1 Percentage Point Adverse Shock to Financial Assets



Source: IMF staff calculations

**Credit, Housing Wealth, and Consumption**<sup>34</sup>

*Household consumption is linked to balance sheets of banks and household through the financial accelerator as well as wealth and collateral effects. We introduce a model to estimate how house prices—the main component of household non-financial wealth—are affected by credit, and in turn how house prices affect household consumption.*

- 50. 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.
- 51. Given inelastic supply in the short-term, demand effects from mortgage financing have a bearing on property values and vice versa.** As the majority of home buyers rely on mortgage financing, an increase (decrease) in mortgage credit is associated with higher housing demand and subsequently higher property values. In an analogy to the financial accelerator effect (Bernanke and Gertler, 1989), the collateral effect of higher (lower) property values can also lead to an easing (tightening) of households' lending capacity and a procyclical strengthening (weakening) of housing demand. While house prices can also have a bearing on residential investment, however, housing supply tends to respond only with long lags.
- 52. Previous estimates have confirmed the empirical relationship between house prices and consumption.** Previous studies have estimated that a 10 percent rise in housing values lifts consumption by between 0.2 and 1.3 percent (Table 16). The wealth effect is thus typically stronger than for financial assets, although the magnitude depends on country circumstances, such as access to housing finance and wealth distribution (Mian et al., (2013); Lydon and O'Hanlon (2012).

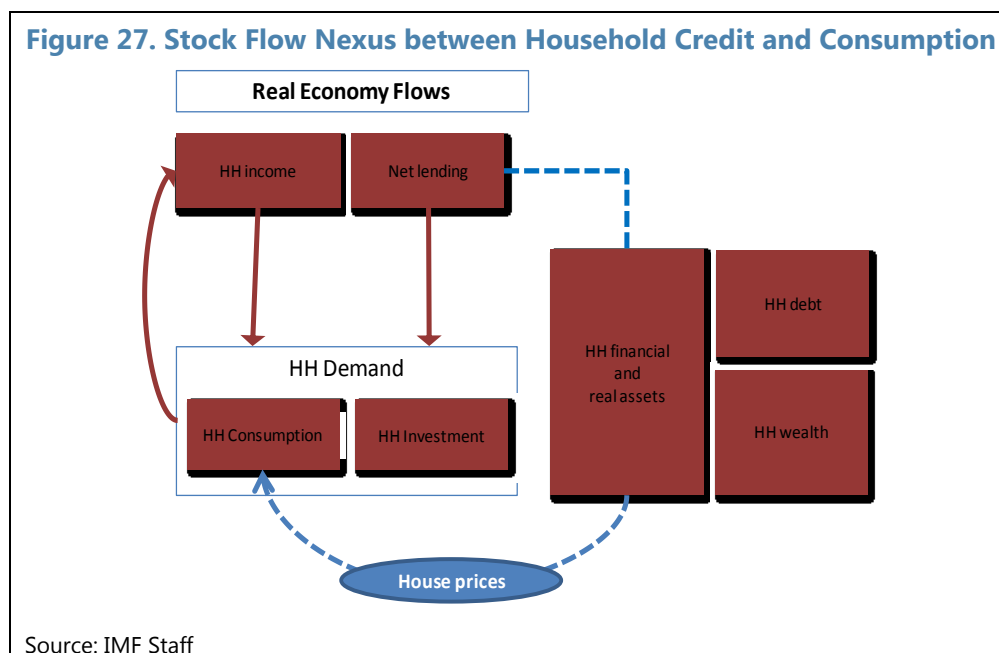
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<sup>34</sup> Prepared by Jochen Andritzky (SPR).

