



First IMF Statistical Forum
Statistics for Global Economic and Financial Stability

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

Hyun Song Shin
Princeton University

Paper presented at the First IMF Statistical Forum
Washington, D.C. | November 12–13, 2013

The views expressed in this paper are those of the author(s) only, and the presence of them, or of links to them, on the IMF website does not imply that the IMF, its Executive Board, or its management endorses or shares the views expressed in the paper.

Mapping the Shadow Banking System through a Global Flow of Funds Analysis¹

Hanan AbuShanab

Goran Amidžić

Luca Errico

Artak Harutyunyan

Yevgeniya Korniyenko

Elena Loukoianova

Hyun Song Shin

Richard Walton

Revised Version

November 4, 2013

¹ Paper prepared for the First IMF Statistics Forum on “Statistics for Global Economic and Financial Stability”, November 12-13, 2013. Preliminary.

1. 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.

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.

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). In particular, we will use a new GFF conceptual framework (see Errico, et al., 2013) to map the funding and lending positions of shadow banks.²

In a nutshell, the new GFF conceptual framework is aimed at constructing a global flow of funds matrix, mapping domestic and external financial positions which can be then broken down bilaterally by (potentially) the 25 jurisdictions identified by the IMF as hosting systemically-important financial sectors. The domestic and external capital flows matrices use existing IMF and other data sources to show the international flow of funds and, for policy-makers, help strengthen the analysis of interconnectedness across borders, global liquidity flows, and global financial interdependencies.

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

² A separate workstream in STA is developing an approach to putting together official data on shadow banking activity which would augment the work done by the FSB.

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.

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)).

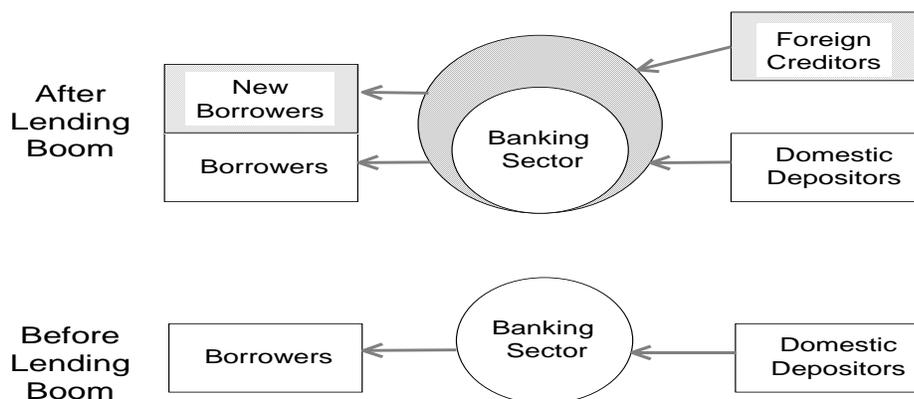


Figure 1 is a schematic illustration of the way that a lending boom will be associated with shifts in the composition of the balance sheet of the financial intermediary sector. The bottom panel of Figure 1 is the intermediation sector before a credit boom, while the top panel illustrates the intermediation 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. 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.

The schematic in Figure 1 can be associated with core and noncore liabilities of the financial corporations (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 (such as 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.³

³ Korea's experience in the run-up to the 2008 crisis gives useful lessons in this regard. 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.

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 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 sector k in country B . (See Table 2 and Figure 3 for illustration, albeit without identifying sectors in counterpart countries.) 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.

Our illustrative work is retrospective. The illustrative 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 can be applied in real time, in order to illuminate the nature of the link between capital flows between sectors. Through such an exercise, the understanding thus gained will enable national and global policy makers to identify trends in real time that they may employ in their surveillance work.

We discuss next the extent to which such GFF analysis may help identify the flow of funds in the U.S. shadow banking system in the context of a national and global financial system and help in identifying vulnerabilities in 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.

2. 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 flow of funds 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 the financial positions both regional/national and cross-border (by country and sector). First results are presented in this paper.

Table 1: BSA matrix for the United States for 2011 (Source: IMF Statistics Department, Standardized Report Forms (SRFs) for monetary statistics)

UNITED STATES – BSA MATRIX (in US\$ billion)

Issuer of liability (debtor)	Central bank			Central government			State and Local Government			Public Nonfinancial Corporations			Other Depository Corporations			Other Financial Corporations			Nonfinancial Corporations			Other resident sectors			Nonresidents		
	A	L	NP	A	L	NP	A	L	NP	A	L	NP	A	L	NP	A	L	NP	A	L	NP	A	L	NP	A	L	NP
Central bank				93	1,672	-1,579	0	0	0	0	0	0	1,571	9	1,562	71	139	-68	0	0	0	0	837	-837	143	248	-105
Currency and deposits																											
Central government	1,672	93	1,579										725	57	668	1,594	43	1,551							5,124	79	5,045
Currency and deposits																											
State and Local Government	0	0	0										682	539	143	1,185	398	786									
Currency and deposits																											
Public Nonfinancial Corp.	0	0	0										0	0	0	0	0	0							1,398	863	535
Currency and deposits																											
Other depository corporations	9	1,571	-1,562	57	725	-668	539	682	-143	0	0	0				2,373	3,850	-1,477	2,102	1,229	873	8,416	6,633	1,783	2,023	2,097	-74
Currency and deposits																											
Other financial corporations	139	71	68	43	1,594	-1,551	398	1,185	-786	0	0	0	3,850	2,373	1,477												
Currency and deposits																											
Nonfinancial corporations	0	0	0										1,229	2,102	-873												
Currency and deposits																											
Other resident sectors	837	0	837										6,633	8,416	-1,783												
Currency and deposits																											
Nonresidents	248	143	105	79	5,124	-5,045	0	0	0	863	1,398	-535	2,097	2,023	74												
Currency and deposits																											

	Other financial corporations		
	Assets	Liabilities	Net position
Other depository corporations	2,372.97	3,850.22	-1,477.25
In domestic currency	2,372.97	3,850.22	-1,477.25
Currency and deposits	1,629.05	0.00	1,629.05
Securities other than shares	191.14	3,119.71	-2,928.57
Loans	552.78	641.48	-88.70
Shares and Other Equity		89.03	
Insurance technical reserves	0.00	0.00	0.00
Financial derivatives			
Other accounts receivable			
In foreign currency			
Currency and deposits	0.00	0.00	0.00
Securities other than shares	0.00	0.00	0.00
Loans	0.00	0.00	0.00
Shares and Other Equity		0.00	
Insurance technical reserves			
Financial derivatives			
Other accounts receivable			

sectoral/instrumental breakdowns not fully available

Table 1 is an illustration of the Balance Sheet Approach (BSA) matrix for the United States for the end of 2011. 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\$2,373 billion against the U.S. banking sector (or ODCs) and had liabilities of US\$3,850 billion to ODCs.

Table 2: United States 2011, external flow of funds matrix (Source: IMF Statistics Department, BIS International Banking Statistics, U.S. Federal Reserve Board)

UNITED STATES – EXTERNAL FLOW OF FUNDS MATRIX

Holder of claim (creditor) \ Issuer of liability (debtor)	Nonresidents			Mexico			Euro Area			Switzerland			United Kingdom			France			Germany			Rest of the World					
	A	L	NP	A	L	NP	A	L	NP	A	L	NP	A	L	NP	A	L	NP	A	L	NP	A	L	NP			
Central bank	143	248	-105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Currency and deposits																											
...																											
General government	6522	942	5580	14	76	-62	220	245	-25	29	102	-73	134	626	-492	71	198	-127	34	163	-129	759	3258	-2499			
Currency and deposits																											
...																											
Other depository corporations	2023	2097	-74	59	14	45	1257	724	533	95	59	36	919	842	77	40	24	17	39	22	17	2893	1533	1359			
Currency and deposits																											
...																											
Other financial corporations	4479	6805	-2327	133	52	81	2537	0	2537	287	6	281	1445	146	1299	758	1045	-287	291	218	73	8775	769	8006			
Currency and deposits																											
...																											
Non-financial corporations	9757	5938	3819	105	121	-16	1530	1256	274	171	487	-316	1053	1478	-425	464	813	-348	192	309	-117	4652	5607	-755			
Currency and deposits																											
...																											

	Mexico		
	Assets	Liabilities	Net positions
Other depository corporations	58.66	13.78	44.88
Currency and deposits	42.08	8.17	33.90
Securities other than shares	3.59	0.51	3.08
Short-term	0.01	0.04	-0.03
Long-term	3.58	0.47	3.11
Loans	0.00	1.09	-1.09
Shares and Other Equity	4.71	1.76	2.95
of which DI	4.71	1.76	2.95
Insurance technical reserves			
Financial derivatives			
Other accounts receivable			

sectoral/instrumental breakdowns not fully available

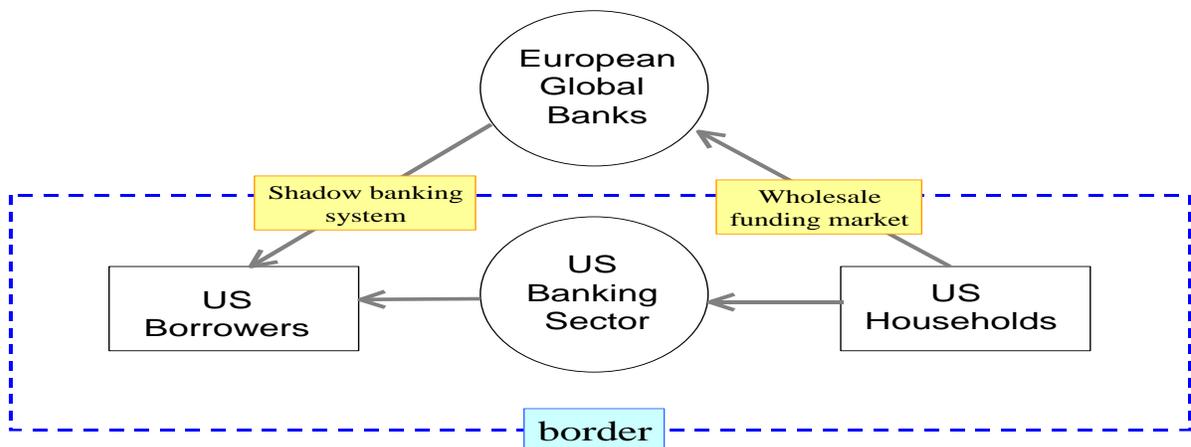
Table 2 is the external flow of funds matrix for the United States for 2011, where the external assets and liabilities have been disaggregated into the counterpart country, and by instrument. In Annex 2 we provide a fuller discussion of the methodology for the external flow of funds matrix.

