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Mapping the Shadow Banking System Through a Global Flow of Funds Analysis

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Abstract

This paper presents an approach to understanding the shadow banking system in the United States using a new Global Flow of Funds (GFF) conceptual framework developed by the IMF's Statistics Department (STA). The GFF uses external stock and flow matrices to map claims between sector-location pairs. Our findings highlight the large positions and gross flows of the U.S. banking sector (ODCs) and its interconnectedness with the banking sectors in the Euro area and the United Kingdom. European counterparties are large holders of U.S. other financial corporations (OFCs) debt securities. We explore the relationship between credit to domestic entities and the growth of non-core liabilities. We find that external debt liabilities of the financial sector are procyclical and are closely aligned with domestic credit growth.

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I. INTRODUCTION

The financial system channels savings from savers to those who draw on the savers' funds—from ultimate lenders to ultimate borrowers. Some credit will be directly provided from the lender to the borrower, as is the case with Treasury securities, municipal bonds, and corporate bonds. A large part of the financing in today's economy is intermediated in wholesale money markets through banks and other financial intermediaries and lent in the capital markets. This is nowadays considered as shadow banking.

The Financial Stability Board (FSB, 2011) defines the shadow banking system as "credit intermediation involving entities and activities (fully or partially) outside the regular banking system" or nonbank credit intermediation in short. Recent IMF staff work focuses on policy responses to rising shadow banking activities, arguing that an appropriate set of policies may lead to a smaller shadow banking system. It also looks at the shadow banking system by introducing new methods to thinking about financial intermediation.[2]

Our paper presents an approach to understanding the shadow banking system in the broader context of the operation of the international capital markets, leveraging work by the IMF's Statistics Department (STA) on global flow of funds (GFF).[3] In particular, we will use a new GFF conceptual framework (see Errico, et al., 2013) to map the funding and lending positions associated with shadow banking in the United States.

In the rest of the paper, we will illustrate the potential usefulness of the GFF approach in the context of identifying both the directions and the magnitudes of the capital flows associated with the shadow banking system in the United States. The work in mapping the flows is still in its early stages, and several simplifying assumptions have been employed due to existing gaps in the data, on which more below.

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[2] See Claessens et al, 2012; Pozsar and Singh, 2011; and Singh and Aitken, 2010.

[3] In this paper, the shadow banking is defined as a global space concept (matrix), which reaches outside traditional borders of banks and non-banks, and is quantified using a survey of financial liabilities covering institutions, markets, and financial instruments. Therefore, the shadow banking defined in this paper combines non-core liabilities of other depository corporations (ODCs), also more commonly referred to as banks, and other financial corporations (OFCs).

In a nutshell, the new GFF conceptual framework is aimed at constructing a GFF matrix, mapping domestic and external financial stocks which can be then broken down bilaterally (potentially) by the 30 or so jurisdictions identified by the IMF as hosting systemically-important financial sectors.[4] The domestic and external financial stocks matrices use existing IMF and other data sources and, for policy-makers, help strengthen the analysis of interconnectedness across borders, global liquidity flows and global financial interdependencies, and support assessments of shadow banking activities.

Shadow banking grew rapidly before the global financial crisis, from an estimated US $27 trillion in 2002 to US $60 trillion in 2007 (FSB (2011, p. 8)). Adrian, Ashcraft and Cetorelli (2013) list several reasons for why the shadow banking system may arise, such as specialization and regulatory arbitrage, and they also list the potential costs of the shadow banking system, such as the leverage cycle, funding fragilities, and neglected risks. A broader question is what role the international context plays in the fluctuations in the size of the shadow banking system. A useful distinction in this regard is that between core and noncore liabilities of the banking and intermediation sector more generally (Shin and Shin (2012)). Core liabilities can be defined as the funding that the intermediaries draw on during normal times, and is sourced (in the main) domestically.

The constituents of core funding will depend on the context and the economy in question, but retail deposits of the domestic household sector would be a good first conjecture in defining core liabilities. When banking sector assets are growing strongly during a lending boom, the core funding available to the intermediary sector is likely to be insufficient to finance the rapid growth in new lending. That is, the pool of retail deposits is not likely to be sufficient to fund the increase in bank credit. Other sources of funding must then be tapped to fund rapidly increasing bank lending. The state of the financial cycle is thus often reflected in the composition of intermediary liabilities.

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[4] The identified 30 or so jurisdictions together are responsible for about 90 per cent of global cross-border claims.

Such procyclical behavior of the banking sector has consequences for capital flows. When credit is expanding rapidly, outstripping the pool of available retail deposits, the bank will turn to other sources of funding to support its credit growth, typically from other banks operating as wholesale lenders in the capital market.

Figure 1: Lending Boom Financed by Noncore Liabilities. This figure depicts the banking sector balance sheet before and after a credit boom. Increased lending during a credit boom is financed by noncore liabilities.
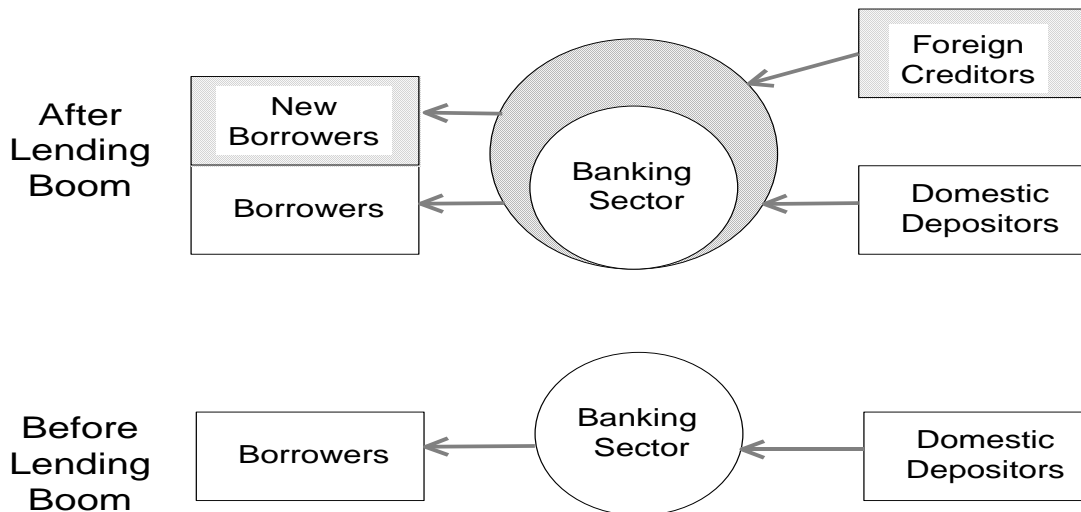
Source: Hahm, Shin and Shin (2013).

Figure 1 is a schematic illustration of the way that a lending boom will be associated with shifts in the composition of the balance sheet of the financial intermediary sector. The bottom panel of **Figure 1** is the intermediation sector before a credit boom, while the top panel illustrates the intermediation sector during the boom. As traditional deposit funding does not keep up with the credit growth, the banking sector's expansion is funded by noncore liabilities (in this example, from foreign creditors), building up vulnerabilities to deleveraging by foreign creditors.[5] Hahm, Shin and Shin (2013) show through a cross-country panel probit study that the incidence of noncore liabilities of the banking system has value in signaling the onset of financial crises.

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[5] In this paper, we use the terms "noncore liabilities" and the "capital flows associated with shadow banking system" interchangeably.

The schematic in **Figure 1** can be associated with core and noncore liabilities of the financial corporations sector (as shown in **Figure 18** below) and also with current account deficits that are financed through the increased borrowing by the domestic intermediation sector. For some instances (e.g., the experience of Spain in the 2000s) such a picture captures the key elements of the relationship between lending booms and capital flows.

The schematic in **Figure 1** misses some crucial aspects. For instance, having a current account surplus would not be a sufficient condition for avoiding a crisis if the schematic in **Figure 1** applied to the banking sector when viewed in isolation, even if other sectors of the economy ran surpluses vis-à-vis the rest of the world. If the foreign creditors to domestic banks are global banks, they may be subject to funding pressures and may withdraw their lending in the event of a sharp deterioration of capital market conditions. The identity of the lenders will, therefore, matter when assessing the degree of vulnerability.

Another way to state the same point is that *gross flows* for each sector will matter, as well as net flows for the whole economy. Even if the country as a whole is running a current account surplus, if the intermediation system conforms to the picture in **Figure 1**, then the deleveraging by the creditors to the intermediation system will matter for a vulnerability assessment.[6]

Our findings address a wider set of issues that have attracted recent attention in international finance. Whereas current account gaps have traditionally been considered as the determinant of capital flows, many recent papers have drawn attention to the dramatic increase in gross capital flows, especially through the banking sector—see Borio and Disyatat (2011), Forbes and Warnock (2012), Lane and Pels (2011), Obstfeld (2012a, 2012b) and Rey (2013). Indeed, Obstfeld (2012b p.3) concludes that "large gross financial flows entail potential stability risks that may be only distantly related, if related at all, to the global configuration of saving-investment discrepancies." One reason for the caution is that the growth in gross

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[6] South Korea's experience in the run-up to the 2008 crisis gives useful lessons in this regard. South Korea ran either balanced current accounts or saw surpluses in the years leading up to the 2008 crisis, but was one of the countries most severely affected by the financial turmoil unleashed after the bankruptcy of Lehman Brothers in September 2008.

capital flows was associated with increased leverage and the size of the banking sector as a whole, as emphasized by Gourinchas and Obstfeld (2012) and Schularick and Taylor (2012). Our contribution relative to the existing literature is to highlight the interaction of global and local banks as the driver of fluctuations in financial conditions.

Based on the approach developed by Errico, et al. (2013), the GFF has two dimensions, as we will explain in more detail below. One dimension is the mapping of the balance sheet of each sector to other sectors in the domestic economy and the rest of the world. The second dimension is the mapping of the external sector to all the jurisdictions globally. The two dimensional mapping allows policy makers to ascertain the answers to questions that relate to the links between sector j in country A to country B, and can potentially be expanded to also identify the sector k in country B. (See **Table 2** and **Figure 3** for illustration.) Such granular information across sectors and countries will be crucial when we begin to address the operation of the shadow banking system, as many of the legal entities that make up the shadow banking system will not be captured as being part of the formal banking system.

In the rest of the paper, we will illustrate the potential usefulness of GFF analysis in the context of identifying both the directions and the magnitudes of the capital flows associated with the shadow banking system in the United States. The work in mapping the flows is still in its early stages, and several simplifying assumptions have been employed, due to existing data gaps and confidentiality constraints.[7]

Our illustrative work is retrospective. This exercise provides many useful lessons on what types of data would have been informative during the boom phase, and directs the policy makers to ask the right questions. In this sense, even though our exercise is retrospective, it holds out hopes that a more systematic application of the methods described in our paper may illuminate the nature of the link between capital flows between sectors. Through such an exercise, the understanding thus gained would enable national and global policy makers in identify trends on a timely basis that they may employ in their surveillance work.

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[7] Annex 3 provides a synopsis of identified data gaps and measurement constraints.

We discuss next the extent to which such GFF analysis may help identify the flow of funds through the U.S. shadow banking system in the context of a national and global financial system and help identify vulnerabilities associated with current developments in emerging market economies.

Our paper concludes with a discussion on directions for future work and existing data gaps. This is followed by a discussion on how closing the identified data gaps will support the GFF analysis, including mapping the shadow banking.

II. OVERVIEW OF THE U.S. FINANCIAL SYSTEM

The objective of the GFF approach employed in this paper is to produce the full domestic and external stock matrices. **Table 1** and **Table 2** show what may be possible in a GFF framework for the United States which will enable the monitoring of financial positions both regional/national and cross-border (by country and sector). First results are presented in this paper.

Table 1 is an illustration of the Balance Sheet Approach (BSA) matrix for the United States for the end of 2012. The matrix identifies nine sectors: eight domestic sectors and the nonresidents sector. Each column corresponds to the balance sheet of the sector in question, and the assets and liabilities are then listed in the rows by instrument with the counterparty sectors identified for each cell. In **Annex 1** we provide a fuller discussion of the methodology for deriving the BSA matrix.

By way of illustration, the red circled set of entries in **Table 1** shows that the OFCs in the United States held assets of US $2,453 billion against the U.S. banking sector (or ODCs)[8] largely in the form of currency and deposits and had liabilities of US$3,920 billion to ODCs in the form of securities other than shares primarily.

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[8] For the definitions of other depository corporations (ODCs) and other financial corporations (OFCs) see International Monetary Fund (2000) and International Monetary Fund (2008).

Table 1: BSA matrix for the Unites States for 2012

Holder of claim (creditor) \\ Issuer of liability (debtor)	Central bank A	Central bank L	Central bank NP	Central government A	Central government L	Central government NP	State and Local Government A	State and Local Government L	State and Local Government NP	Public Nonfinancial Corporations A	Public Nonfinancial Corporations L	Public Nonfinancial Corporations NP	Other Depository Corporations A	Other Depository Corporations L	Other Depository Corporations NP	Other Financial Corporations A	Other Financial Corporations L	Other Financial Corporations NP	Nonfinancial Corporations A	Nonfinancial Corporations L	Nonfinancial Corporations NP	Other resident sectors A	Other resident sectors L	Other resident sectors NP	Nonresidents A	Nonresidents L	Nonresidents NP
Central bank				57	1,657	-1,600	0	0	0	0	0	0	1,534	1	1,533	23	79	-56	0	0	0	0	927	-927	160	160	1
Currency and deposits ...																											
Central government	1,657	57	1,600										825	64	761	3,033	11	3,022							5,702	85	5,617
Currency and deposits ...																											
State and Local Government	0	0	0										726	568	159	1,276	614	663									
Currency and deposits ...																											
Public Nonfinancial Corps.	0	0	0										0	0	0	0	0	0							1,418	842	576
Currency and deposits ...																											
Other depository corporations	1	1,534	-1,533	64	825	-761	568	726	-159	0	0	0				2,453	3,920	-1,467	2,220	1,325	895	8,770	6,812	1,958	2,285	1,996	288
Currency and deposits ...																											
Other financial corporations	79	23	56	11	3,033	-3,022	614	1,276	-663	0	0	0	3,920	2,453	1,467				50	12,162	-12,113	21,151	8,630	12,521	5,747	6,919	-1,172
Currency and deposits ...																											
Nonfinancial corporations	0	0	0										1,325	2,220	-895	12,162	50	12,113							9,298	5,416	3,882
Currency and deposits ...																											
Other resident sectors	927	0	927										6,812	8,770	-1,958	8,630	21,151	-12,521									
Currency and deposits ...																											
Nonresidents	160	160	-1	85	5,702	-5,617	0	0	0	842	1,418	-576	1,996	2,285	-288	6,919	5,747	1,172	5,416	9,298	-3,882						
Currency and deposits ...																											

Source: IMF Statistics Department, BIS International Banking Statistics, U.S. Federal Reserve Board.