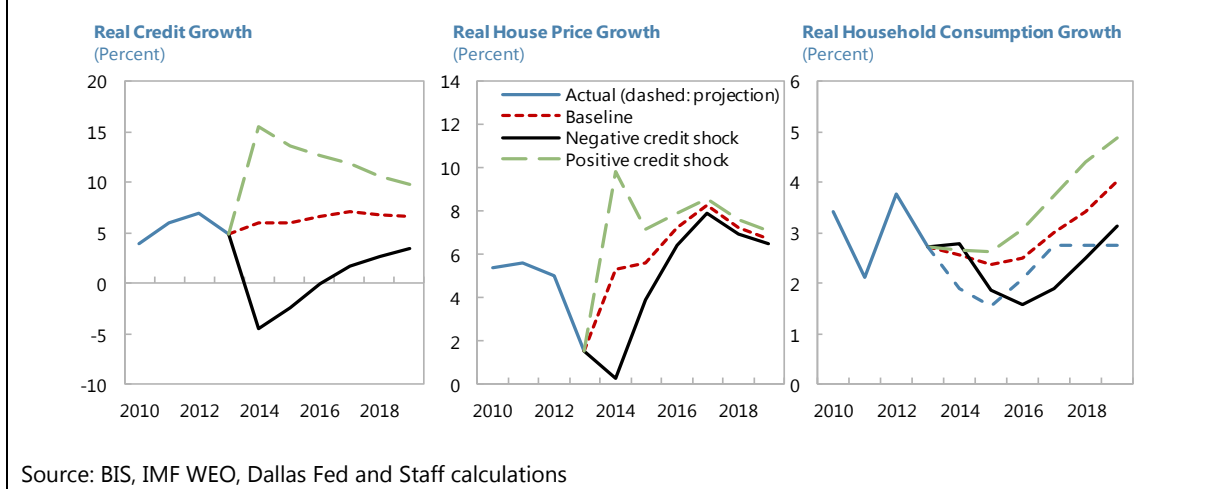
**Table 16. Estimates of Elasticities of Household Consumption**

	House prices or housing assets	Financial assets	Countries
Case, Quiley, Shiller (2005/2011)	0.13	Insig.	AM
Mrckaic (2014)	0.11	0.01	NLD
Benjamin, Chinloy, Jud (2004)	0.08	0.02	US
Campbell, Cocco (2006)	0.08		US
Bostic, Gabriel, Painter (2009)	0.06	0.02	US
Tang (2006)	0.06	0.02	AUS
Igan, Loungani (2012)	0.05		AM
Dreger, Reimers (2009)	0.03	0.03	EUR
Bassanetti, Zollino (2010)	0.02	0.05	ITA
Carroll, Otsua, Slacalek (2010)	0.02	0.01	US

- 53. The effect of credit on house prices is more intricate.** A few papers have documented a two-way relationship between credit and house prices, i.e. house prices affecting credit and vice versa. Anundsen and Jansen (2013), Gimeno and Martinez-Carrascal (2010), and Fitzpatrick and McQuinn (2007) document the interdependence between house prices and credit through a cointegrating analysis for both the short and the long run. However, other studies, such as Hofmann (2004), find that the only robustly significant effect runs from credit to house prices.
- 54. In our empirical application, the relationship between mortgage credit and household consumption is modeled through house prices as the main driver of the wealth effect (Figure 27).** Taking advantage of the long-run relationship between property prices and household balance sheet variables—e.g. debt, income and interest rates—and expectations that house prices react to credit shocks, we estimate a structural vector error correction model.



- 55. Applying this model to Norway suggest a strong effect of credit on house prices, and a high elasticity of consumption with regard to housing wealth.** The results underscore the strong effect of credit on house prices, and in turn house prices on consumption. Figure 28 illustrates some tentative results in applying the framework to Norway, building on related work by Anundsen and Jansen (2013). An illustrative positive shock to real credit growth of 10 percentage points could increase house prices and household consumption growth by about 7 and 2 ½ percentage points vis-à-vis the baseline, respectively, over a 5 year horizon. For Norway, a strong feedback effect from house prices on credit suggests the initial credit shock could be propagated through a strong collateral effect. The cointegration model estimates that the rise in household credit may exceed the rise in house prices, which implies a deterioration of households' debt-to-asset ratio from 100 to 123 percent assuming inelastic housing supply. Furthermore, the wealth effect on consumption from rising house prices would be estimated to be relatively persistent.
- 56. Simple models of this kind could enhance Fund surveillance in a number of ways.** First, the estimation helps to understand the directionality and strength of balance sheet effects from house prices on credit and vice versa, as well as from housing wealth to consumption. Second, the framework can be used to numerically explore the nexus between credit supply, house prices, consumption, interest rates, and incomes. This could help, for instance, to examine the effect of macroprudential measures constraining mortgage lending. Third, the framework enables the projection of household and bank balance sheets as well as indicators of balance sheet vulnerability such as debt-to-assets or debt-to-income of households, which can also be helpful in calibrating macroprudential policies.