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 counterparty 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, 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

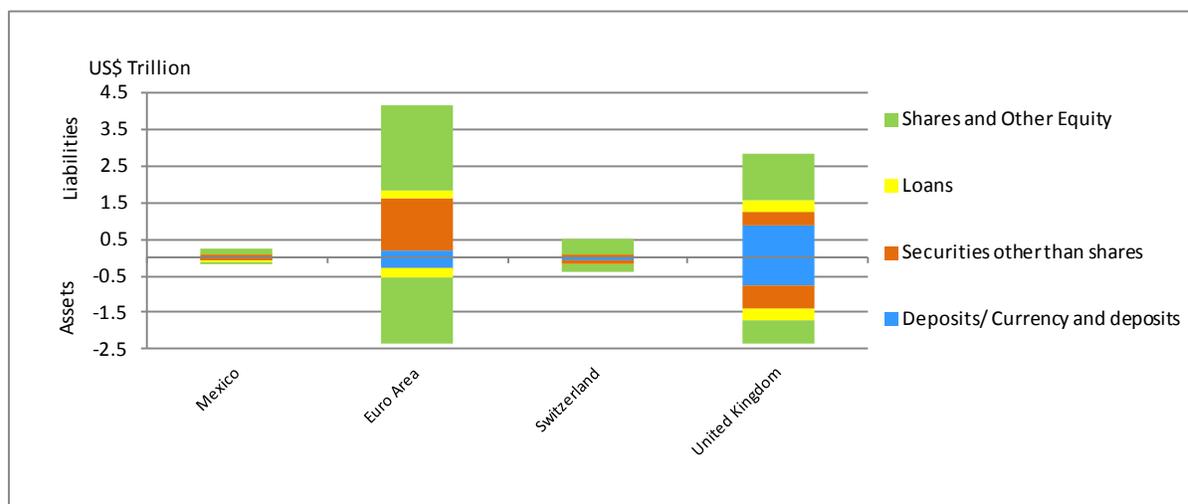
money first leaves the United States via the banking sector to return in the shape of the purchase of non-Treasury securities, formed the bulk of the flows, or only a small proportion.

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 the information gap. In Annex 3, we summarize the main measurement issues involved in the GFF conceptual framework used in this paper.

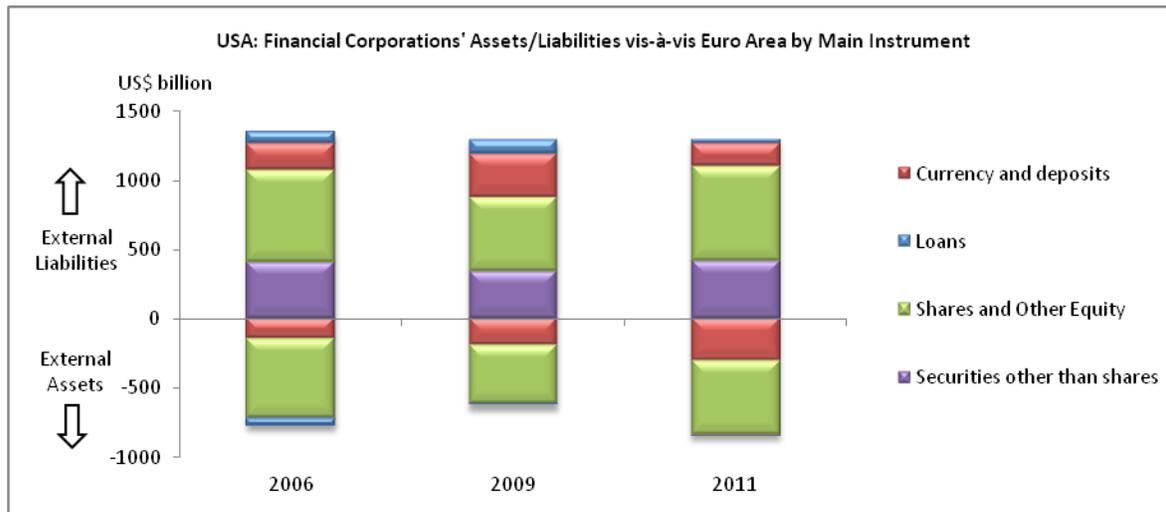
In the aggregate, the bilateral positions between the United States and Mexico, the Euro area, Switzerland, and the U.K., are shown as in Figure 3 below.

Figure 3: USA: external assets/liabilities by counterpart country and main instrument (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 the type of instrument.

Figure 4: USA: financial corporations' assets/liabilities vis-à-vis Euro Area by main instrument (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 other depository corporations (ODC) sector, and so tracking the ODC 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.

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 (ODC sector) by instrument. In the figure, we do not include equity, and do not include derivatives. But all the major items on bank balance sheets are present.

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

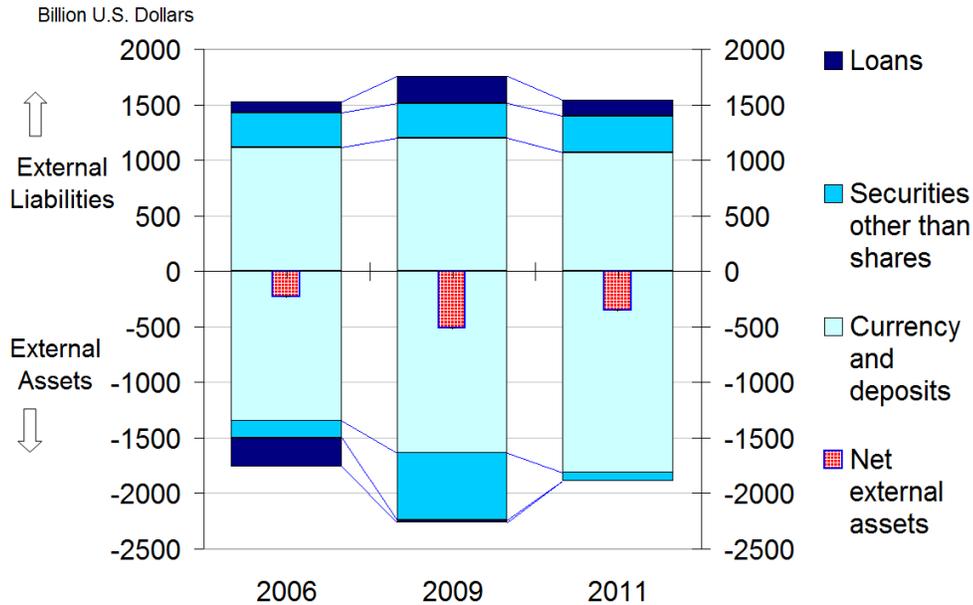


Figure 5 is notable in several respects. Note that the dominant component of the external claims and liabilities is “currency and deposits”. Loans are only a very small part of the external balance sheet, and so are securities.

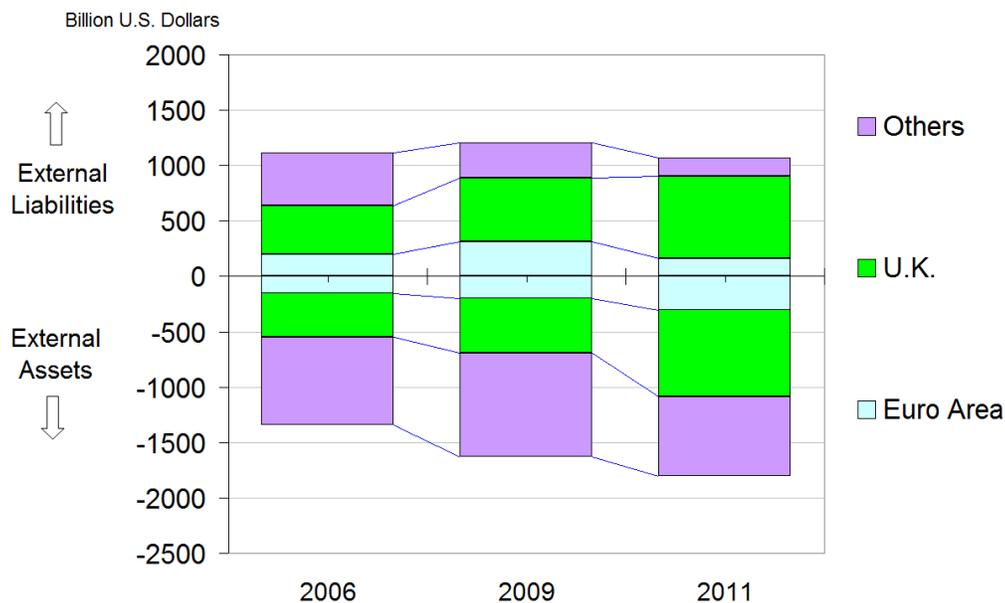
The fact that deposits form the main part of the external claims and liabilities suggests that *interbank claims* form the bulk of the cross-border linkages for the U.S. banking sector. What is important to bear in mind is that the external matrix is drawn up on a residence basis. Thus, the U.S. banking 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 present three counterparties – the U.K., Euro area and all others. The notable feature of Figure 6 is the weight of the U.K. in the total. Indeed by 2011, the U.K. emerges as the largest counterparty among the three categories. 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.