Other financial corporations	Assets	Liabilities	Net position
Other depository corporations	2,453	3,920	-1,467
In domestic currency	2,453	3,920	-1,467
Currency and deposits	1,724	0	1,724
Securities other than shares	170	3,155	-2,985
Loans	558	656	-97
Shares and Other Equity		109	
Insurance technical reserves	0	0	0
Financial derivatives			
Other accounts receivable			
In foreign currency			
Currency and deposits	0	0	0
Securities other than shares	0	0	0
Loans	0	0	0
Shares and Other Equity		0	
Insurance technical reserves			
Financial derivatives			

sectoral/instrumental breakdowns not fully available

Table 2: United States external flow of funds matrix for 2012

Issuer of liability (debtor)	Nonresidents			Euro Area			Switzerland			United Kingdom		
Holder of claim (creditor)	A	L	NP	A	L	NP	A	L	NP	A	L	NP
Central Bank	160	160	1	0	0	0	0	0	0	0	0	0
Currency and deposits												
...												
Public Sector (excluding Central Bank)	7119	926	6193	234	1077	-843	93	32	61	420	113	307
Currency and deposits												
...												
Other depository corporations	2285	1996	288	389	313	77	48	65	-17	619	902	-283
Currency and deposits												
...												
Other financial corporations	5747	6919	-1172	774	1420	-646	74	233	-159	270	897	-628
Currency and deposits												
...												
Nonfinancial Private Sector	9298	5416	3882	1275	945	330	176	143	32	818	764	53
Currency and deposits												
...												

Source: IMF Statistics Department, BIS International Banking Statistics, U.S. Federal Reserve Board.

	Euro Area		
	Assets	Liabilities	Net positions
Other depository corporations	389.48	312.88	76.60
Currency and deposits	233.13	123.95	109.18
Securities other than shares	54.89	12.93	41.96
Short-term	5.14	2.06	3.07
Long-term	49.76	10.87	38.89
Loans	0.00	58.61	-58.61
Shares and Other Equity	101.46	117.39	-15.93
of which DI	53.20	60.21	-7.01
Insurance technical reserves			
Financial derivatives			
Other accounts receivable			

sectoral/instrumental breakdowns not fully available

Note: Columns 2-4 of the United States external flow of funds matrix are taken from the last three columns of the **Table 1** BSA matrix for the Unites States. Numbers in column two correspond to the nonresident assets in USA (USA liabilities to nonresidents) and in column three nonresident liabilities in USA (USA assets abroad).

Table 2 is the external flow of funds matrix for the United States for 2012, where the external assets and liabilities have been disaggregated into the counterpart country, and by instrument. In **Annex 2**, we provide a fuller discussion of the methodology for the external flow of funds matrix.

When the information in **Table 1** is combined with that in **Table 2** we can map out the complete bilateral relationships between national/regional economies using stock data. The matrices could potentially be extended to flow data to quantify gross bilateral flows into: (i) transactions; (ii) changes in the value of a financial asset/liability; and (iii) other changes in volume of an asset/liability. For this next step, we would need to break down transactions data by counterpart country.

Shin (2012) provides additional evidence that some of the funding that was taken out of the United States by the European banks were recycled back into the United States for the purchase of non-Treasury securities and shares, so that the European banks became part of the overall intermediation system linking U.S. savers and U.S. borrowers (**Figure 2**).

Figure 2: European global banks and the U.S. banking system
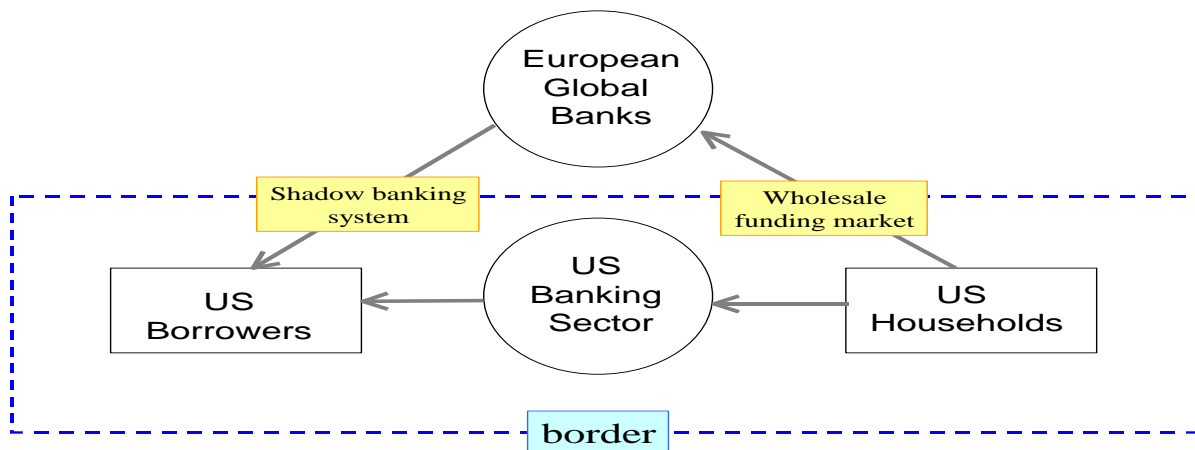
Source: Shin (2012).

Although the combination of publicly available information on U.S. balance of payments and other sources on the European banking sector gives some suggestive insights into the relationship between capital flows through the banking and nonbank sectors and the shadow banking system in the United States, the evidence is partial and incomplete in two important respects.

First, although the direction of the arrows in **Figure 2** gives some qualitative insights into the flows, the available evidence is patchy in terms of the quantities. Thus, for instance, we do not have a good handle on the question of whether the type of "round trip" flows where money first leaves the United States via the banking sector to return in the shape of the purchase of non-Treasury securities, formed the bulk of the flows, or only a small proportion.

Second, the flows are not disaggregated into the flows to and from individual countries or even regions. The publicly available data do not give systematic quantitative evidence on the activities of some group of banks relative to other banks and nonbanks.

The GFF conceptual framework that pieces together the information on the domestic flow of funds with the international investment positions gives a potential route to addressing these issues. In what follows below, we give some preliminary approaches to remedy identified information gaps. In **Annex 3**, we summarize the main measurement issues involved in the GFF approach employed in this paper.

In the aggregate, the bilateral positions between the United States and the Euro area, Switzerland, and the U.K., are shown in **Figure 3** below.

Figure 3: USA: external assets/liabilities by counterpart country and main instrument in 2012
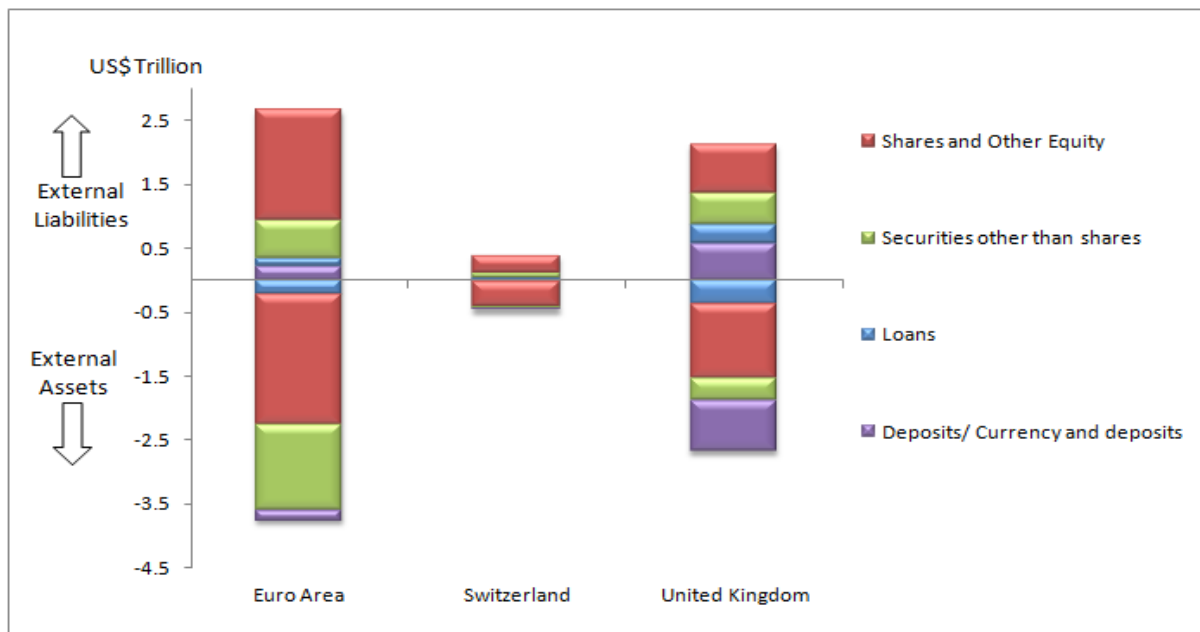
Source: IMF Statistics Department, BIS International Banking Statistics, U.S. Federal Reserve Board, ECB.

The GFF external matrix then allows presenting external positions for U.S. resident sectors by counterpart country and by instrument. **Figure 4** presents U.S. financial corporations' assets and liabilities vis-à-vis the Euro Area by type of instrument.

Figure 4: USA: Financial corporations' assets/liabilities vis-à-vis Euro Area by main instrument[9]
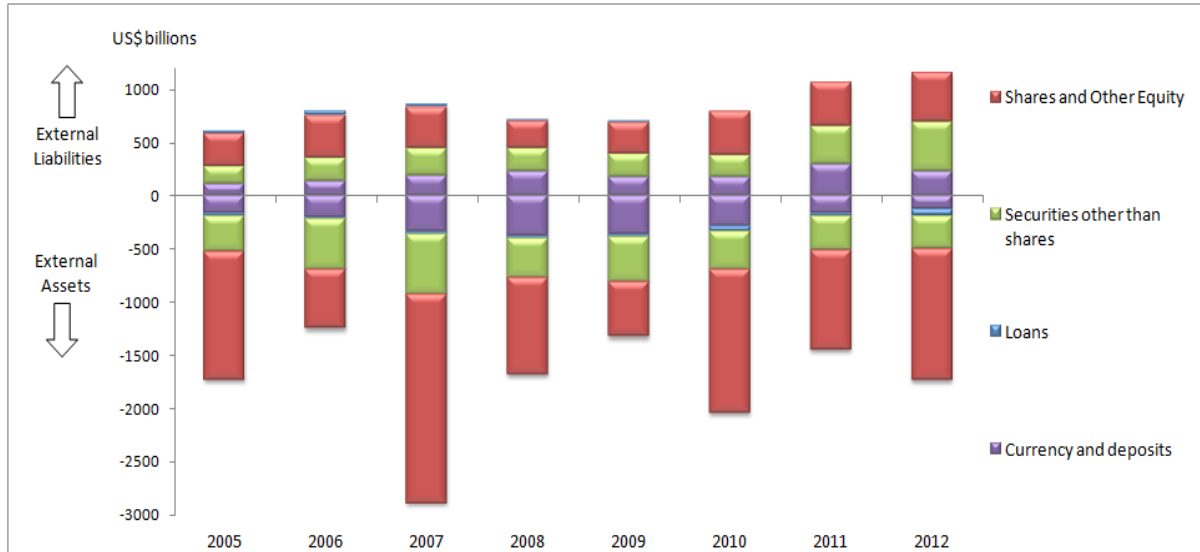
Source: IMF's Monetary and financial statistics/SRFs.

Although the GFF external matrix aggregates the sectors of the economy into broad categories, two features make the GFF external matrix informative about the direction of flows and the quantities behind those flows.

First, the shadow banking system is intimately tied to the workings of the formal banking system—the ODCs sector, and so tracking the ODCs sector gives information on the composition of the flows in the shadow banking system.

Second, in spite of the categorization of nonbanks as "Other Financial Corporations" (OFCs), the legal form of the claim can give estimates of the counterparty in the capital inflows through the purchase of securitized claims (inward-pointing arrow in **Figure 2**). We take these points in turn.

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[9] Figure 4 shows assets/liabilities of US financial corporations, which includes assets/liabilities of ODCs and OFCs. Data on Euro Area's holdings of US financial corporations' shares are not available.

Begin with the U.S. banking system. Consider **Figure 5**, which shows the gross external assets and gross external liabilities of the formal U.S. banking system (ODCs sector) by instrument. The figure covers all the major items on bank balance sheets.

Figure 5: Gross external assets and external liabilities of the U.S. banking system (ODC sector) by instrument

Source: IMF Statistics Department.

Figure 5 is notable in several respects. Note that the dominant component of the external claims and liabilities is "currency and deposits." Loans, securities and shares, and other equity are each only a small part of the external balance sheet.

The fact that deposits form the main part of the external claims and liabilities suggests that *interbank claims* form the bulk of the cross-border linkages for the U.S. banking sector. What is important to bear in mind is that the external matrix is drawn up on a residence basis. Thus, the U.S. banking sector includes the U.S.-based branches and subsidiaries of foreign banks. We will see independent verification later in the paper that a substantial part of the interbank deposits are the interoffice claims of a branch or subsidiary with its parent bank.

The fact that loans play such a small role in **Figure 5** suggests that the role of the U.S. banking sector in the global financial system has changed greatly from the 1960s and 1970s

when the major U.S. banks were large creditors to Latin American sovereigns in the form of loans, as the sovereign bond market was relatively underdeveloped for emerging economies then. The funding for the loans to Latin American sovereigns came from the recycled dollar deposits of the petroleum exporters. Thus, the composition of the external balance sheet of the U.S. banking system would have been quite different, with loans accounting for the bulk of the external assets.

If we focus attention only on the "currency and deposits" category in **Figure 5**, we can decompose this item by the location of the counterparty. That information is presented in **Figure 6**, where we show three counterparties—the U.K., Euro area, and Switzerland. The notable feature of **Figure 6** is the weight of the U.K. in the total. Together with our earlier point that most of the external claims and liabilities are interbank claims, the combination of **Figure 5** and **Figure 6** suggests that banks located in the U.K. play an important role in the U.S. banking system. Given that the data in these figures are residence based, they also cover the positions between UK resident banks' branches and subsidiaries in the United States and between U.S. resident banks' branches and subsidiaries in the UK which contribute significantly to the intermediation of flows between these two countries.

Figure 6: Counterparties by location of the "Currency and Deposits" component of the U.S. banking system (ODC sector)
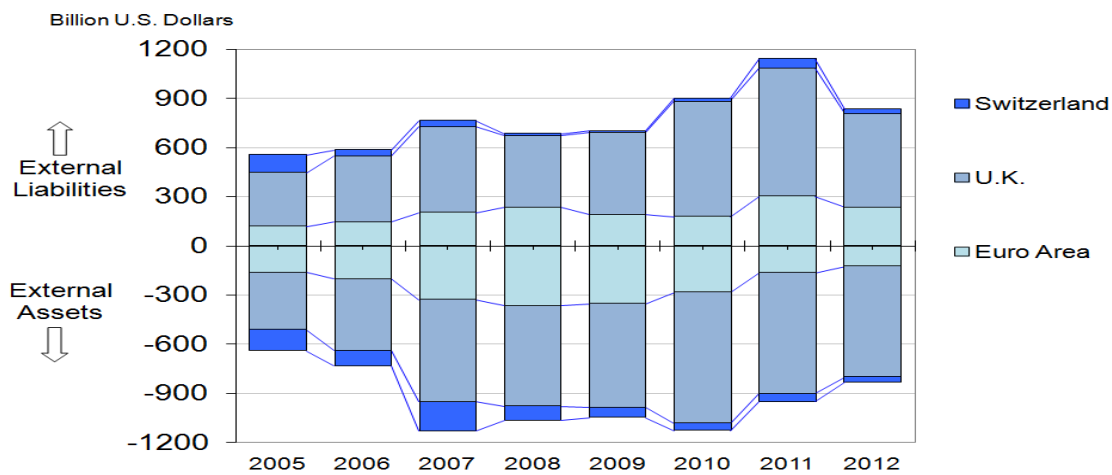

Source: IMF Statistics Department.

The capital outflows through the U.S. banking system put some context on the information that can be gleaned from other sources.