**Figure 28. Norway—Projections Under Credit Shock Scenarios****Technical Details**

**57. We extend a model by Anundsen and Jansen (2013) in a second step to household consumption.** As a first step, we estimate a structural vector error correction model following Anundsen and Jansen (2013). The model consists of two simultaneous equations each for the long equilibrium as well as the short run dynamic of house prices and credit,

$$\left. \begin{aligned} hp_t &= -1.51 + 0.40 * \theta_t + 0.06 * y_t + \varepsilon_{hp,t} \\ \theta_t &= 2.49 + 1.47 * hp_t - 0.01 * \Delta r_{t-1} + \varepsilon_{\theta,t} \end{aligned} \right\} (1a)$$

$$\left. \begin{aligned} \Delta hp_t &= 0.08 + 0.48 * \Delta \theta_t - 0.37 * \Delta \theta_{t-1} + 0.32 * \Delta hp_{t-1} - 0.004 * \omega_{hp,t-1} + 0.004 * \varepsilon_{\theta,t-1} + \gamma_{hp,t} \\ \Delta \theta_t &= 0.01 + 0.79 * \Delta \theta_{t-1} + 0.14 * \Delta hp_t - 0.01 * \Delta y_{t-1} - 0.003 * \Delta r_{t-1} - 0.0004 * \varepsilon_{d,t-1} + \gamma_{d,t} \end{aligned} \right\} (1b)$$

where  $hp$  is the house price index,  $\theta$  is household credit,  $y$  is household disposable income,  $r$  is the interest rate, and  $\varepsilon$  refers to residuals from the long term relationship of equation (1a). All variables are in log real terms, while the interest rate is in real terms. In a second step, the effect of gross housing wealth on household consumption is estimated with a vector error correction model,

$$\left. \begin{aligned} c_t &= 1.41 + 0.33 * y_t + 0.46 * hp_t + \varepsilon_{c,t} \\ \Delta c_t &= 0.44 * \Delta c_{t-1} + 0.29 * \Delta c_{t-2} + 0.18 * \Delta y_{t-1} - 0.21 * \varepsilon_{c,t-1} + \gamma_{\Delta c,t} \end{aligned} \right\} (2)$$

where  $c$  is household consumption. Income projections are derived using the WEO's consumption forecast and assuming a constant savings rate. The model is estimated using annual data from 1995 to 2014 for Norway for demonstrative purposes. Coefficient estimates suggest a strong effect of credit on house prices, and a high elasticity of consumption with

regard to housing wealth. Short-run dynamics of Equations (1b) result in a strong effect of credit on house prices comparable to Andersen and Jansen (2013). Our estimates also show a significant short-term coefficient for house prices in the credit equation, which may be related to the lower data frequency used herein (annual instead of quarterly).

**58. The model has some important caveats.** First, the chosen parsimonious specification assumes income and real interest rates to be exogenous, a trade-off also adopted by Anundsen and Jansen (2013) following the stepwise elimination of insignificant variables from the system. Second, housing supply is assumed to be inelastic over the projection period. Third, the balance sheet-consumption nexus excludes the possible effects of debt overhang (Bouis, 2015), which may need to be considered when applying the framework to countries with high household debt. Finally, estimates provided here for demonstrative purpose are derived from a relatively small sample of annual data.

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