Figure 6: Counterparties by location of the “Currency and Deposits” component of the U.S. banking system (ODC sector) (Source: IMF Statistics Department)

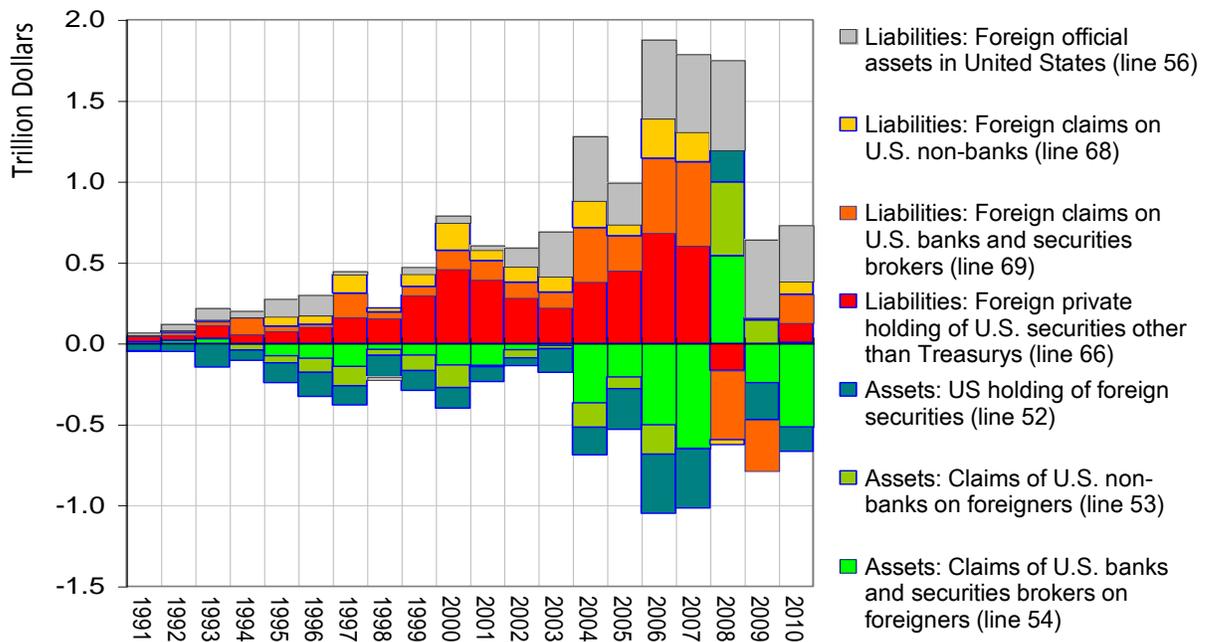


The capital outflows through the U.S. banking system put some context on the information that can be gleaned from other sources. Figure 7 from Shin (2012) plots U.S. balance of payments by category of flows. An increase in US liabilities to foreigners is indicated by an upward-pointing bar (gross capital 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.⁴ 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.

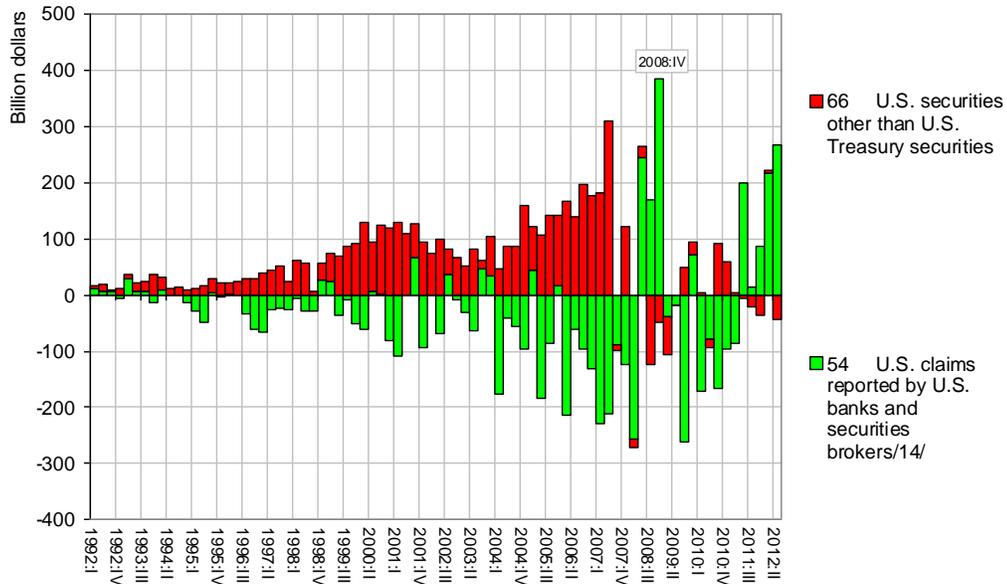
Figure 7: U.S. annual capital flows by category

(Source: Shin (2012), data from U.S. Bureau of Economic Analysis).



⁴ 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).

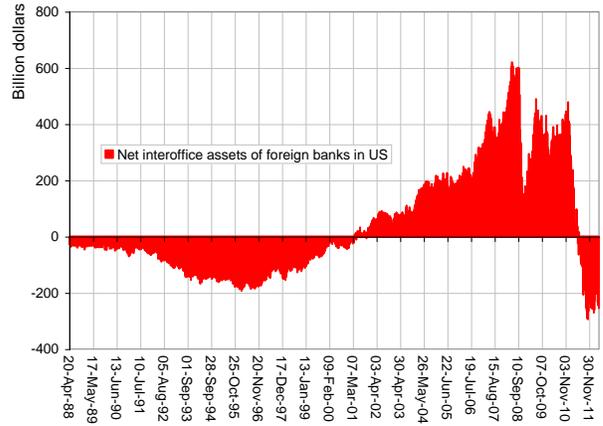
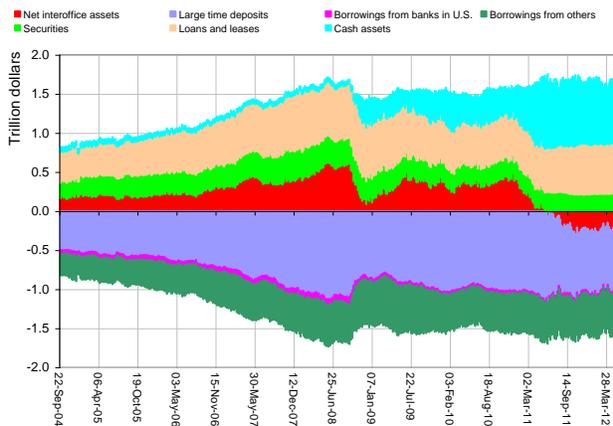
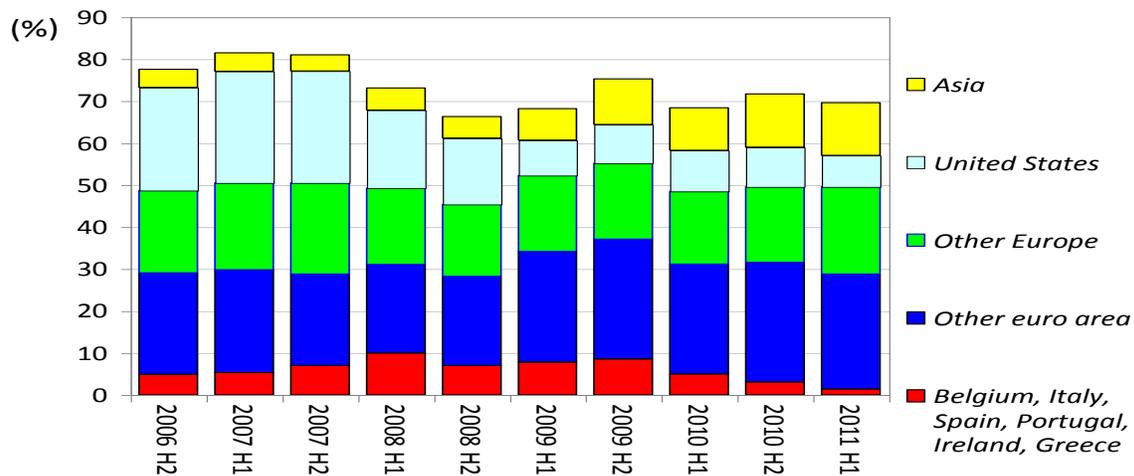


Figure 9 plots the assets and liabilities of foreign banks in the United States (left panel) and their net interoffice assets (right panel) obtained from the Federal Reserve.⁵

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' U.S. branches and subsidiaries in the United States are treated as U.S. banks in the balance of payments, as the balance of payments accounts are based on residence, not nationality. 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 fund (MMF) sector that the foreign banks engaged in sending fund to their headquarters were the European banks.