Figure 7 from Shin (2012) plots U.S. balance of payments by category of flows. An increase in US liabilities to foreigners is indicated by an upward-pointing bar (gross capital inflow), while an increase in U.S. claims on foreigners is indicated by a downward-pointing bar (gross capital outflow). The line numbers in **Figure 7** refer to the balance of payments table from the U.S. Bureau of Economic Analysis.[10] The downward-pointing green bars before 2008 indicate capital outflows from the United States through the banking sector (line 54). Set against this are large inflows into the United States in the form of foreign purchases of non-Treasury securities (line 66). The securities associated with subprime mortgages would be included in line 66, and we return to this issue shortly. **Figure 8** presents the two line items (lines 54 and 66) at a quarterly frequency.

Figure 7: U.S. annual capital flows by category
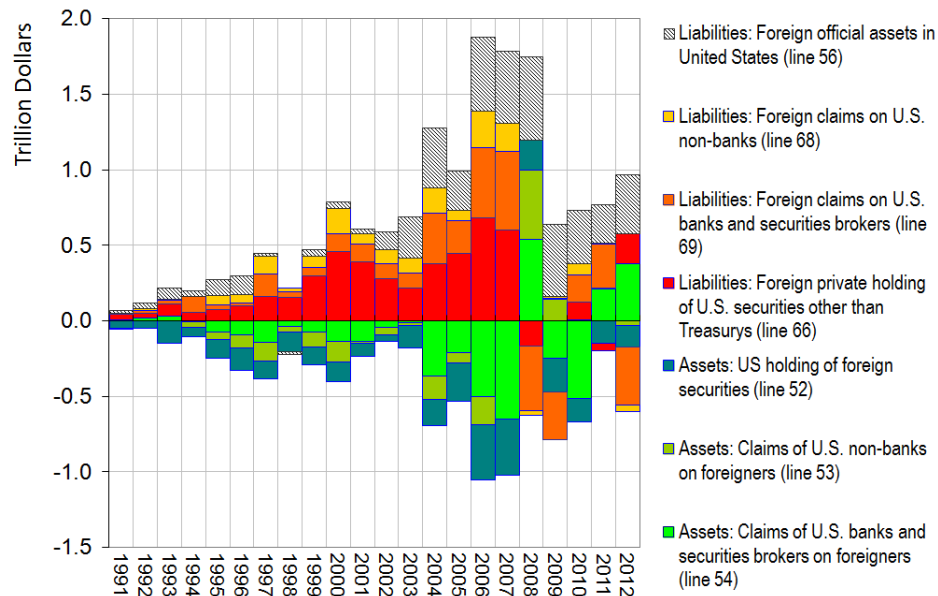
Source: Shin (2012), data from U.S. Bureau of Economic Analysis.

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[10] http://www.bea.gov/newsreleases/international/trade/trad_time_series.xls

Figure 8: U.S. quarterly capital flows by category
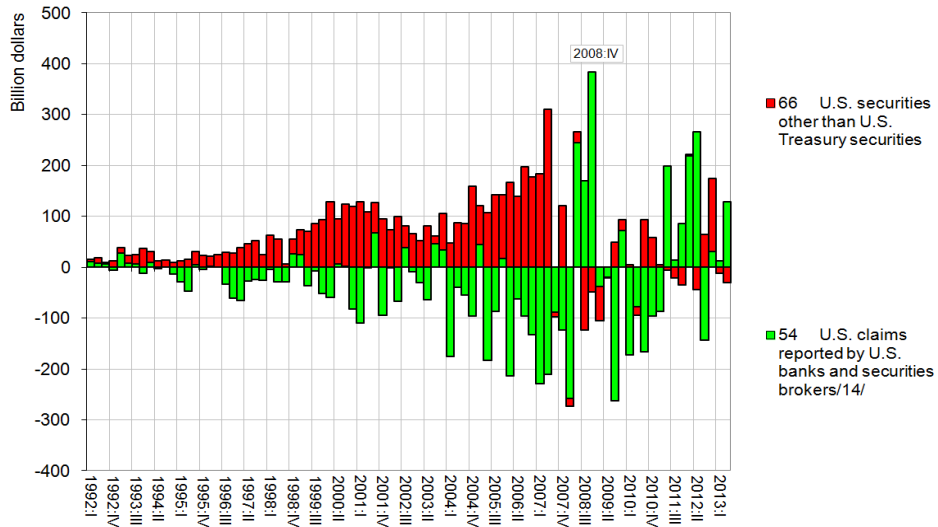
Source: U.S. Bureau of Economic Analysis.

We noted earlier that the external claims and liabilities of the U.S. banking system consist mainly of interbank claims. We can gain some additional insights on the nature of those interbank claims from the balance sheets of foreign banks operating in the United States.

Figure 9: Net interoffice assets of foreign banks in the United States
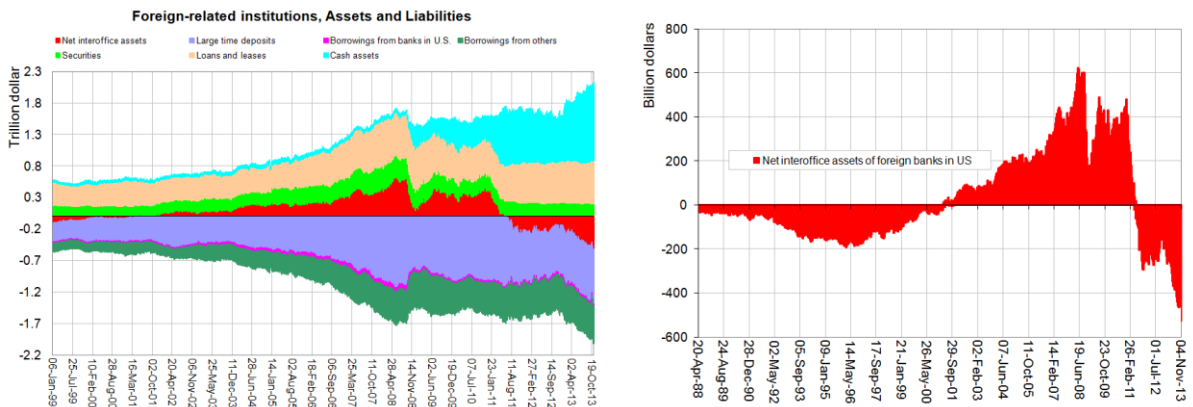
Source: Federal Reserve Board H8 series on commercial banks.

Figure 9 plots the assets and liabilities of foreign banks in the United States (left panel) and their net interoffice assets (right panel) obtained from the Federal Reserve.[11]

Normally, we would expect net interoffice assets to be negative, as foreign bank branches act as lending outposts. However, the decade between 2001 and 2011 was exceptional, when net interoffice assets turned sharply positive, before reversing into negative territory during the 2011. Foreign banks' branches and subsidiaries in the United States are treated as U.S. resident banks in the balance of payments, as the balance of payments accounts are based on residence, not nationality basis. Therefore, **Figure 9** suggests that an important component of the capital outflows from the United States through the banking sector (line 54) is accounted for by the activity of foreign banks. Shin (2012) points to further evidence from the money market funds (MMFs) sector that the foreign banks engaged in sending funds to their headquarters were the European banks.

Figure 10 plots the chart from the IMF's Global Financial Stability Report of September 2011 of the amount owed by banks to U.S. prime MMFs based on top 10 prime MMFs, representing US$755 billion of approximately US$1.66 trillion total prime MMF assets, classified by nationality of the borrowing bank. As **Figure 10** shows, U.S. prime MMFs have almost completely withdrawn from EU periphery as of the second half of 2011.

Figure 10: Amount owed by banks to US prime MMFs (% of total), by nationality of borrowing bank
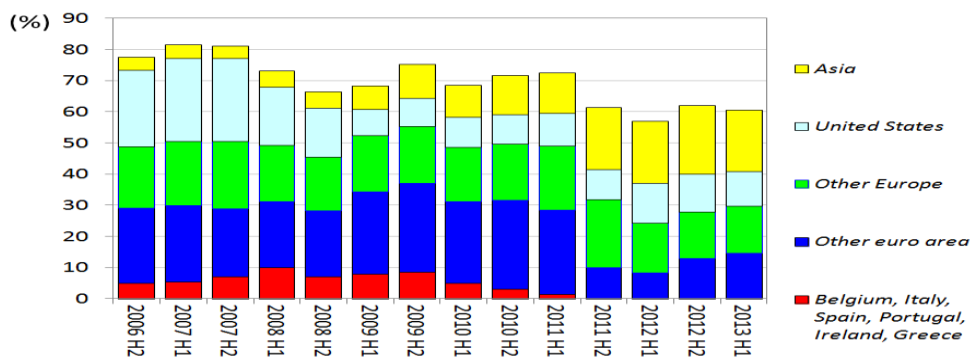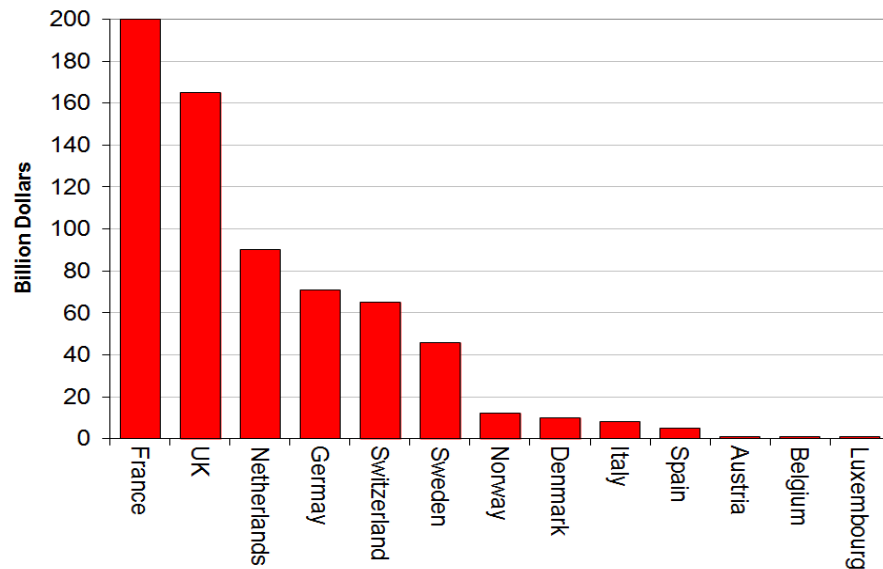

Source: IMF GFSR September 2011; and Fitch database.

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[11] Net interoffice assets measure the net claim of the branch or subsidiary of the foreign bank on its parent.

Around 50 percent of the assets of the prime MMFs are the obligations of European banks, and **Figure 11** gives a snapshot of the dollar amounts borrowed by European banks as of June 30, 2011. In effect, during the decade between 2001 and 2011, European bank offices in the United States became funding sources for the parent, rather than lending outposts. As noted in a recent BIS (2010) report, many European banks use a centralized funding model in which available funds are deployed globally through a centralized portfolio allocation decision.

Figure 11: Amount owed by banks to US prime MMFs on June 30, 2011, by nationality of borrowing bank

Source: IMF GFSR September 2011; and Fitch database.

We now turn to the capital inflows, and to the inward-pointing arrow in **Figure 2**, which indicates the capital inflows into the United States through the purchase of securitized debt instruments. The GFF external matrix has the claims and obligations of the OFCs, that is, the nonbank financial institutions in the United States. This category encompasses a broad group of financial institutions, such as mutual funds, insurance companies, pension funds and others. Thus, extracting information from such a broad category may appear to be difficult at first. However, the legal form of the claim can give us useful clues on the capital inflows through the purchase of securitized claims (inward-pointing arrow in **Figure 2**) and the counterparty in such flows.

The external liabilities of the OFCs are broadly divided into two categories: equity ("Shares and other equity") and debt securities ("Securities other than shares"). For mutual funds, their liabilities are mostly equity shares, and so foreign stakes in U.S. mutual funds will not figure in the "Securities other than shares" category. The same is true for insurance companies and pension funds. Only a small portion of insurance company liabilities are in the form of debt securities, and so focusing on debt securities will eliminate from consideration most insurance company liabilities held by foreigners. This will leave the debt securities issued by nonbank financial intermediaries, such as the broker dealers, the special purpose vehicles that hold securities claims on mortgages and other vehicles in the shadow banking system. The OFC debt security category will also include the Government-Sponsored Enterprises (GSEs), such as Fannie Mae and Freddie Mac.

Figure 12 shows the gross external liabilities of U.S. OFCs that are in the form of debt securities, and they are sub-divided into three counterpart countries—the U.K., Euro area, and Switzerland.

Figure 12: Gross external liabilities of the Other Financial Corporations (OFCs) sector in "Securities Other Than Shares" by location of counterparty
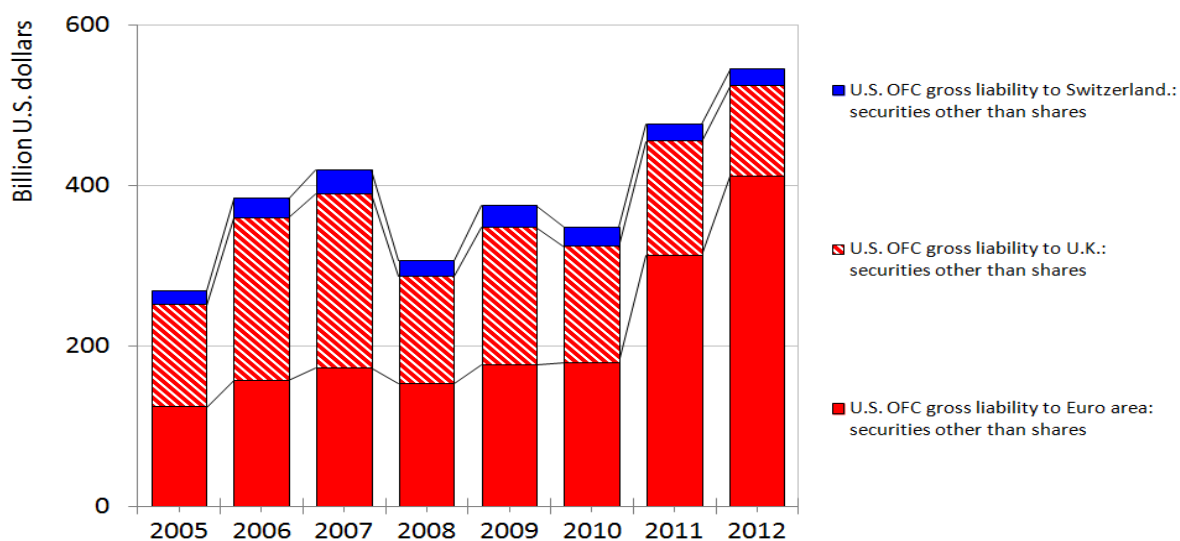
Source: IMF Statistics Department.

We see that starting in 2008 the U.K. holdings of U.S. OFCs debt securities are small compared to that of the Euro area. We also see the fluctuations in the holdings of the U.K.

and Euro area due to the financial crisis. The amounts held by the U.K. and Euro area fall in 2008, to rebound by 2011. Holdings of OFCs' debt securities by other counterpart countries include different groups. On the one hand, this category will contain non-U.K. and non-Euro area creditors from Europe that hold private label mortgage-backed securities (MBSs). On the other hand, the bulk will be the current account surplus countries that hold GSE securities as a substitute for U.S. Treasury securities. To the extent that GSE securities have quite different attributes from the private label MBSs that were responsible for the subprime crisis, a careful distinction between the two would shed further light on the capital flows that are directly related to the subprime securitizations in the middle years of the last decade.