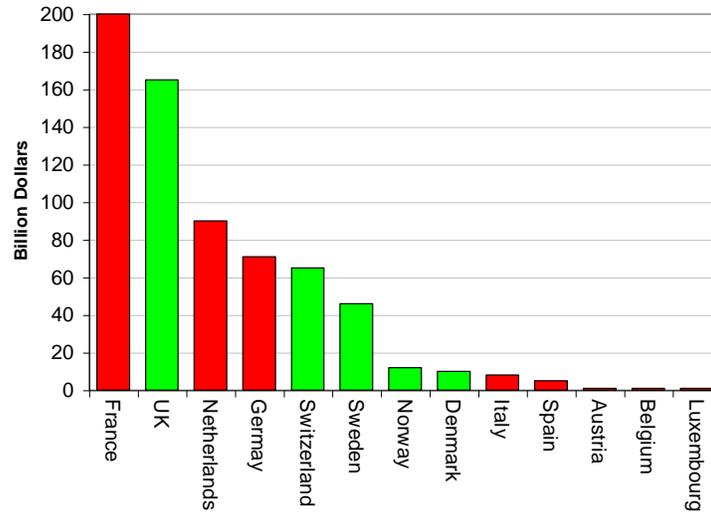
Figure 10 plots the chart from the IMF's Global Financial Stability Report of September 2011 of the amount owed by banks to U.S. prime money market funds based on top 10 prime MMFs, representing US\$755 billion of approximately US\$1.66 trillion total prime MMF assets, classified by nationality of borrowing bank, while Figure 11 is a snapshot of the dollar amounts by nationality of the borrowing bank on June 30, 2011.

Figure 10: Amount owed by banks to US prime money market funds (% of total), by nationality of borrowing bank (Source: IMF GFSR Sept 2011, data from Fitch)



⁵ Net interoffice assets measure the net claim of the branch or subsidiary of the foreign bank on its parent.

Figure 11: Amount owed by banks to US prime money market funds on June 30, 2011, by nationality of borrowing bank (Source: IMF GFSR Sept 2011, data from Fitch)



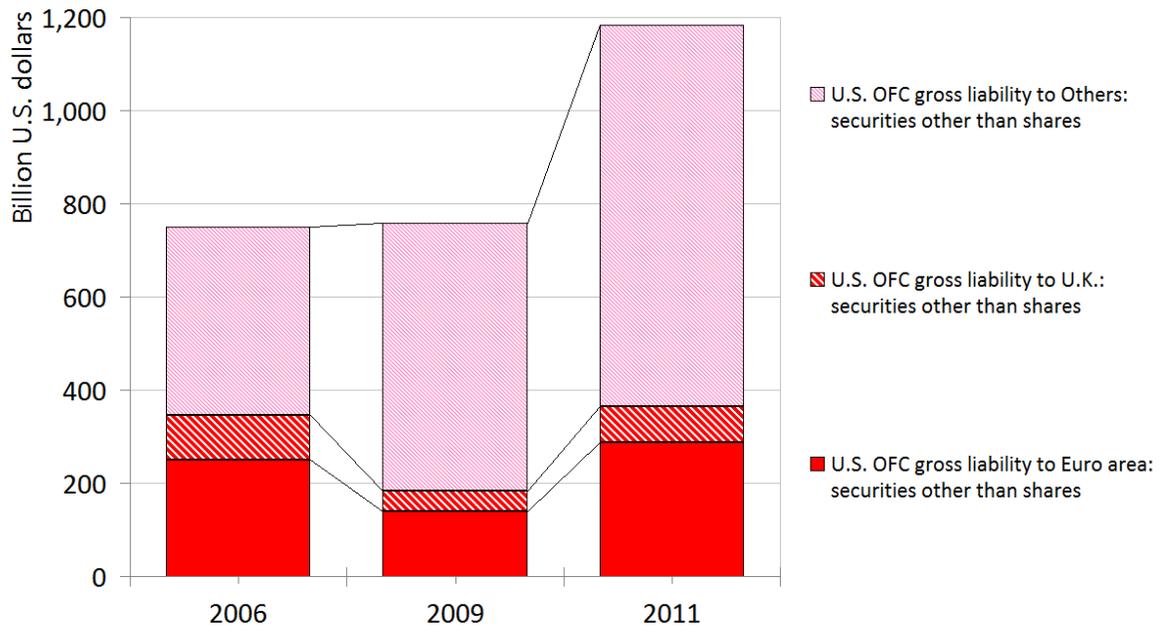
Around 50 percent of the assets of the prime money market funds are the obligations of European banks, and Figure 11 gives a snapshot of the dollar amounts borrowed by European banks. In effect, during the decade between 2001 and 2011, European bank offices in the United States became funding sources 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.

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 “Other Financial Corporations” (OFCs), that is, the nonbanks 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 claims (“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 categories of counterparty – the U.K., Euro area and all others.

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



We see that the U.K. holding of OFC debt securities is 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 sharply in 2009, to rebound by 2011. The “Other” category is by far the largest counterparty, and this category of counterparty will be aggregating very 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 security (MBSs). On the other hand, the bulk of the “Other” category 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. However, 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 (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. 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 project, 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 a project in an unthinking way would result in incidental details and very small quantities that are uninteresting 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 the ambitious measurement project 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 consolidated 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)

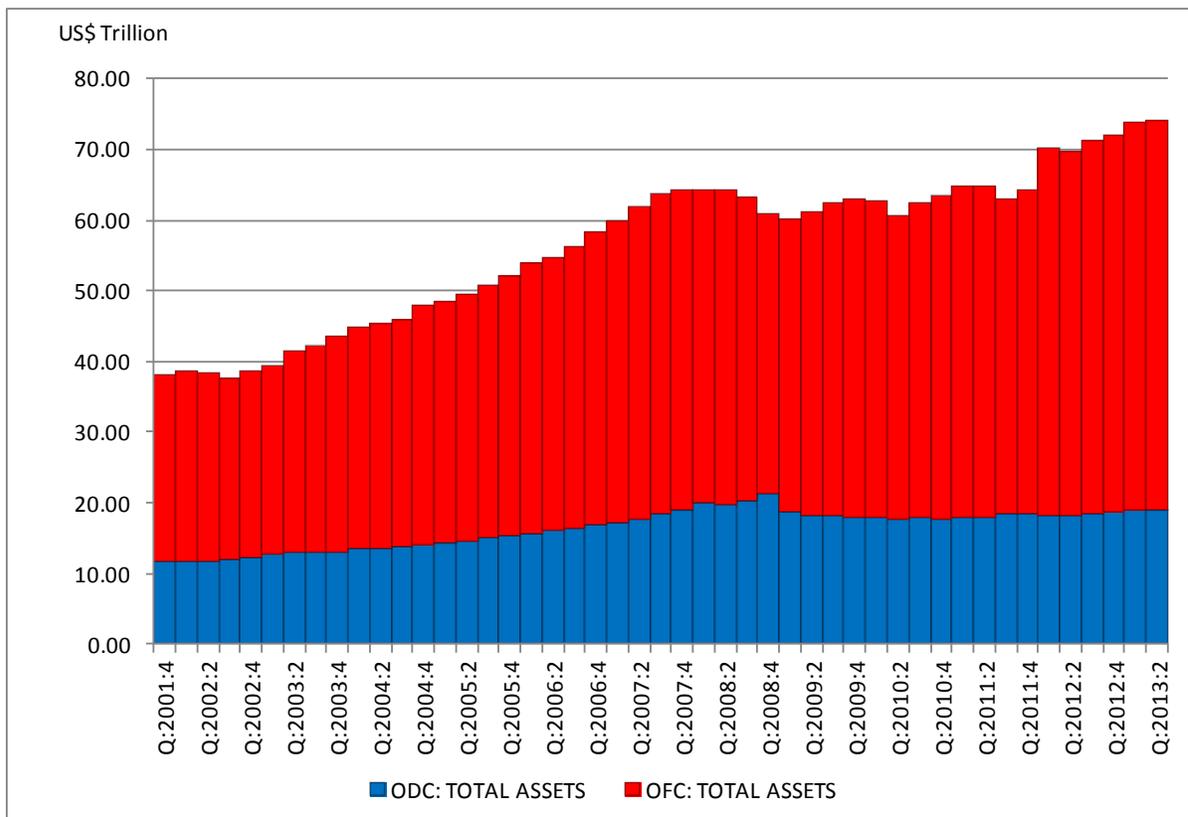


Figure 14: USA: Assets and liabilities of ODCs by main instrument (Source: IMF's Monetary and financial statistics/SRFs)