Thus far, we have viewed the capital flows from the U.S. external matrix in the GFF approach. Nonetheless, the strength of the GFF approach is that the same exercise that we have done for the United States can be done for other participating regions of the world.

In particular, two additional exercises should shed much light on the quantities and counterparties involved in the U.S. shadow banking. The first is to construct the external GFF matrices for the Euro area and the U.K. and then to examine the gross external claims and liabilities of the banking (ODCs) sector in the two jurisdictions. The "roundtrip" of U.S. dollar funding depicted in the schematic flow chart in **Figure 2** will only be settled if we can identify not only the residence of the investor, but also the type of the investor. By examining more closely the external GFF matrix for the Euro area and the U.K., it would be possible to settle the question of whether the banks in these jurisdictions brought U.S. dollar funding from their branches and subsidiaries in the United States back to their headquarters location, and then sent the funds back to the U.S. in order to purchase debt securities issued by the special purpose entities involved in the U.S. shadow banking system.

The task of disaggregating the external GFF matrix by counterparty location and by counterparty sector would be the ultimate goal of the approach, so that we can treat each sector in each location as a node in the network of interconnections. The disaggregation of the relationships by counterparty location and sector would mean that the two-dimensional tables that we have used to motivate the exercise would no longer be adequate to visualize the full set of connections. Clearly, pursuing such an endeavor without focusing on specific

pre-defined relationships would result in incidental details and very small quantities that would not be interesting and instead obscure the key relationships. Thus, any measurement exercise will need to be guided by careful selection of the pairwise relations between the (location, sector) nodes in the network.

Leaving this ambitious endeavor for a later time we will, for now, engage in a much more basic exercise of measuring the broad categories of credit and funding involved in the U.S. shadow banking system that can be gleaned from the BSA matrix and the external GFF matrix.

An aggregate picture of the growth and subsequent contraction of the financial intermediary sector in the United States is given in **Figures 13, 14** and **15** which show the total unconsolidated financial assets of two main financial subsectors in the United States, as well as financial assets and liabilities of these sectors by main instrument, respectively.

Figure 13: USA: Total assets of ODCs and OFCs

Source: IMF's Monetary and financial statistics/SRFs.

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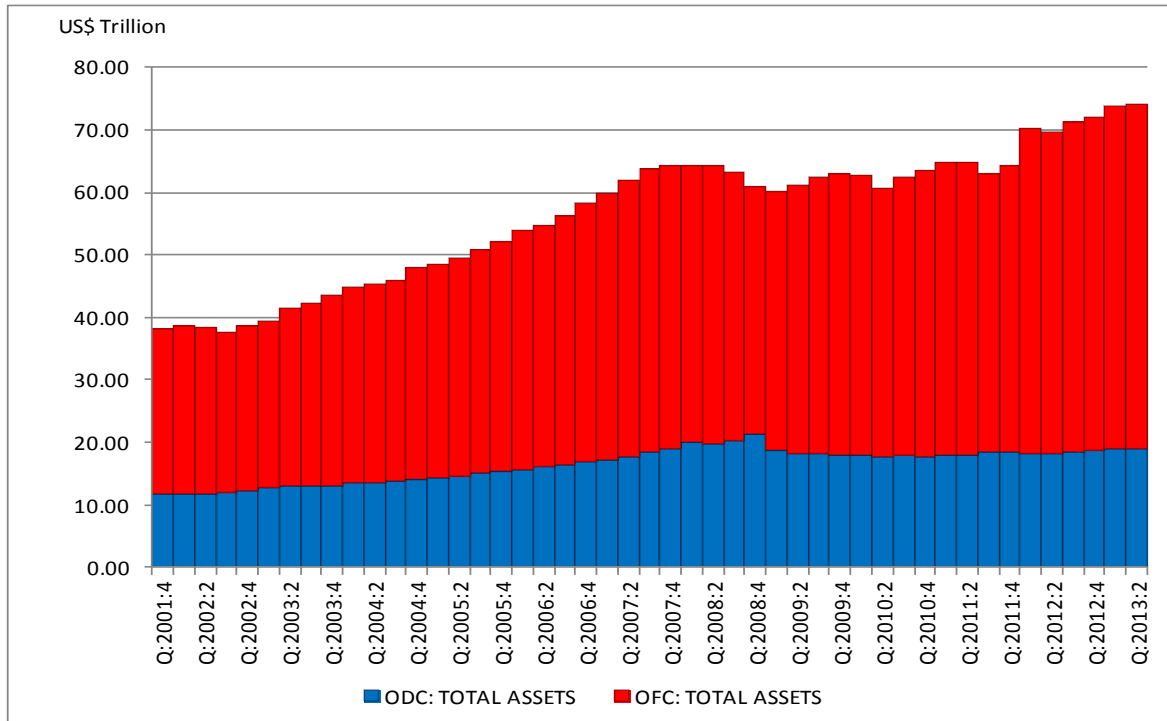
Figure 14: USA: Assets and liabilities of ODCs by main instrument
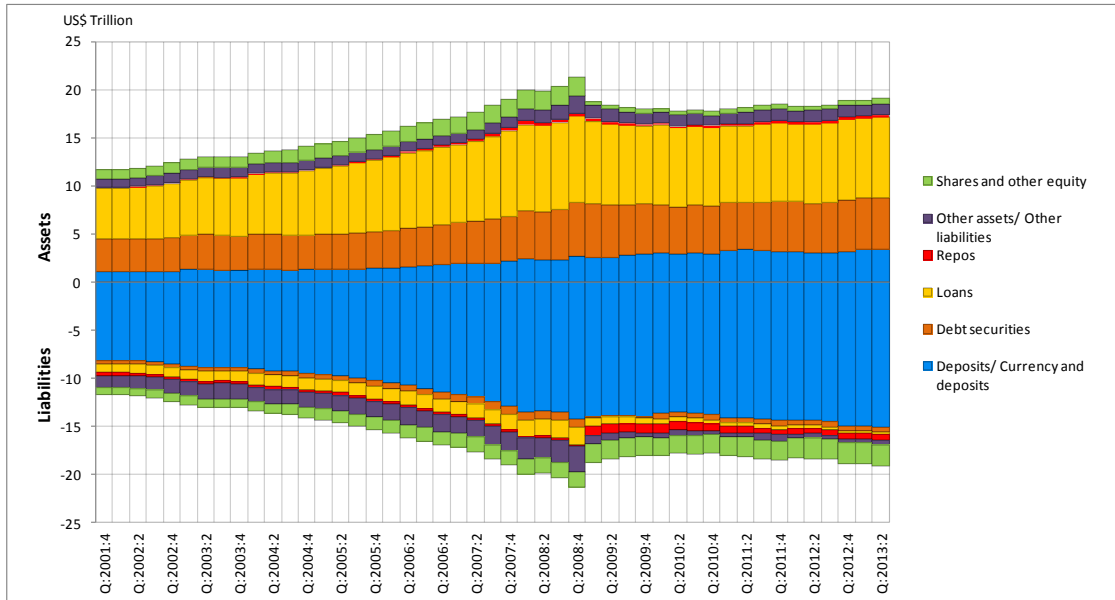
Source: IMF's Monetary and financial statistics/SRFs.

Figure 15: USA: Assets and liabilities of OFCs by main instrument
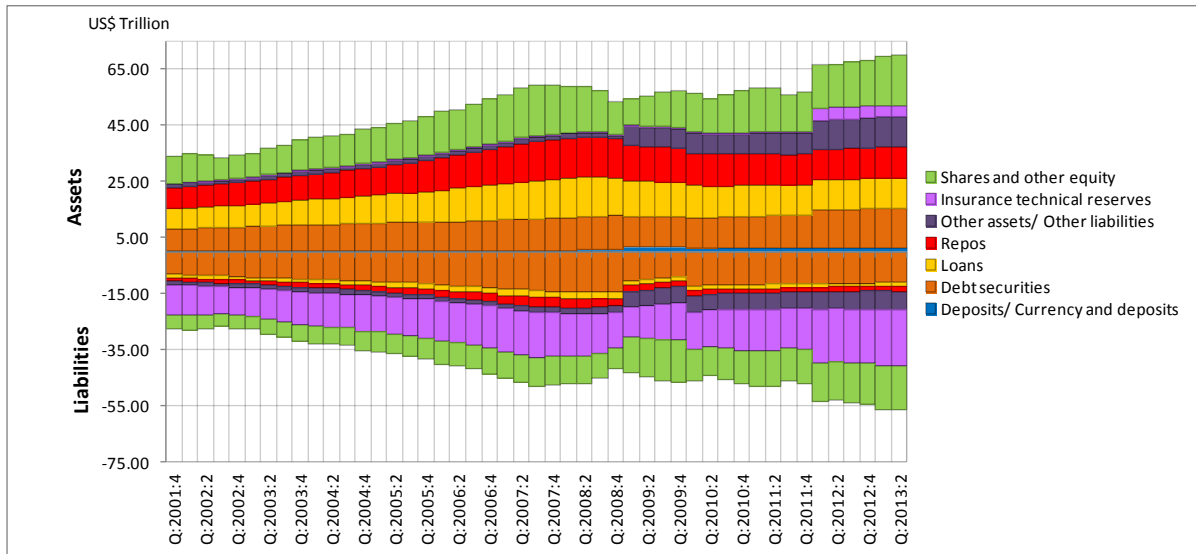
Source: IMF's Monetary and financial statistics/SRFs.

Figure 16 presents aggregate financial assets of five subsectors in the United States that are associated with financial intermediation—the U.S.-chartered banking, credit unions, finance companies, security broker dealers and the asset-backed securities (ABS) issuers.

Figure 16: Total assets of financial intermediation sectors in the United States
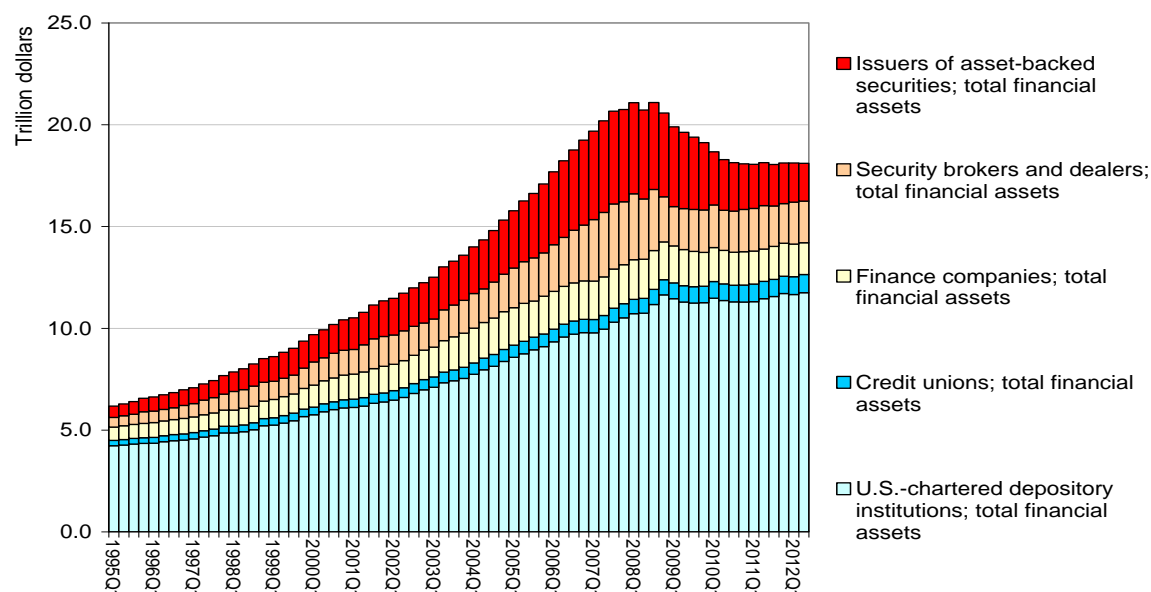
Source: U.S. Federal Reserve Flow of Funds.

We see from **Figure 16** that the two sectors that saw the greatest fluctuations were the ABS issuer sector and the security broker dealer sector, both associated with the market-based intermediation sector where credit intermediation takes place through the securitization of financial claims.[12] The ABS issuers consist of the legal entities (special purpose vehicles) that are associated with the securitization of financial claims, and so would encompass the entities that securitized subprime mortgage claims. **Figure 16** does not correspond exactly to the total credit outstanding to the ultimate borrowers. It does not include the GSEs such as Fannie Mae and Freddie Mac, and so could underestimate total lending. On the other hand there will also be some double-counting of credit flows, for instance, when a security broker dealer holds a security issued by an ABS issuer.

Figure 16 above bears some resemblance to the schematic in **Figure 1** on the expansion of the intermediary sector during and upward phase of the credit boom, and the ABS-issuer sector and broker dealer sector could be seen as an approximation to the noncore liabilities of the intermediation system. Moreover, since the ABS issuer sector and the security broker

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[12] See Adrian and Shin (2010) for a survey of the market-based intermediation system in the United States.

dealer sector are nonbank financial firms, they would be classified as OFCs under the classification system used in the monetary statistics and balance of payments, so that even a coarse decomposition of the sectors would capture the main trends.

We could improve upon **Figure 16** if further split of liability side deposits were available for ODCs. In monetary statistics, liability side short-term repos included in broad money are classified as deposits, so that liability side deposits may include short-term repos. For ODCs that saw more stable growth in assets, some of the asset growth may have been funded through repos or other market-based funding methods that have more in common with the noncore liabilities of the intermediation sector, but are not clearly disaggregated in monetary statistics.

Figure 17 is a chart from the survey of shadow banking given by Adrian and Ashcraft (2012) which shows the time path of relative sizes of funding sources of the US intermediation sector. It shows the gradual decline of the traditional funding sources of the banking sector in the form of deposits, and the relative increase in market-based funding sources. For some of the exercises in the GFF analysis to be reported below, we have access to more detailed information on the balance sheet of ODCs as well as non-depository financial firms. Potentially, the disaggregated information by instrument will allow a more detailed mapping of the funding sources for the shadow banking system.

Figure 17: Relative size of intermediation by the shadow banking system
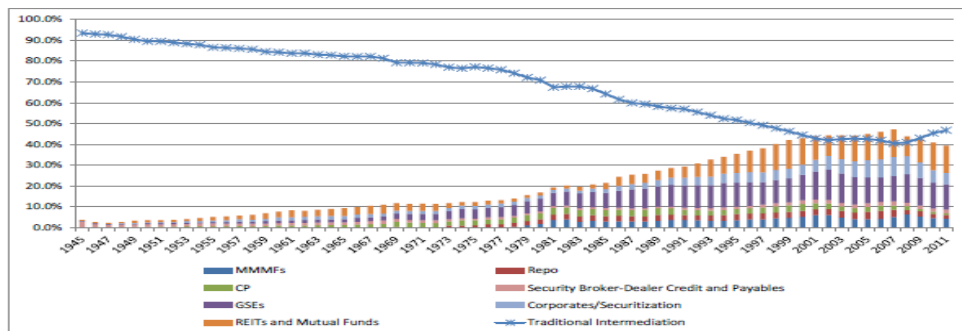
Source: Adrian and Ashcraft (2012).

Figure 18 presents the core and noncore liabilities of the U.S. financial corporations using the IMF's monetary statistics data (SRFs). Noncore liabilities could be considered as a proxy for the funding associated with shadow banking in the United States.[13]

Figure 18: Core and noncore liabilities of US financial corporations
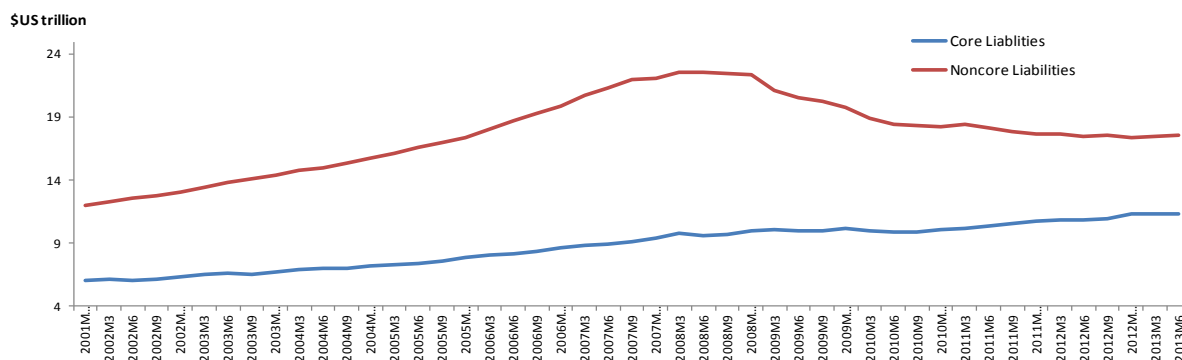
Source: IMF's Monetary and financial statistics/SRFs.

III. EMPIRICAL EVIDENCE

To confirm the significance of the capital flows associated with the shadow banking system for credit availability in the United States and more generally we run panel regressions with various loan categories within the financial system as being the dependent variable. With the exception of large corporates, most domestic firms and households engage with the international credit system only indirectly, with most positions intermediated by the domestic banking system. The capital flows associated with the shadow banking system, as it was shown in detail using the United States as an example, affect the funding environment faced by domestic banks. Bruno and Shin (2012a, b) look at the relationship between international banking-sector flows and domestic private credit, emphasizing that global liquidity and the leverage cycle of global banks as a key driver of credit growth. However, their specification does not directly examine the relation between cross-country variation in capital flows and the cross-country variation in domestic credit growth.

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[13] Noncore liabilities of the financial corporations are defined in this paper as the sum of (i) deposits (including foreign currency deposits) at ODCs excluded from broad money; (ii) debt securities issued by ODCs, MMFs, and OFCs; (iii) loans received by ODCs and OFCs; and (iv) nonresidents' deposits with ODCs and OFCs.

In this paper, we look at the relationship between domestic growth of loans to non-banks and the capital flows associated with the shadow banking system for a sample of 82 countries.

Clearly, there may be two-way causality between domestic growth of loans and the capital flows associated with the shadow banking system. Since it is difficult to find convincing instruments that might help establish causality, we simply report OLS regressions coefficients to establish partial correlations. The primary goal of this exercise is to guide future theoretical work on the relation between noncore liabilities of banks and other financial corporations and domestic credit growth.[14]

The dependent variable is domestic growth in loans to non-financial sector (split into private and public), measured by the change of ODCs and OFCs loans to corporates in logarithms. A set of independent variables can be grouped in three blocks (i) core and noncore funding of financial system proxied by the sum of domestic ODC and OFC's deposits and the sum of ODC and OFC's deposits and debt securities liabilities from nonresidents lagged by one period correspondently; (ii) controls for global liquidity conditions (market volatility index, global cross-border credit[15] and quantitative easing (QE) dummy variable which takes a value of one during periods of quantitative easing in the USA (lagged by one period); and (iii) a set of macro controls that are typically used to control for domestic demand and supply conditions in this type of regressions, also lagged by one period.[16] In addition we use country fixed effects to control for any additional country specific time-invariant characteristics not captured by our control variables.

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[14] Clearly, our empirical approach has several limitations. First of all, the use of macroeconomic data - the results should be cross-checked with the estimation of a VAR model that can capture the dynamic relationship between growth of loans and the capital flows associated with the shadow banking system. Furthermore, it would be desirable to come up with an identification strategy that might be able to establish causal impact of noncore liabilities of banks and other financial institutions on domestic credit growth (or vice-versa). Finally, the use of micro data at institution level could be useful in understanding how noncore liabilities influence funding conditions of banks and other financial corporations and loan growth.

[15] This variable is taken from the BIS Global liquidity indicators (BIS website).

[16] The choice of independent variables is based on Bruno and Shin (2012a,b) and Shin at el (forthcoming).

The regression results are presented in **Table 3**. We see that both core liabilities (proxied by domestic deposits) and noncore liabilities of banks and OFCs (proxied by securities and deposits from nonresidents) have significant and positive correlation with domestic growth of loans to private sector corporate, but no relationship with lending to the public sector corporate.[17] This relationship holds for banks when we split the total lending into lending by ODCs and OFCs (no result for OFCs as the sample drops significantly).[18]

The data for the ODC and OFC deposits and securities liabilities draw on the information contained in the SRFs submitted by individual country monetary authorities to the IMF and then used to compile monetary data for publication in the International Financial Statistics (IFS).

Our confirmation that the noncore liabilities of the intermediary sector is closely associated with the growth of lending gives support to the schematic given at the outset of our paper (**Figure 1**) on the role of noncore liabilities financing the marginal increase in lending during a boom. As we illustrated in **Figure 1**, when intermediary assets are growing strongly during a lending boom, the pool of domestic retail deposits is not likely to be sufficient to fund the increase in lending. Other sources of funding must then be tapped to fund rapidly increasing lending, and the state of the financial cycle is thus often reflected in the composition of intermediary liabilities.

Our results on the information value of noncore liabilities are obtained even when controlling for global factors of credit availability, domestic demand and risk-on sentiment. In the absence of a cross-country consistent domestic credit rates, we have used a deposit rate as a proxy of domestic credit rates or a proxy for the domestic costs of borrowing (see **Table 3**).

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[17] There are several plausible explanations of insignificant results for loans to public sector corporates. First of all the types of available lending products and characteristics (pricing, maturity etc) may differ significantly between private and public corporates. Also the way they build their relationship with lenders may differ, as well as the information available for monitoring and analysis. Often, lending to public corporates includes explicit or implicit government guarantees or special regulation.

[18] The results for OFCs are not shown as sample size drops from 82 to 15 countries due to data availability in SRFs.

Additionally, we present a series of scatter charts (**Figures 19-23**) for various instruments across pre-crisis, crisis, and post-crisis periods in the form of scatter plots. We consider log-differences for four different sub-periods: pre-crisis period (Q1:2005-Q1:2007), crisis period (Q1:2007-Q1:2009), post-crisis period (Q1:2009-Q1:2011), "Greek crisis" (Q1:2011-Q1:2013), and we examine the behavior of each instrument in the sector.

The rationale for showing scatter charts is that they give a visual summary of the changes that take place in a quantity over two sub-periods. For a noncore liability, its behavior over the financial cycle will be associated with a more procyclical behavior. It will rise more during booms, and fall more during the subsequent downturn. The scatter charts reveal the extent to which such procyclicality shows through. The prediction is that the noncore category will show more negatively sloped relationships in the scatter chart. The more the aggregate has increased, the more it will fall subsequently. The scatter charts reveal considerable evidence of such reversals in total noncore liabilities of ODCs and OFCs (**Figure 19**), at the same time there is no clear pattern for disaggregated data.

Table 3: Determinants of Domestic Growth of Loans to Non-Financial Sector

VARIABLES	ODCs+OFCs loans to corporates (ONFCs+PNFCs)	ODCs+OFCs loans to ONFCs	ODCs+OFCs loans to PNFCs	ODCs loans to corporates (ONFCs+PNFCs)	ODCs loans to ONFCs	ODCs loans to PNFCs
	(1)	(2)	(3)	(4)	(5)	(6)
ODCs+OFCs deposits and securities liabilities from non-residents (log difference)	0.0180***	0.0157***	0.0236	0.0188***	0.0163***	0.0311
	[0.003]	[0.008]	[0.750]	[0.002]	[0.005]	[0.677]
ODCs+OFCs domestic deposits (log difference)	0.0595**	0.0545**	0.613	0.0588***	0.0528***	0.630
	[0.028]	[0.035]	[0.248]	[0.031]	[0.042]	[0.239]
REER (log difference)	0.0152	0.0152	0.224	0.00460	0.00534	0.163
	[0.643]	[0.615]	[0.504]	[0.886]	[0.858]	[0.635]
VIX	-0.00672	-0.0119	-0.159	-0.0136	-0.0163	-0.189
	[0.710]	[0.540]	[0.531]	[0.473]	[0.411]	[0.463]
US banks' interoffice cross-border positions (one period percentage change)	0.000675	-0.000398	-0.0413	0.00122	9.64e-05	-0.0441
	[0.756]	[0.852]	[0.374]	[0.564]	[0.962]	[0.350]
QE dummy	-0.00378	-0.00677	-0.0850	-0.00361	-0.00503	-0.0917
	[0.656]	[0.420]	[0.461]	[0.758]	[0.541]	[0.432]
Interaction terms between QE dummy and VIX	-0.0189	-0.0162	0.345	-0.0206	-0.0193	0.350
	[0.619]	[0.666]	[0.399]	[0.586]	[0.601]	[0.399]
Real GDP growth	0.133***	0.0164***	-0.0726	0.136***	0.168***	-0.0254
	[0.003]	[0]	[0.714]	[0.003]	[0]	[0.898]
Inflation rate	-0.0117	-0.0425	0.139	-0.00832	-0.0402	0.141
	[0.746]	[0.219]	[0.641]	[0.820]	[0.245]	[0.640]
Debt-to-GDP ratio	-0.0366***	-0.0307***	0.0310	-0.0349***	-0.0293***	0.0312
	[0]	[0.002]	[0.516]	[0.000]	[0.003]	[0.518]
Global cross-border credit (log difference)	0.0934	0.0281	-0.294	0.0935*	0.0334	-0.369
	[0.109]	[0.639]	[0.633]	[0.0985]	[0.564]	[0.555]
Domestic deposit rate	-0.132**	-0.0533	-0.586	-0.151***	-0.0689	-0.645
	[0.0189]	[0.395]	[0.186]	[0.009]	[0.269]	[0.147]
Constant	0.0610***	0.0584***	0.0641	0.0626***	0.0593***	0.0766
	[0]	[0]	[0.389]	[0]	[0]	[0.313]
Number of observations	2,990	2,990	2,876	2,990	2,990	2,853
Number of countries	0.055	0.052	0.006	0.057	0.054	0.006
R-squared	82	82	80	82	82	80

Note: This table represents results from fixed effects panel OLS regressions of determinants of domestic growth of loans to non-financial sector. The dependent variable is the quarterly growth rate of loans to non-financial sector, split into public and private loans. All right hand side variables are taken with one lag to account for possible endongeneity. Quarterly dummies are included but not shown to account for possibly seasonality in lending. The coefficients are shown together with p-values and robust standard errors. *, ** and *** denote significance at the 10%, 5% and 1% level respectively.

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Figure 19: ODCs+OFCs securities and deposits from nonresidents (non-core liabilities)
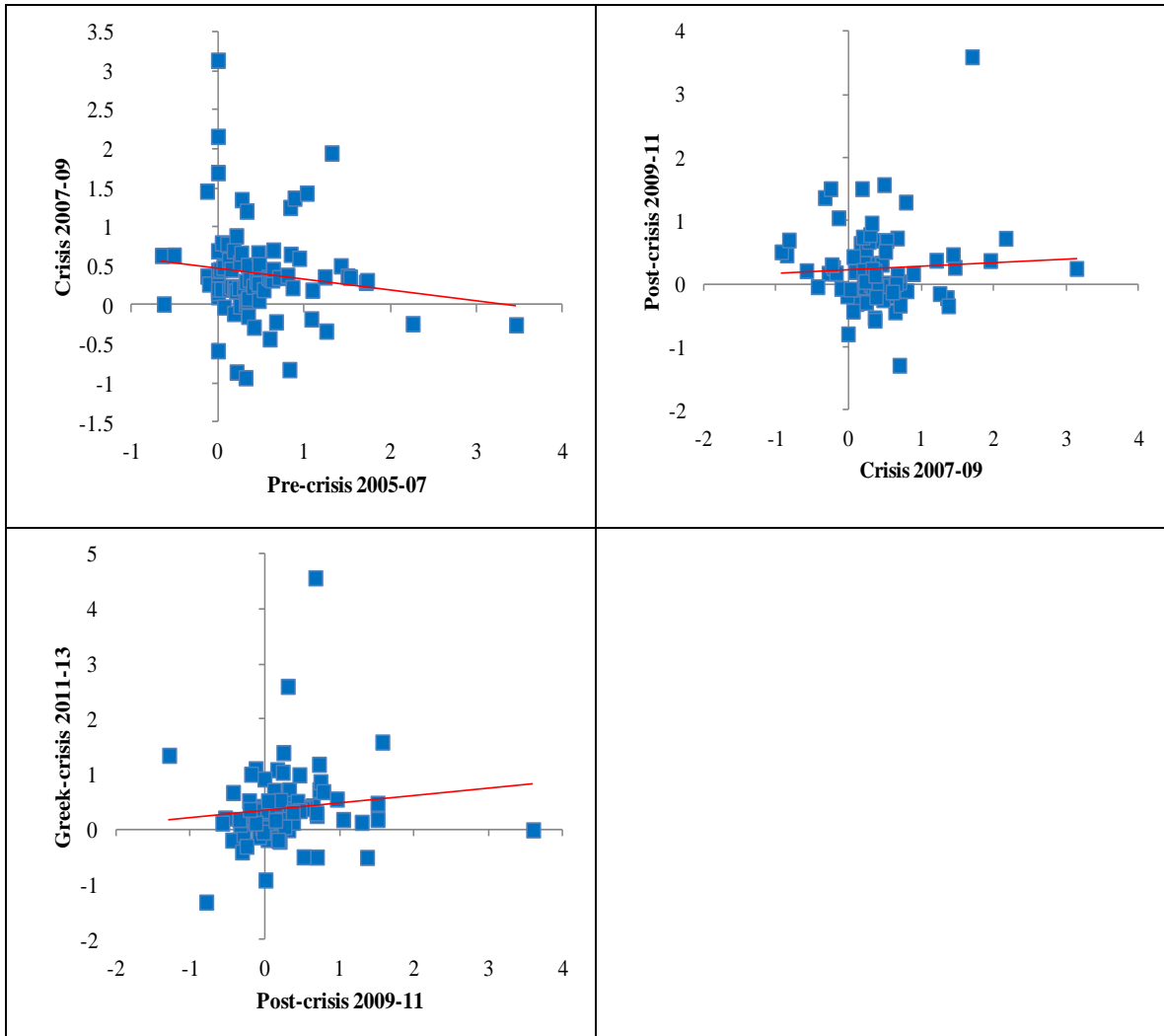
Note: log-differences for four different sub-periods: pre-crisis period (Q1:2005-Q1:2007), crisis period (Q1:2007-Q1:2009), post-crisis period (Q1:2009-Q1:2011), "Greek crisis" (Q1:2011-Q1:2013).