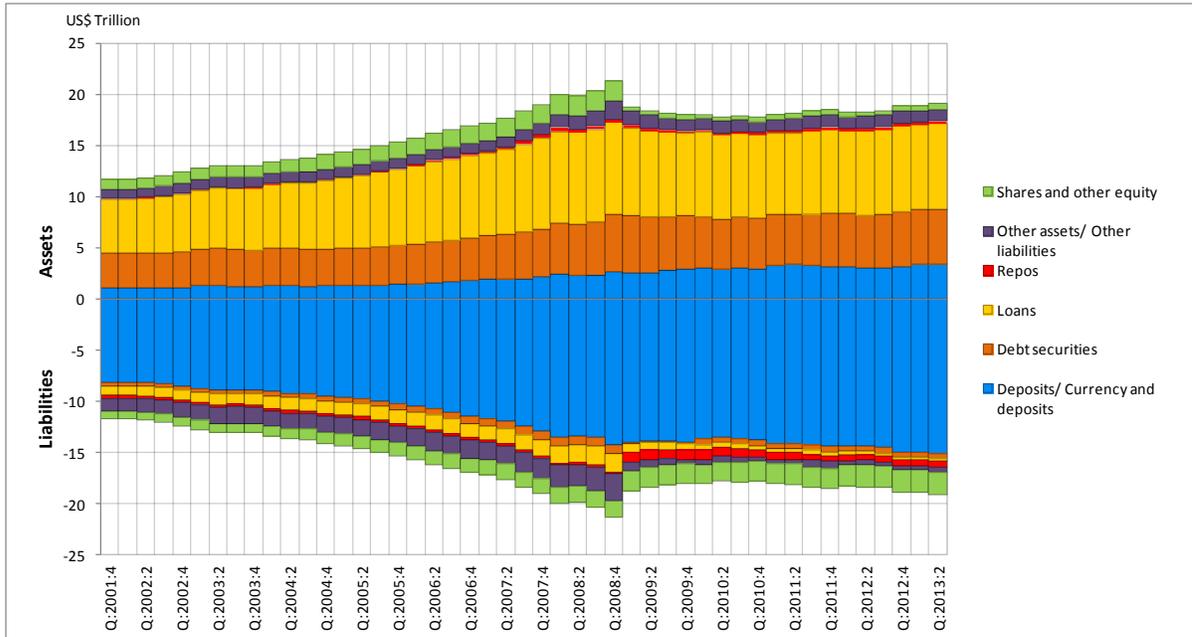


Figure 15: USA: Assets and liabilities of OFCs by main instrument (Source: IMF's Monetary and financial statistics/SRFs)

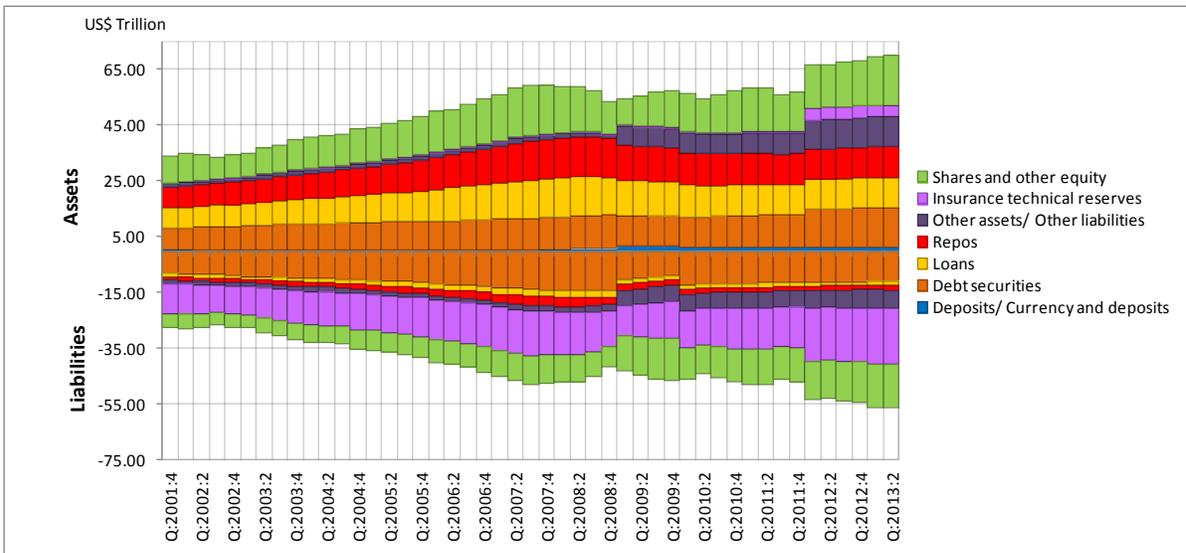
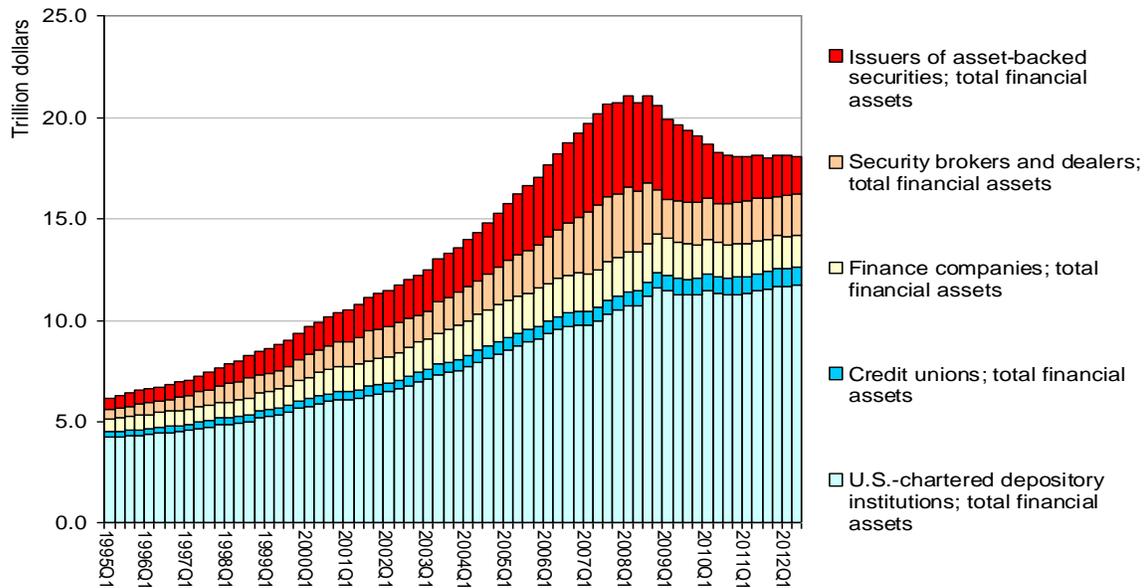


Figure 16 presents aggregate financial assets of five subsectors in the United States that are associated with financial intermediation – the U.S.-chartered banking, credit unions, finance companies, security broker dealers and the asset-backed securities (ABS) issuers.

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.⁶ 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 government sponsored enterprises (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.

Above Figure 16 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

⁶ See Adrian and Shin (2010) for a survey of the market-based intermediation system in the United States.

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 dealer sector are nonbank financial firms, they would be classified under 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))

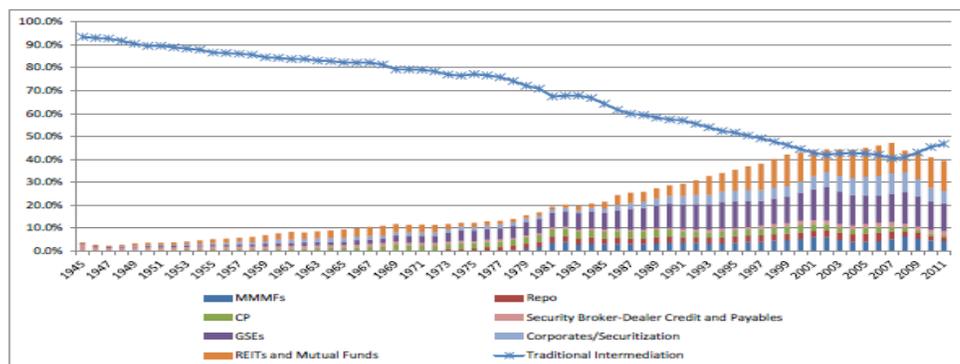
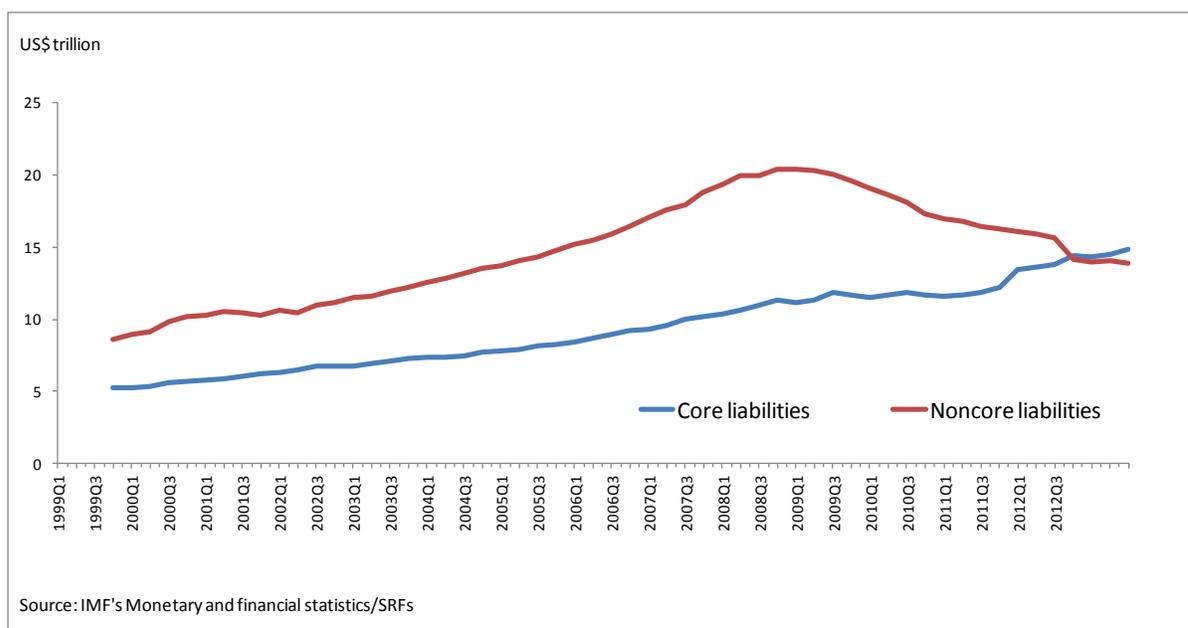


Figure 18 presents the core and noncore liabilities of the U.S. financial corporations using the IMF's monetary statistics data (SRFs).⁷ Noncore liabilities could be considered as the funding of shadow banks.