Figure 20: ODCs securities other than shares liabilities from nonresidents
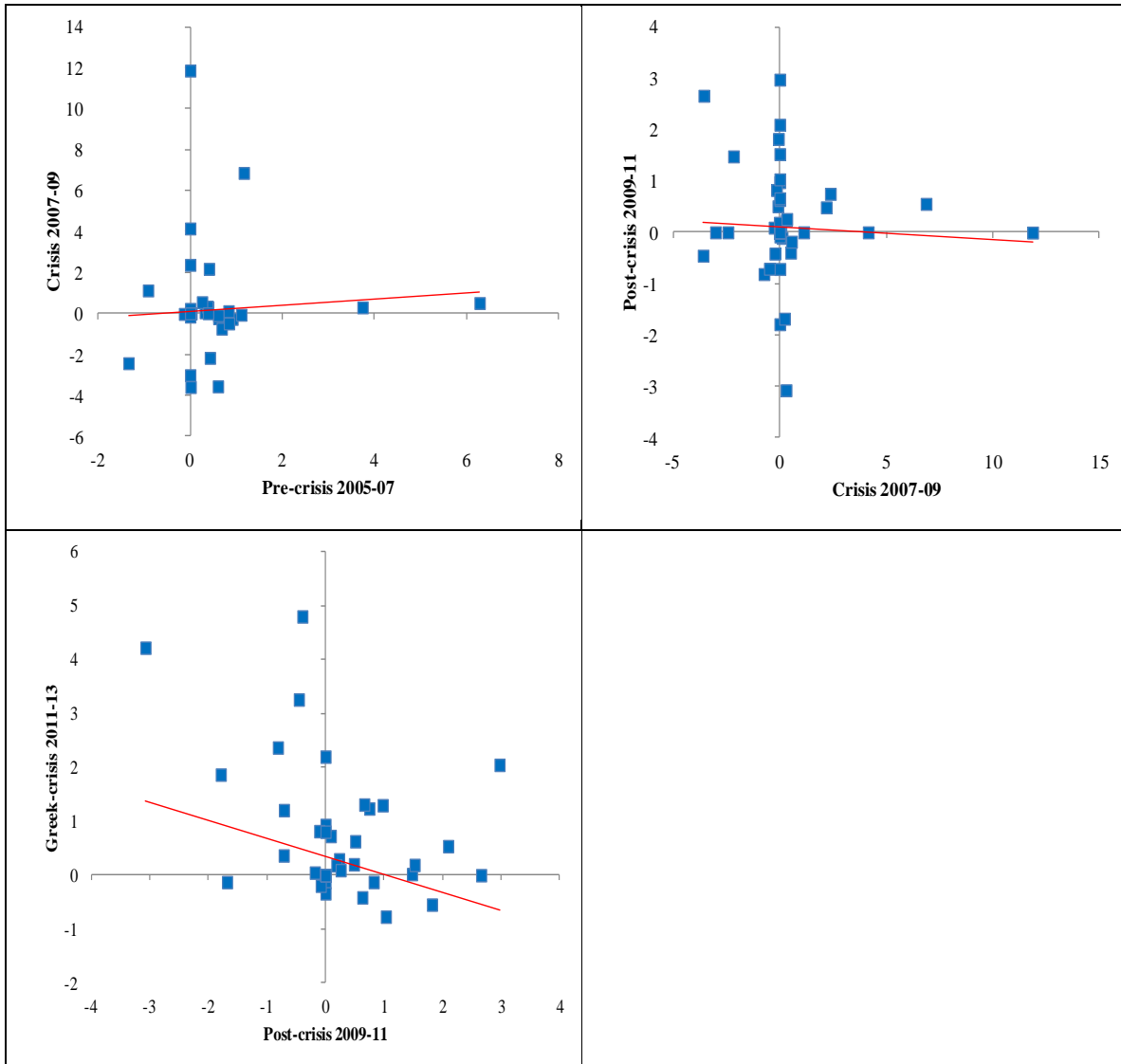
Note: log-differences for four different sub-periods: pre-crisis period (Q1:2005-Q1:2007), crisis period (Q1:2007-Q1:2009), post-crisis period (Q1:2009-Q1:2011), "Greek crisis" (Q1:2011-Q1:2013).

Figure 21: ODCs+OFCs deposits from nonresidents

Note: log-differences for four different sub-periods: pre-crisis period (Q1:2005-Q1:2007), crisis period (Q1:2007-Q1:2009), post-crisis period (Q1:2009-Q1:2011), "Greek crisis" (Q1:2011-Q1:2013).

Figure 22: ODCs deposits from nonresidents

Note: log-differences for four different sub-periods: pre-crisis period (Q1:2005-Q1:2007), crisis period (Q1:2007-Q1:2009), post-crisis period (Q1:2009-Q1:2011), "Greek crisis" (Q1:2011-Q1:2013).

Figure 23: ODCs+OFCs domestic loans to corporates

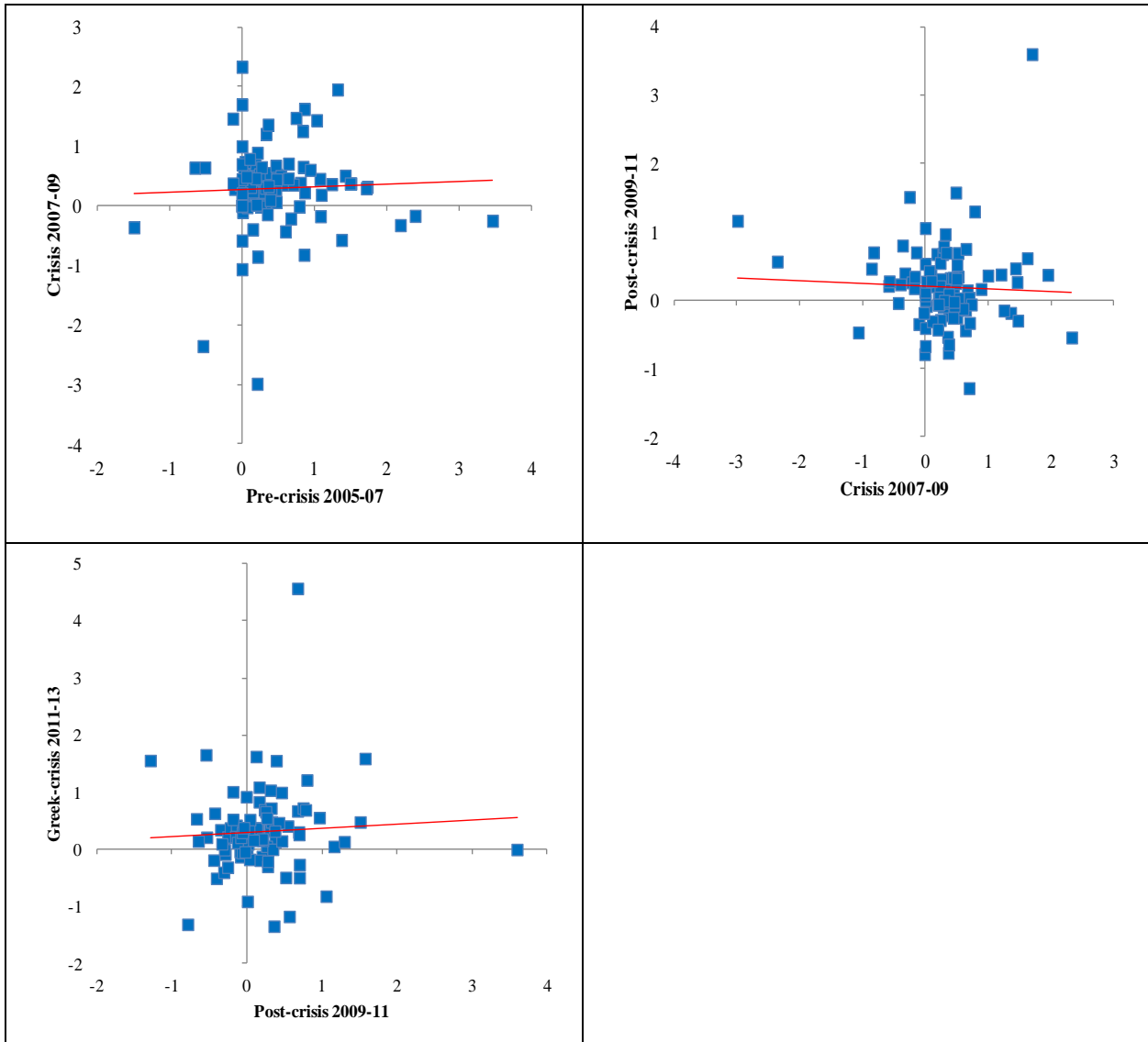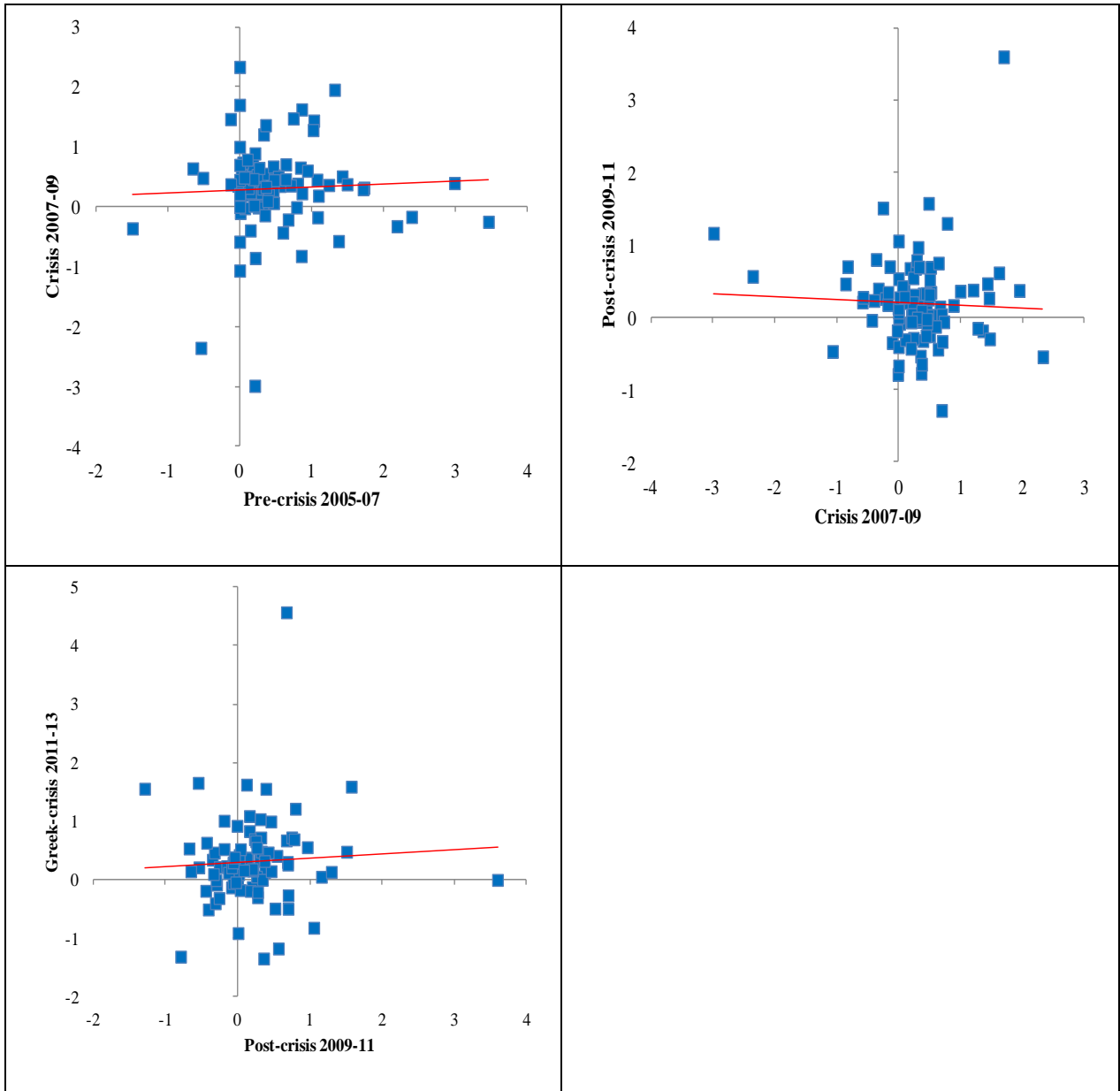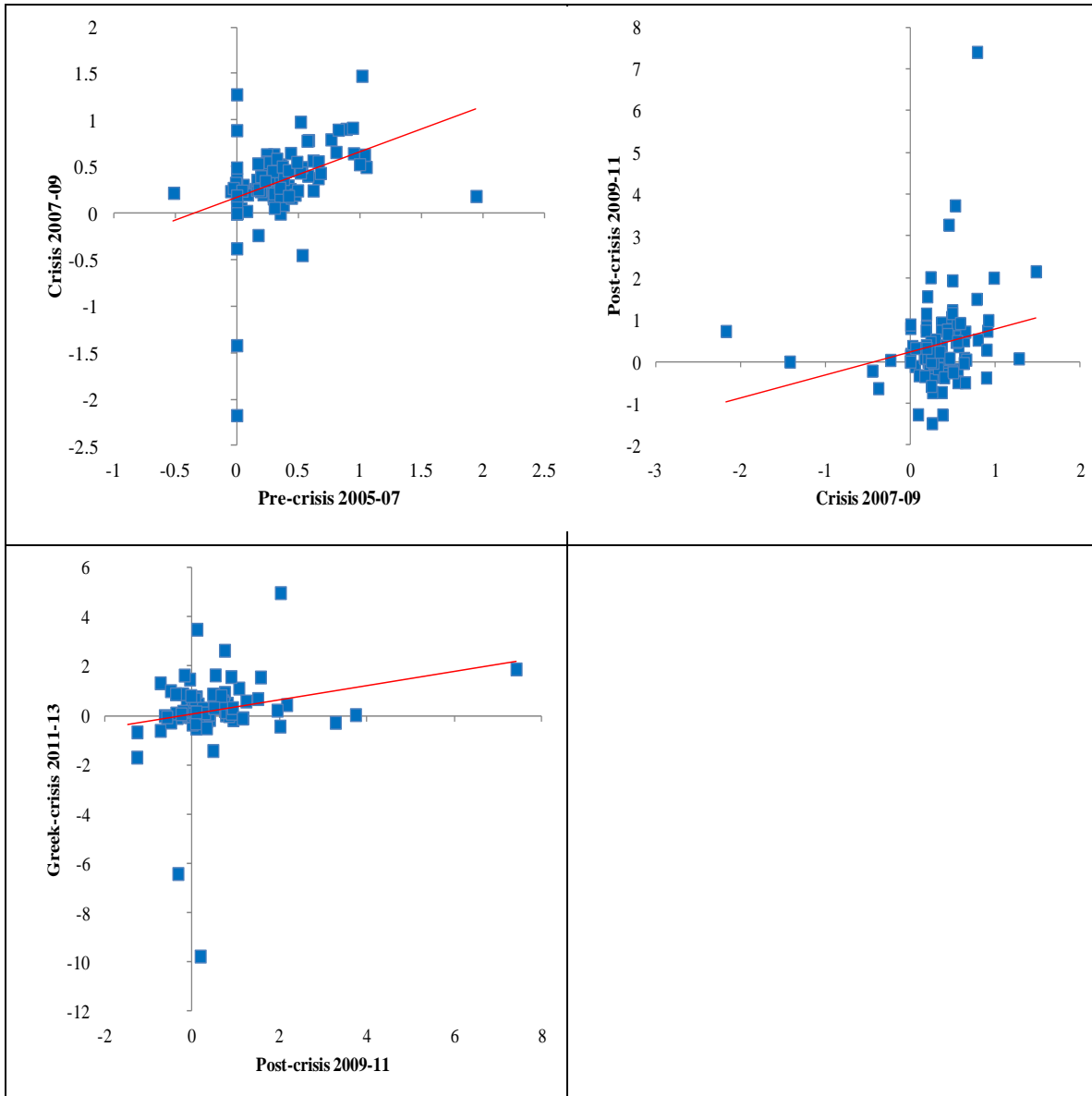Note: log-differences for four different sub-periods: pre-crisis period (Q1:2005-Q1:2007), crisis period (Q1:2007-Q1:2009), post-crisis period (Q1:2009-Q1:2011), "Greek crisis" (Q1:2011-Q1:2013).