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



3. Empirical Evidence

We now examine more closely through empirical analysis both the directions and the magnitudes of the capital flows associated with the shadow banking system. To do so, we run regressions with various loan categories within the financial system as being the dependent variable. A set of independent variables include (i) the sum of ODC and OFC's deposits and debt securities liabilities from nonresidents lagged by one period; (ii) controls for global liquidity conditions (market volatility index, global cross-border credit⁸ and dummy variable to control for periods of quantitative easing in the USA lagged by one period); and (iii) a set of macro controls that are typically used in this type of regressions, also lagged by one period (Table 3).

⁷ 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.

⁸ This variable is taken from the BIS Global liquidity indicators (BIS website).

Table 3: List of variables used in the regression analysis

Variable	Description
L.reer_dlg	Real Effective Exchange Rate (log difference lagged by one period)
L.vix	Chicago Board Options Exchange Market Volatility Index (lagged by one period)
L.interoffice_pch	US banks' interoffice cross-border positions (percentage change lagged by one period)
L.qe	Dummy for the periods of US quantitative easing (lagged by one period)
L.qe_vix	Interaction between QE and VIX variables (lagged by one period)
L.rgdp_pch	Real GDP growth rate (lagged by one period)
L.acpi_pch	Inflation rate (lagged by one period)
L.dgdp	Debt to GDP ratio (lagged by one period)
L.noncore_liab_dlg	ODCs+OFCs deposits and securities liabilities from non-residents (log difference lagged by one period)
L.anb_stock_allfx_rcallrcwrl_dlg	Global cross-border credit (percentage change lagged by one period) ⁹
L.dep_rate	Domestic deposit rate (lagged by one period)

The regression results are presented in Table 4. We see that 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. This relationship holds for banks when we split the total lending into lending by ODCs and OFCs (no result for OFCs as the sample is very small).

The data for the ODC and OFC deposits and securities liabilities draw on the information contained in the standardized reporting forms (SRFs) submitted by individual country monetary authorities to the IMF and then used to compile 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.

⁹ BIS Global liquidity: selected indicators.

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 (the results are in Table 4).

In addition, we also present a series of scatter charts 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: Q1:2005-Q1:2007, Q1:2007-Q1:2009, Q1:2009-Q1:2011, Q1:2011-Q1:2013, and we examine the behavior of each instrument in the sector. The relationships between changes between sub-periods are presented in a series of scatter charts below Table 4.

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 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.

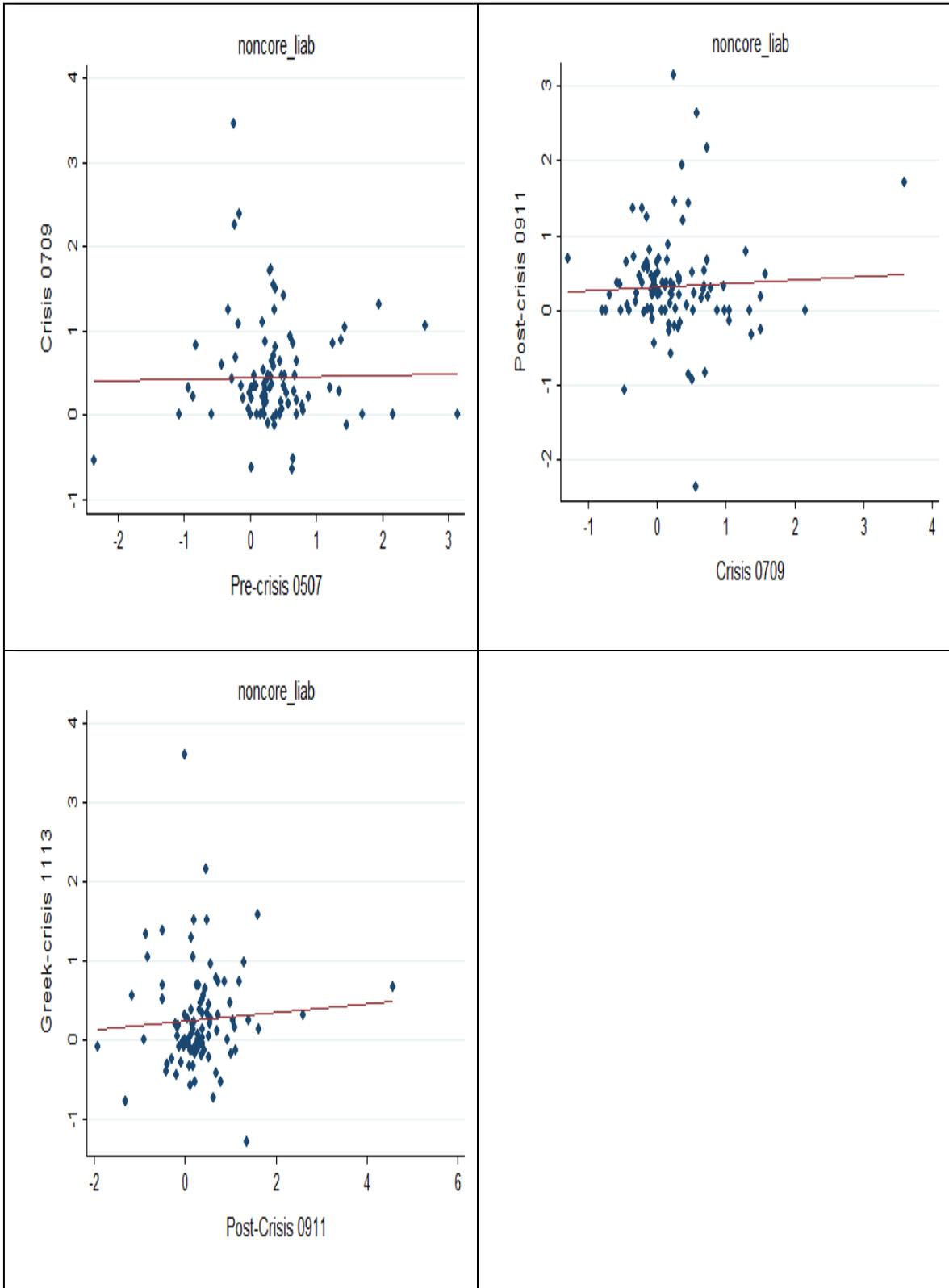
Table 4: Determinants of Domestic Growth of Loans to Non-Financial Sector

VARIABLES	ODCs+OFC	ODCs+OFCs	ODCs+OFCs	ODCs loans to	ODCs loans to	ODCs loans to	OFCs loans to	OFCs loans to	OFCs loans to
	corporates	loans to ONFCs	loans to PNFCs	corporates	ONFCs	PNFCs	corporates	ONFCs	PNFCs
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	loantops_dlg	loantoonfc_dlg	loantopnfc_dlg	r2_loantops_dlg	r2_loantoonfc_dlg	r2_loantopnfc_dlg	r4_loantops_dlg	r4_loantoonfc_dlg	r4_loantopnfc_dlg
L.reer_dlg	-0.0115 [0.741]	0.000865 [0.979]	0.0238 [0.936]	-0.0149 [0.668]	-0.00167 [0.959]	-0.0295 [0.922]	0.0180 [0.908]	0.198 [0.241]	0.0919 [0.837]
L.vix	-0.00253 [0.882]	-0.00137 [0.938]	-0.183 [0.417]	-0.00629 [0.721]	-0.00329 [0.855]	-0.193 [0.399]	0.0861 [0.657]	0.153 [0.509]	0.578 [0.219]
L.interoffice_pch	0.00242 [0.242]	0.000982 [0.633]	-0.0307 [0.445]	0.00287 [0.155]	0.00139 [0.486]	-0.0329 [0.420]	0.00389 [0.753]	-0.00775 [0.454]	-0.0163 [0.555]
L.qe	0.00240 [0.764]	-0.00133 [0.869]	-0.0675 [0.539]	0.00420 [0.596]	0.00102 [0.897]	-0.0711 [0.522]	0.0183 [0.761]	-0.0176 [0.759]	0.413 [0.101]
L.qe_vix	-0.0451 [0.192]	-0.0384 [0.262]	0.345 [0.426]	-0.0486 [0.158]	-0.0435 [0.197]	0.352 [0.422]	-0.122 [0.498]	-0.0448 [0.801]	-1.302* [0.0577]
L.rgdp_pch	0.131*** [0.00460]	0.161*** [0.000195]	-0.0562 [0.748]	0.132*** [0.00461]	0.162*** [0.000200]	-0.00966 [0.956]	-0.826** [0.0322]	-0.450 [0.260]	-0.365 [0.698]
L.acpi_pch	-0.0250 [0.557]	-0.0404 [0.300]	-0.0269 [0.883]	-0.0258 [0.544]	-0.0419 [0.280]	-0.0332 [0.857]	0.161 [0.427]	0.134 [0.524]	-0.0446 [0.966]
L.dgdp	-0.0442*** [1.56e-05]	-0.0374*** [0.000313]	-0.0160 [0.697]	-0.0420*** [2.89e-05]	-0.0354*** [0.000557]	-0.0161 [0.698]	-0.172* [0.0905]	-0.198* [0.0871]	0.687 [0.119]
L.noncore_liab_dlg	0.0169*** [0.00224]	0.0143*** [0.00617]	-0.00151 [0.975]	0.0176*** [0.00137]	0.0149*** [0.00426]	0.00443 [0.929]	0.0327 [0.459]	0.0704 [0.206]	-0.0835 [0.416]
L.anb_stock_allfx_rcallrcwrlid_dlg	0.147*** [0.00332]	0.109** [0.0267]	0.0247 [0.950]	0.153*** [0.00213]	0.117** [0.0180]	0.0400 [0.921]	-0.104 [0.808]	-0.126 [0.766]	-0.0550 [0.968]
L.dep_rate	-0.0249 [0.682]	0.0103 [0.834]	-0.102 [0.658]	-0.0337 [0.599]	0.00265 [0.959]	-0.127 [0.597]	0.364 [0.524]	0.259 [0.599]	-1.156 [0.469]
Constant	0.0540*** [0]	0.0504*** [0]	0.0811 [0.241]	0.0539*** [0]	0.0499*** [5.94e-11]	0.0842 [0.229]	0.0854 [0.219]	0.0783 [0.356]	-0.330* [0.0617]
Number of observations	3,295	3,295	3,062	3,295	3,295	3,039	700	699	302
R-squared	0.048	0.045	0.002	0.049	0.045	0.002	0.017	0.012	0.020
Number of country_code	88	88	82	88	88	82	25	25	15

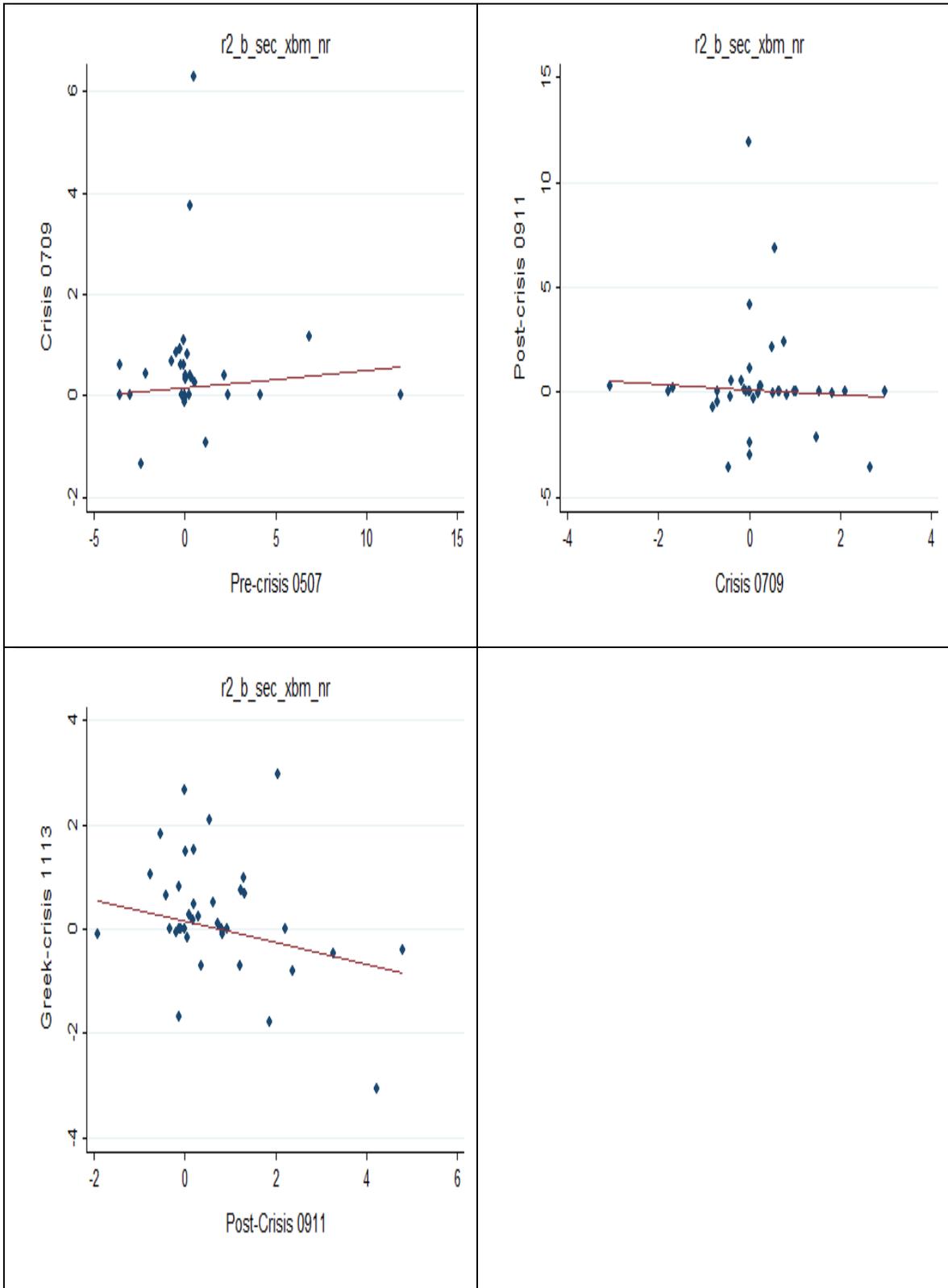
Robust pval in brackets

*** p<0.01, ** p<0.05, * p<0.1

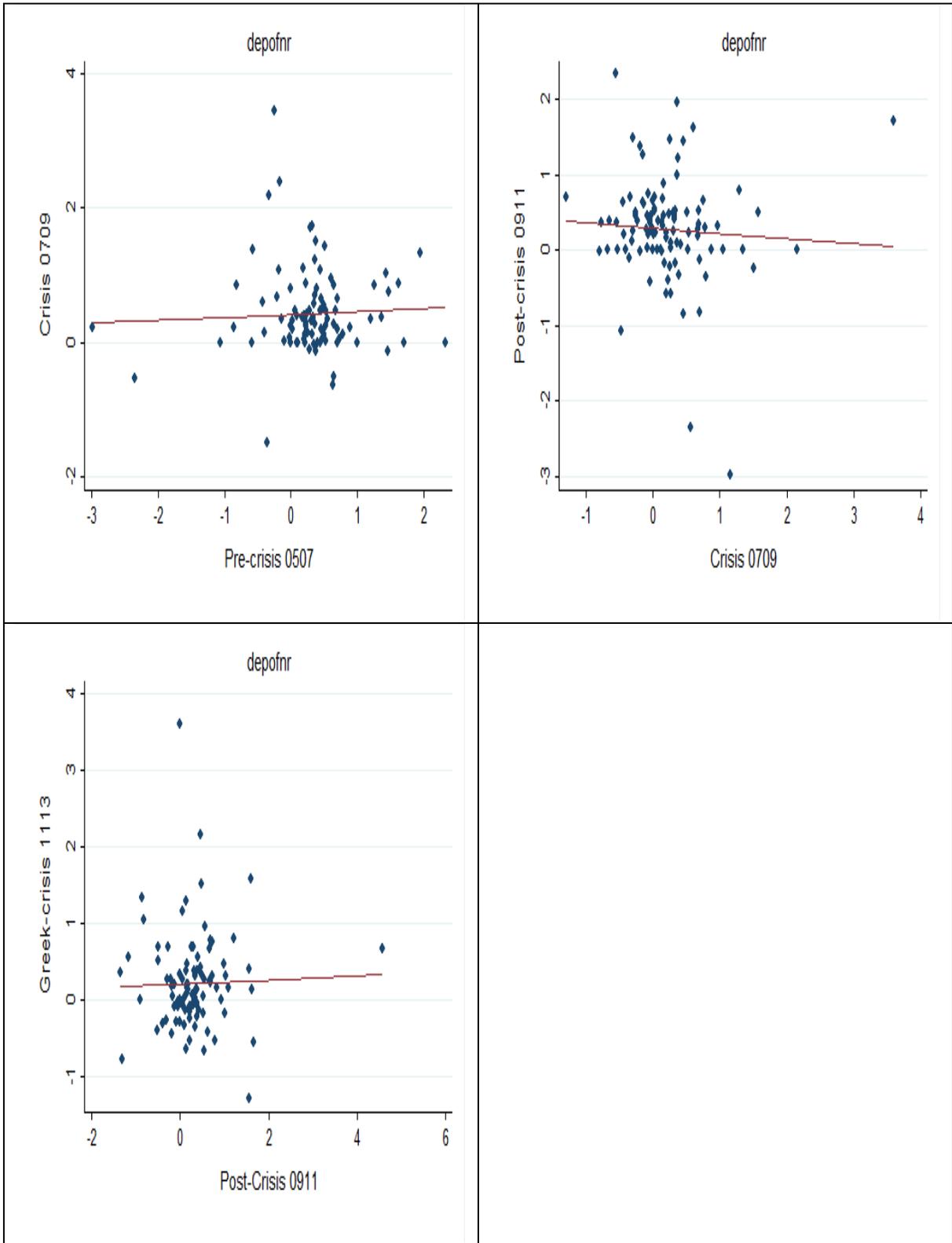
ODCs+OFCs securities and deposits from nonresidents(non-core liabilities)