IV. DIRECTIONS FOR FURTHER WORK

The exercise in piecing together the shadow banking system in the United States with the capital flows that underpin its operation has revealed many interesting details that would be of potential use for policy makers. The results reported in this paper should be viewed as the interim report of an on-going program of research.

There are three directions to extend our work so far. The first is to complete the time series observations by completing the BSA and external matrices for the years that we have not covered in the paper. In this paper, we have shown evidence based on years— 2005–12. However, examining the BSA and external flow of funds matrices from earlier years—say 2002 or 2003 would show the state of affairs before the banking sector boom took off in the middle years of the last decade.

The second task is to construct the external matrices for the Euro area and the U.K. and then to examine the gross external claims and liabilities of the banking (ODC) sector in the two jurisdictions. The "roundtrip" of U.S. dollar funding depicted in the schematic flow chart in **Figure 2** will only be settled if we can identify not only the residence of the investor, but also the type of the investor.

Finally, the most ambitious endeavor would be to disaggregate the external matrices by counterparty location and by counterparty sector as the ultimate goal, so that we can treat each sector in each location as a node in the network of interconnections. Given the dimensionality of the problem, any measurement exercise will need to be guided by careful selection of the pairwise relations between the (location, sector) nodes in the network. Furthermore, the BSA and external matrices could potentially be extended to flow data to identify transactions, revaluation changes, and other changes in volume of an asset/liability. This may be even a more challenging task given that the flow data would need to be broken down by counterpart country as relevant.

However, even if the most ambitious endeavor can bear fruit, we should be cognizant of the inherent limitations of an approach that is based on the residence of the entity in question. This limitation has been brought to the surface by the market stresses suffered by many emerging economies in the summer of 2013. One conceptual challenge is to

reconcile the small net external debt positions of many emerging market economies with the disproportionate impact of tighter global monetary conditions on their currencies and financial markets.

One piece in the puzzle may be the role of nonfinancial corporations as surrogate financial intermediaries that operate across borders. When corporate activity straddles the border, measuring exposures at the border itself may not capture the strains on corporate balance sheets. For instance, if the London subsidiary of a company from emerging market country *A* has taken on U.S. dollar debt but the company is holding domestic currency financial assets at its headquarters, then the company as a whole faces a currency mismatch and will be affected by currency movements, even if no cross-border exposures are registered in the official net external debt statistics. Nevertheless, the firm's fortunes (and hence its actions) will be sensitive to currency movements. In the case of firms that straddle borders, it may be more illuminating to look at the consolidated balance sheet that motivates corporate treasurers, rather than the balance of payments statistics that are organized according to residence. Furthermore, there are some financial intermediation services which are provided by a wider circle of financial agents as well as nonfinancial corporations. Shadow banks combine multiple nonbank agents in providing financial intermediation, in national economies and across borders.

A further insight would be to trace and quantify how much repos of shadow banks fund credit to the real economy and how much support risk taking and how much support inter-system liquidity redistribution by market participants. Cash-driven repo between shadow bank intermediaries has proven to be an important funding and liquidity source in the rise and fall of shadow banking liquidity.

In such instances, we may need to examine more than simply the financial exposures measured at the border. We need to look at the role of global banks in offshore financial centers as the carriers across borders of global liquidity driven by global banks and of shadow banks, and the role of these centers in providing offshore banking accounts in foreign currency instruments.

Indeed, one aspect of firms' access to international capital markets is the offshore issuance of debt securities sold to international investors. If the debt securities issued offshore are in foreign currency, offshore issuance would mirror currency mismatches on the consolidated balance sheet. Hence, offshore issuance goes beyond just a measurement issue on the size of the company's debt and instead addresses the fundamental issue of how firms will fare when global financial conditions and exchange rates change. In the recent issue of the BIS Quarterly Review (BIS (2013)), the offshore issuance of debt securities by nonbank issuers from emerging economies is shown to account for a large proportion of new international debt securities. To the extent that consolidated balance sheets give insights into behavior, it would be informative to overlay the consolidated data by nationality on top of the locational data given by the external flow of funds matrix.

In this paper we have shown the promising nature of a new GFF approach in which the national flow of funds matrix is combined with the external flow of funds matrix to yield insights into the broad direction and size of capital flows. For the U.S. shadow banking system, such an approach yields important insights into the role of external conditions on the fluctuations in the size of the U.S. intermediation sector. Among other benefits, the possible applications of the new GFF approach could support IMF surveillance and policy analysis by: (i) providing a consistent and comparable official global estimate of the shadow banking sector to assess what the estimate tells us about repo concentration risks; maturity and liquidity transformation; leverage and credit risk transfer and the quality of collateral, to facilitate the monitoring of regulatory boundaries; (ii) measuring the impact of unconventional monetary policy through core (monetary aggregates) and noncore (shadow banking) liabilities; (iii) developing and quantifying global liquidity funding aggregates; and (iv) measuring noncore liabilities as an indicator of financial crisis vulnerability.[19]

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[19] *Non-core Bank Liabilities and Financial Vulnerability*, Joon-Ho Hahm, Yonsei University, Hyun Song Shin, Princeton University and Kanho Shin, Korea University, September 2012 investigates the role of non-core liabilities in signaling financial vulnerability.

Several major data gaps remain (**Annex 3**). A number of G20 economies still do not provide information on ODCs and OFCs to the IMF in the form of SRFs and it is not possible to construct a domestic balance sheet for these countries which would enhance the usefulness of the flow of funds analysis. The provision to the IMF of comprehensive monetary statistics, through full SRF reporting, including for OFCs, should thus be a priority. Work in enhancing (frequency, timeliness and widening the scope of the encouraged items) the CPIS survey; more participation in CPIS and CDIS; additional analytical position data according to *BPM6* reporting; and improved quarterly reporting of IIP data and consistency with data collected in the CDIS and CPIS will close some of the gaps in the GFF matrices. There will be enhanced reporting of the BIS locational banking statistics, but the IMF's access to these data is restricted.

These obstacles—both in data and in transparency—can be surmounted by the IMF working closely with countries to fill data gaps and construct bilateral country flow of funds for their own policy use. Smart ways need to be found to provide to the IMF bilateral counterparty flow data on IIP and to work together to determine the common granularity in the split by counterpart sector.

This paper has shown what could be possible drawing on available data. The work has the potential to cover both domestic/regional and cross-border (by country and sector) stocks and flows, enabling the monitoring of national/regional and international capital flows on a regular basis. We have also noted some of the limitations of the purely locational data approach. When the economic entity that takes decisions has a balance sheet that straddles the border (as when a financial or nonfinancial company has a subsidiary in a financial center), then we would need to supplement the locational information with the complementary consolidated balance sheet information.

Annex 1. Balance Sheet Approach Matrix Methodology

The Balance Sheet Approach (BSA) matrix is derived from Standardized Report Forms (SRFs) data on monetary statistics reported by IMF member countries to the IMF's Statistics Department (STA).[20] The BSA matrix presents intersectoral asset and liability positions, showing the issuer of a liability on the horizontal axis and the holder of a liability on the vertical axis.

SRFs data used in the mapping exercise originate from the balance sheet data of the central bank (CB sectoral balance sheet), other depository corporations (ODC sectoral balance sheet) and other financial corporations (OFC sectoral balance sheet). These figures are the main data source for the BSA matrix and are considered to be most accurate.[21] In addition, data from the IMF's Government Finance Statistics Yearbook (GFSY) and international investment position (IIP) have been used to augment the BSA matrix to show the fullest picture obtainable from IMF-source data. In doing so, we made some working assumptions on a country by country basis as discussed below.[22]

IIP data have been used to supplement the data for nonresidents vis-à-vis: (i) general government; (ii) public nonfinancial corporations (PNFC); and (iii) other nonfinancial corporations (ONFC). After subtracting SRFs' data from the corresponding IIP item, the residual data have been split between PNFCs and ONFCs. This split is based on the ratio of deposits held by PNFCs and ONFCs with the financial sector.[23] We assumed that the

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[20] Currently, there are 140 SRF-reporting economies, of which 33 extend reporting to OFCs data. Eight G20 economies, covering about 50 percent of world GDP, report OFCs in SRFs: Australia, Brazil, Euro Area, Indonesia, Japan, Mexico, South Africa and the United States.

[21] The main benefits of the SRFs are: (i) improvement in cross-country comparability of monetary data; and (ii) higher quality of monetary data given that the instrument and sector classifications in SRFs are based on the *Monetary and Financial Statistics Manual* (http://www.imf.org/external/pubs/ft/mfs/manual/index.htm) and its accompanying *MFS Compilation Guide* (http://www.imf.org/external/pubs/ft/cgmfs/eng/pdf/cgmfs.pdf).

[22] For this paper, we produced actual BSA matrices for the United States, Euro Area and Mexico, and actual external flow of funds matrices for the United States vis-à-vis the following counterpart countries: the United States, Euro Area, Mexico, Switzerland, the United Kingdom, Germany, and France.

[23] The percentages used to distribute the residual IIP data into the BSA are working assumptions based on individual country experiences. For Mexico, the share of deposits held with the financial sector by PNFCs is 4 percent and by ONFCs is 96 percent for both 2006 and 2009; in 2011, the shares were 3 percent and 97

(continued…)

split of nonfinancial corporations' holdings of each instrument is approximately the same as the ratio of deposit holdings with the financial sector.

Moreover, IIP instruments on a one-to-one basis were mapped to the BSA. In cases where the residual was negative, the respective cells were populated by zeros.

Assets in the IIP are recorded as liabilities of nonresidents in the BSA and IIP liabilities represent nonresidents' claims in the BSA. A preliminary assumption—subject to further investigation[24]—was that all items taken from the IIP were mapped to the foreign currency lines of the BSA (except for the United States).

The IIP data are mapped to the BSA as follows:

i. For assets, direct investment (DI), and equity and investment fund shares under portfolio investment (PI) are mapped to shares and other equity in the BSA. Please note that the SRFs total is removed from the IIP figure and the residual is distributed based on the share of deposits held with the financial sector by PNFCs and by ONFCs. Since the portion included under PI in the IIP includes CB, ODCs and OFCs' data, these are added back to avoid under-recording. For liabilities, IIP is the only source of data for shares and other equity held by nonresidents, given that SRFs do not provide any breakdown for holding sectors.

ii. DI debt instruments are mapped to loans in the BSA because the IIP does not contain a sectorized breakdown. After the SRFs total is taken from the IIP figure, the residual is distributed based on the share of deposits with the financial sector for PNFCs and ONFCs. As the IIP figure includes CB, ODCs and OFCs' figures, these are added back to avoid under-recording.

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percent, respectively. For the United States, in the absence of proxy data, the split is based on a working assumption of 15 percent for PNFCs and 85 percent for ONFCs for all the years under review (2006, 2009 and 2011). For the Euro Area, also in the absence of proxy data, the split is based on a working assumption of 25 percent for PNFCs and 75 percent for ONFCs for all the years under review (2006, 2009 and 2011).

[24] The IMF's Balance of Payments Manual (*BPM6)* recommends reporting additional analytical position data including the currency composition of debt claims on nonresidents and debt liabilities to nonresidents, as well as financial derivative positions with nonresidents.

iii.   PI debt securities in the IIP are classified under securities other than shares in the BSA. The SRF figures for securities held by OFCs are subtracted from the IIP data before distribution.

iv.   PI equity and investment fund shares for general government are classified under shares and other equity in the BSA.

v.   PI debt securities for the general government are classified under securities other than shares in the BSA.

vi.   Financial derivatives are mapped to financial derivatives in the BSA. Where financial derivatives are recorded in IIP, but not in the SRFs, they are allocated between the ODC, OFC and NFC sectors, according to the holdings of securities other than shares by financial corporations.

vii.   Other investment, currency and deposits for the general government and other sectors are mapped to currency and deposits in the BSA.

viii.   Loans for the general government and other sectors are classified under loans in the BSA.

ix.   Trade credit and advances for the general government and other sectors are mapped to other accounts receivable in the BSA.

x.   Other accounts receivable for the general government and other sectors are recorded under other accounts receivable in the BSA.

For the GFSY data, where the total of securities other than shares and loans are under "foreign", they are mapped to nonresidents. For the portion of these instruments recorded under "domestic," the corresponding SRF data are subtracted and the residual is added to PNFCs and ONFCs in the same way as for the IIP data.

Annex 2. External Flow of Funds Matrix Methodology

As noted in Annex 1, the domestic flow of funds matrix is based on the Balance Sheet Approach (BSA) matrix methodology. The rest of the world sector data are drawn from the international investment position (IIP); assets in the IIP are recorded as liabilities of nonresidents in the BSA and IIP liabilities represent nonresidents' claims in the BSA. Cross-border liabilities of debtors are along the horizontal axis, and cross-border claims of asset holders along the vertical axis, for each financial instrument.

The external flow of funds matrix provides a conceptual framework for presenting cross-border positions by counterpart country and instrument. The first column of the external flow of funds matrix fully corresponds to the last column in the BSA matrix, only with reduced number of sectors as all sectors related to the public sector (excluding the central bank) and related to the private nonfinancial sector are aggregated together. The matrix presents external financial asset and liability positions, showing what data are available by IIP category and instrument: direct investment,[25] portfolio investment equity and debt securities (the latter, separately for long-term and short-term debt), other investment (separately for banks and others), reserve assets, and financial derivatives (other than reserves).[26] These positions are then broken down by counterpart country, by sector of investor and investee, maturity, and currency. Drawing on IMF and Bank for International Settlements (BIS) data sources, this matrix has the potential to further allocate the cross-border liabilities and claims for the destination country and the country of origin.

Data sources

The external flow of funds matrix is based on IMF and BIS data sources. The datasets managed by the IMF with bilateral counterpart country detail include the Coordinated Direct Investment Survey (CDIS) (for "inward" direct investment positions, i.e., direct

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[25] For intercompany loans in the matrix, we used information from BIS statistics on stocks of claims/liabilities to affiliated offices (intrabank lending).

[26] Financial derivatives other than reserves and employee stock options were not covered in the external statistics flow of funds matrix.

investment into the reporting economy, cross-classified by economy of immediate investor, and data on "outward" direct investment positions, i.e., direct investment abroad by the reporting economy, cross-classified by economy of immediate investment) and the Coordinated Portfolio Investment Survey (CPIS) (for the stock of cross-border holdings of equities and long- and short-term debt securities broken down by the economy of residence of the issuer).

For reserve assets, the Data Template on International Reserves and Foreign Currency Liquidity (RDT) provides country level data based on country of reserves holder. The Survey of Securities Held as Reserve Assets (SEFER)—a companion survey to the CPIS—provides holder data on securities held as foreign exchange reserve assets, cross-classified by country of issuer, and the Currency Composition of Official Foreign Exchange Reserves (COFER) provides data on holdings of reserve assets cross-classified by currency composition. COFER and SEFER country level data are reported to the IMF on a strictly confidential basis and are disseminated in the form of statistical aggregates only. Therefore, we did not use reserve assets data in the external flow of funds matrix. Additionally, IIP data for functional categories are available at the individual reporting country level.

For intercompany loans in the matrix, we used information from BIS statistics on stocks of claims/liabilities to affiliated offices (interbank lending).

The BIS International Banking Statistics (IBS) is the source of bilateral geographic details for loans, deposits, and other claims and liabilities.[27]

Frequency

The frequency of the source data used varies by dataset as follows: IIP–quarterly/annual; CDIS–annual; CPIS–annual (but, becomes semi-annual, effective with reporting of data for end-June 2013 in January 2014); RDT–monthly; COFER–quarterly; SEFER–annual; and BIS IBS–quarterly. New or enhanced data sources (including the planned

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[27] Other sources such as the U.S. BEA have also been used.

enhancements in the CPIS; the additional analytical position data according to *BPM6* reporting; and the enhanced reporting of the BIS locational banking statistics) will close some of the gaps in the external flow of funds matrix.

Supplementing the BSA with source data on external assets and liabilities: mapping assumptions

In the BSA matrix, the resident sector counterpart breakdown is based on the IMF's monetary statistics, namely: central bank, general government, other depository corporations, other financial corporations, and nonfinancial corporations.[28] In *BPM6*, the classification of institutional sectors is: central bank, deposit taking corporations except central bank, general government, other sectors (further broken down into OFC and nonfinancial corporations, households, and NPISH).

The methodology to supplement the BSA with source data on external assets and liabilities identified in the external flow of funds matrix is under review. As a first step, the stock data have been identified as a reference total, and assumptions made on how to split it into instruments and sectors as presented in the BSA and further into counterpart countries.

CDIS and CPIS published data are mapped to the sectors and instruments in the IMF's monetary statistics (where available) for cross-border exposures at bilateral levels. In the matrix, the external assets are recorded from the reporting country position and the external liabilities from the mirror data from the counterpart countries as reporters.

For CPIS, the current "encouraged" breakdown by sector of the resident holder is as follows: monetary authorities, banks, other financial institutions (of which: insurance, mutual funds, other), general government, nonfinancial sector (of which: nonfinancial companies, households, other). Planned CPIS enhancements include additional extensions and the institutional sector of the nonresident issuer and institutional sector of resident holder cross-classified by the institutional sector of the nonresident issuers (this

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[28] Other resident sectors are not included in the matrix.

is "from whom-to-whom" positions according to sectors of both the security-issuing and security-holding economies).

The BIS locational statistics provide quarterly information on claims and liabilities of banks vis-à-vis banks and nonbanks located in other countries worldwide. They are based on the economy of location or residence of the creditor bank.

Where there is no breakdown by sector (and no breakdown by short-term and long-term) in the country data as a reporter of the CDIS and CPIS, by the bilateral country, the working assumption for "Securities other than shares" and "Shares and other equity" is to map by the holdings by sectors reported in monetary statistics.

For financial derivatives which are included in the IIP for a country, but are not recorded in a reporting MFS sector, the working assumption is to allocate according to the holdings of securities other than shares into the following sectors: other depository corporations, other financial corporations, and nonfinancial corporations.

Annex 3. Mapping Domestic and External Flow of Funds: Data Sources and Data Gaps

Data sources for the BSA and external flow of funds matrices are described in Annexes 1 and 2, respectively. For the United States, Euro Area, and Mexico, we used the data reported in the SRFs.[29] The United Kingdom and Switzerland do not provide monetary data to the IMF using SRFs, and it is thus not possible to construct a domestic balance sheet for the UK and Switzerland which would enhance the usefulness of the domestic flow of funds analysis. For emerging market economies the lack of data is more severe. Many of these countries do not report OFCs data and the majority does not report monetary data for ODCs and OFCs in SRF format. Moreover, the BIS international banking statistics, CPIS and CDIS surveys are not available for numerous emerging market economies. These constraints inhibit the ability to construct a domestic balance sheet for these countries and the utility of the flow of funds analysis.[30]

Data Gaps

The BIS International Banking Statistics (IBS) is the source for claims and liabilities of banks vis-à-vis banks and nonbanks located in other countries. The IBS is based on the economy of location or residence of the creditor bank. Thirteen out of the 17 Euro Area countries report to BIS (Estonia, Malta, Slovak Republic and Slovenia do not report).

> **Illustration: Data Gaps**
>
> The Balance Sheet matrix for the United States for 2012 demonstrates the lack of some important sectoral and instrumental breakdowns. For instance, data on ODCs financial positions with the PNFCs sector is not available. Moreover, data on ODCs instrument breakdown with OFCs such as shares and other equity and financial derivatives are not fully available.

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[29] Although the United States and the euro area do not report data to IMF in SRF format, they do provide data with sufficient detail to compile SRFs.

[30] In addition SRF data does not capture off balance sheet items. Off-balance transactions only partly included in GFF analysis through the use of IIP data (information on cross-border credit lines, acceptances, financial derivatives and securitization transactions is registered at the IIP data).

With regard to the geographical breakdown for the euro area, almost full IIP (stocks) and Balance of Payments (BOP) (flows) data are available for the individual countries of the Euro area at an annual and quarterly frequency, respectively (the sources are mainly National Central Banks). Portfolio investment liabilities are not available by the geographic breakdown of the holder. CDIS and CPIS data are available for France and Germany vis-à-vis the selected economies. Publicly available data can be found in the ECB's Monthly Bulletin Table 7.3.9. A geographical breakdown of the IIP and BOP of the Euro Area (bilateral stocks and flows) is available for the United States, UK and Switzerland, but not Mexico.[31]

For the BIS locational dataset, the IMF's data access is restricted. For bilateral data reported by Singapore and other key jurisdictions (e.g., France, UK, Japan), a special data-request is needed. Japan and UK have some publicly available data, but there are some important gaps, especially for historical time series. For instance, for the UK, the IMF does not have access to a breakdown of foreign claims into cross-border and local claims, which is essential to properly map banks' global activities.[32]

The SRF forms comprise an instrument breakdown for each sector; the main instruments represented are: currency and deposits, shares and other equity, securities other than shares and loans. Further breakdown on the nature of positions and financial characteristics would be very useful for this exercise; however such data is not available. In addition to country-specific data gaps, in several cases full breakdowns by sector and instrument are not available. In these cases, working assumptions have been used for this paper to make the necessary allocations, as discussed in Annexes 1 and 2. Closing such gaps will enable us to sharpen the analysis further. The following initiatives are underway to address some of the existing data gaps. Planned CPIS enhancements include extensions to the current "encouraged" breakdown by sector of the resident holder. The enhanced reporting of the BIS locational banking statistics (Stage 2) will cover new data on counterparts and maturity for liabilities, and will introduce changes to and

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[31] See: http://sdw.ecb.europa.eu/reports.do?node=100000215

[32] See IMF WP/11/222 which was also published as BIS WP 376 and NBER WP 18531.

composition of the reporting population of banks (domestic banks; foreign subsidiaries; foreign branches; and consortium banks).

Table 2 below presents available data sources, planned enhancements, and main data gaps for the external flow of funds matrix.

Data comparability

Following the methodology described in Annex 2 and using the "same" data for two countries, dysfunctional reporting may occur in some critical cases for counterpart country data (**Table 1**).

Table 1: Comparison of Euro Area's and US' external flow of funds matrices

US external flow of fund matrix

Issuer of liability (debtor)	Nonresidents			Switzerland			United Kingdom			Euro Area		
	A	L	NP	A	L	NP	A	L	NP	A	L	NP
Central Bank												
Currency and deposits												
…												
Public Sector (excluding Central Bank)												
Currency and deposits												
…												
Other depository corporations												
Currency and deposits												
…												
Other financial corporations												
Currency and deposits												
…												
Nonfinancial Private Sector												
Currency and deposits												
…												

Euro Area external flow of fund matrix

Issuer of liability (debtor)	Nonresidents			USA			Switzerland			United Kingdom		
	A	L	NP	A	L	NP	A	L	NP	A	L	NP
Central bank												
Currency and deposits												
…												
Public Sector (excluding Central Bank)												
Currency and deposits												
…												
Other depository corporations												
Currency and deposits												
…												
Other financial corporations												
Currency and deposits												
…												
Nonfinancial Private Sector												
Currency and deposits												
…												

As presented in **Table 1**, data for corresponding sectors should match. In the U.S. external flow of funds matrix,[33] the column "Assets" (A) under "Euro Area" presents Euro Area claims on the U.S. (or U.S. liabilities to euro area), and the column

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[33] For 2006, United States source data are from the U.S. Department of Commerce, Bureau of Economic Analysis: *U.S. Direct Investment Position Abroad on a Historical-Cost Basis and Country Detail by Industry and Foreign Direct Investment in the United States: by Coun*try.

"Liabilities" presents euro area liabilities to the U.S. (or U.S. claims on the euro area). In the Euro Area matrix, the column "Liabilities" (L) under "U.S." presents U.S. liabilities on the euro area (or Euro area claims on the U.S.), and the column "Assets" presents U.S. claims on the euro area (or euro area liabilities to the U.S.).

The reasons why this is not the case is three-fold. First, differences can be observed between the IMF's *International Financial Statistics* (IFS) and BIS locational data due to coverage and/or the underlying methodology of the data. For coverage, the reporting institutions for the BIS data cover mainly internationally active banks, whereas monetary data in the *IFS* cover all resident other depository corporations. Furthermore, other depository corporations for monetary statistics also include money market funds (e.g., for the United States), which are excluded in the BIS data. Regarding the United States, the data for other depository corporations in the *IFS* is sourced from the Fed's Flow of Funds publication and comprises commercial banks, savings institutions, credit unions, and money market mutual funds. The BIS locational data cover "all balance sheet positions (and some off-balance sheet positions in the area of trustee business) which represent financial claims or liabilities vis-à-vis nonresidents, as well as foreign currency positions vis-à-vis residents" or "International banking business comprises claims and liabilities vis-à-vis nonresidents in any currency plus claims and liabilities vis-à-vis residents of the reporting country in foreign currencies."[34] The latter positions vis-à-vis residents are included as claims on residents in the *IFS* monetary data, because claims on and liabilities to residents and nonresidents are based on the counterparty's residence (center of predominant economic interest), independent of the currency involved.

Second, survey data undertaken for the CPIS and CDIS are often carried out by different institutions, statistical offices vis-à-vis central banks; central banks prepare the SRFs.

Third, our assumptions on mapping are country specific, rather than specific across pairs of countries.

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[34] March 2013 version of the BIS, *Guidelines to the International Locational Banking Statistics*.

Table 2: External flow of funds matrix: data sources, availability and gaps (Source: Errico et al., 2013)

	Concept	Country breakdown	Sector of Investor	Sector Investee	Frequency	Maturity	Currency
Assets	Direct Investment Assets	CDIS (net figures)	CDIS partial data for net debt for resident financial intermediaries and all other residents	None, potential enhancement	Annual CDIS and annual/quarterly IIP	IIP BPM6 AAPD (additional analytical position data), only for intercompany debt (BPM6 table A9-1-1a) with breakdown of which one year or less	IIP BPM6 AAPD with currency breakdown, but only for intercompany debt (BPM6 table A9-1-1a)
	Portfolio Investment (PI) Equity	CPIS	IIP and CPIS encouraged item by sector of resident holder	CPIS enhancements: PI holdings by sector of nonresident issuer	Annual CPIS, semiannual CPIS enhancements, and annual/quarterly IIP	Not applicable	CPIS encouraged item: PI holdings by currency.
	Debt Securities LT	CPIS				CPIS, IIP	CPIS encouraged item: PI holdings by currency. IIP BPM6 AAPD (BPM6 table A9-1-1a), but data in this table refer to all debt claims, with no breakdown for PI
	Debt Securities ST	CPIS				CPIS, IIP	
	Other Investment (OI) Banks	BIS IBS loans, deposits, other assets	IIP. BIS IBS data	BIS IBS data (Sector of investee: total and non banks)	Annual/quarterly IIP and quarterly BIS IBS	IIP	IIP BPM6 AAPD (BPM6 table A9-1-1a) with currency breakdown, for all debt claims (no breakdown for OI). BIS IBS data by five major currencies
	OI Other	BIS IBS mirror data with non bank sector as reported by banks	IIP. BIS IBS mirror data with non bank sector as reported by banks	BIS IBS mirror data with non bank sector as reported by banks (Sector of investee: banks)	Annual/quarterly IIP and quarterly BIS IBS mirror data	IIP	IIP BPM6 AAPD (BPM6 table A9-1-1a) with currency breakdown, for all debt claims, with no breakdown for OI. BIS IBS mirror data by five major currencies
	Reserves	SEFER	Reserves Data Template (RDT) and IIP	None, potential enhancement	Monthly RDT, quarterly/annual IIP, quarterly COFER, and annual SEFER	IIP and SEFER (debt securities long and short term).	COFER. RDT section IV and country notes. IIP BPM6 AAPD (BPM6 table A9-1-1a).
Liabilities	Direct Investment Liabilities	CDIS (net figures)	None, potential enhancements	CDIS partial data for net debt for resident financial intermediaries and all other residents	Annual CDIS and annual/quarterly IIP	IIP BPM6 AAPD, only for intercompany debt (BPM6 table A9-1-2a), with breakdown of which one year or less	IIP BPM6 AAPD with currency breakdown, but only for intercompany debt (BPM6 table A9-1-1a)
	Portfolio Investment (PI) Equity	CPIS	IIP and CPIS encouraged item by sector of resident holder	CPIS enhancements: PI holdings by sector of nonresident issuer	Annual CPIS, semiannual CPIS enhancements, and annual/quarterly IIP	Not applicable	CPIS encouraged item: PI holdings by currency.
	Debt Securities LT	CPIS				CPIS, IIP	CPIS encouraged item: PI holdings by currency. IIP BPM6 AAPD (BPM6 table A9-1-1a), but data in this table refer to all debt claims, with no breakdown for PI
	Debt Securities ST	CPIS				CPIS, IIP	
	Other Investment (OI) Banks	BIS IBS loans, deposits, other assets	IIP. BIS IBS data	BIS IBS data (Sector of investee: total and non banks)	Annual/quarterly IIP and quarterly BIS IBS	IIP	IIP BPM6 AAPD (BPM6 table A9-1-1a) with currency breakdown, for all debt claims (no breakdown for OI). BIS IBS data by five major currencies
	OI Other	BIS IBS mirror data with non bank sector as reported by banks	IIP. BIS IBS mirror data with non bank sector as reported by banks	BIS IBS mirror data with non bank sector as reported by banks (Sector of investee: banks)	Annual/quarterly IIP and quarterly BIS IBS mirror data	IIP	IIP BPM6 AAPD (BPM6 table A9-1-1a) with currency breakdown, for all debt claims, with no breakdown for OI. BIS IBS mirror data by five major currencies
	Reserves	SEFER	Reserves Data Template (RDT) and IIP	None, potential enhancement	Monthly RDT, quarterly/annual IIP, quarterly COFER, and annual SEFER.	IIP and SEFER (debt securities long and short term).	COFER. RDT section IV and country notes. IIP BPM6 AAPD (BPM6 table A9-1-1a).

■ Data encouraged and so reported on voluntary basis
■ Expected enhancements
■ Data gaps without current plans to fill

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