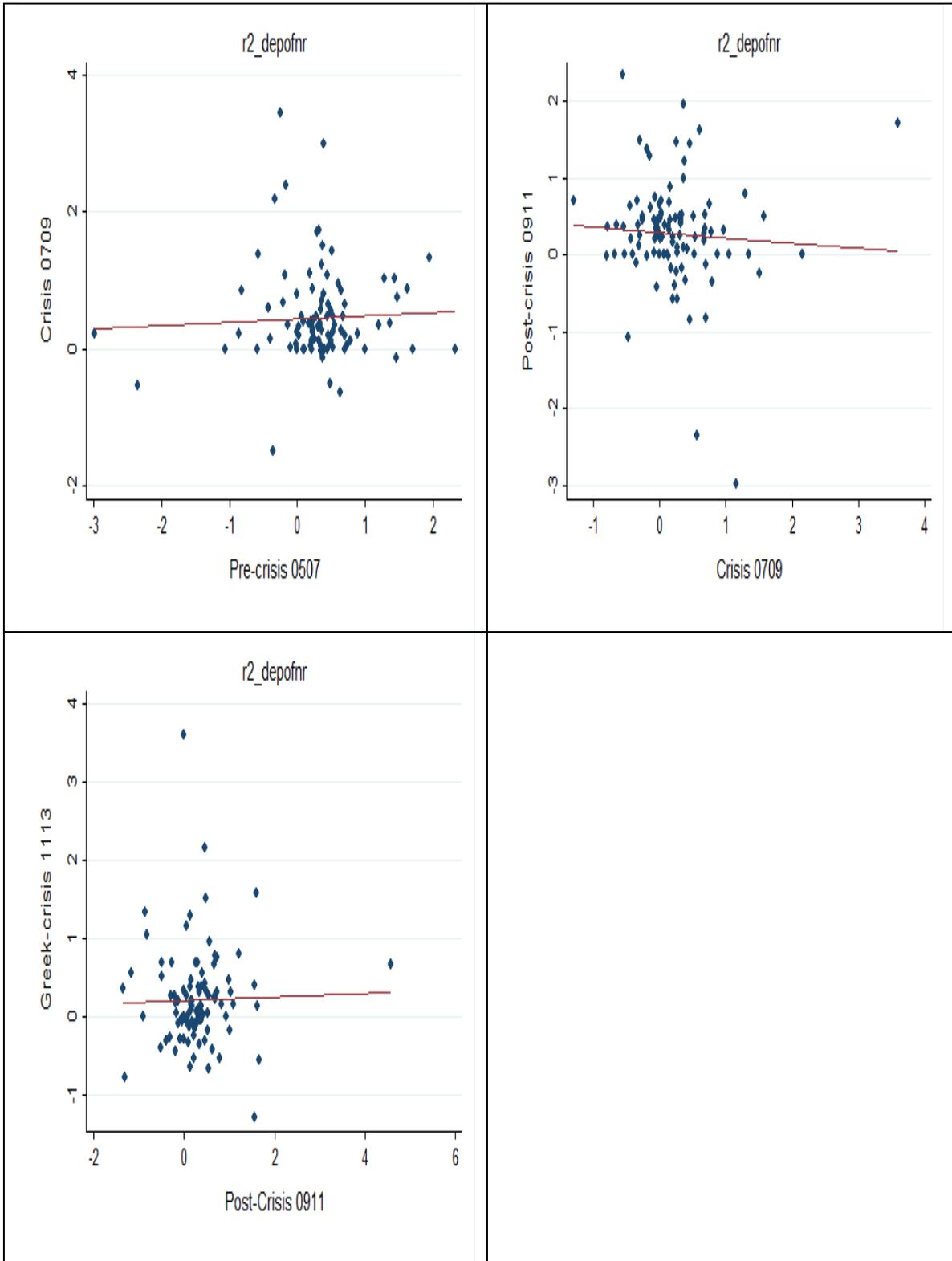
ODCs securities other than shares liabilities from nonresidents



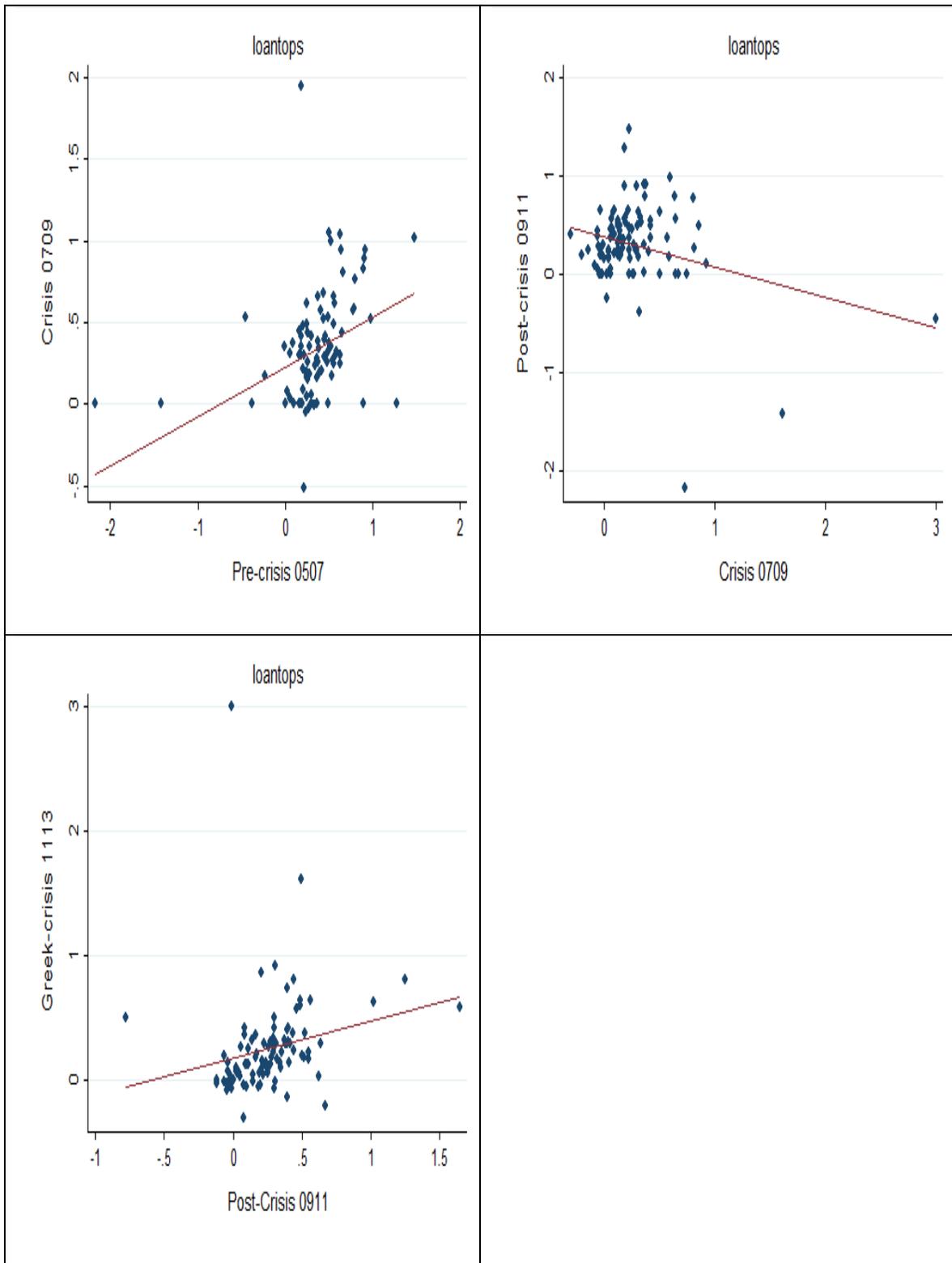
ODCs+OFCs deposits from nonresidents



ODCs deposits from nonresidents



ODCs+OFCs domestic loans to corporates



4. 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 flow of funds matrices for the years that we have not covered in the paper. In this paper, we have shown evidence based on just three years – 2006, 2009 and 2011. However, more informative about the height of the boom would be figures from 2007. Also, 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 flow of funds 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 project would be to disaggregate the external flow of funds matrix by counterparty location and by counterparty sector as the ultimate goal of the project, 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.

However, even if the most ambitious project 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 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 intra-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 the 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.¹⁰

Several major data gaps remain (Annex 3). A number of G20 countries 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 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 data access 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.

¹⁰ *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.

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).¹¹ 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.¹² 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.¹³

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.¹⁴ We assumed that the

¹¹ 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.

¹² 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*¹ (<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>).

¹³ 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 same countries vis-à-vis the following counterpart countries: the United States, Euro Area, Mexico, Switzerland, the United Kingdom, Germany, France and the rest of the world.

¹⁴ 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 percent, respectively. For the United States, in the absence of proxy data, the split is based on a working

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 investigation¹⁵—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. 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.
- 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.
- 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.

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).

¹⁵ 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.

- 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,¹⁶ 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).¹⁷ 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

¹⁶ For intercompany loans in the matrix, we used information from BIS statistics on stocks of claims/liabilities to affiliated offices (intrabank lending).

¹⁷ 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 (intrabank lending).

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

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 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.¹⁸ 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

¹⁸ 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. 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.

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 worldwide. 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).

With regard to the geographical breakdown for the euro area, almost full IIP (stocks) and Balance of Payments (BOP) (flows) data with geographical composition are available for 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.¹⁹

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

¹⁹ See: <http://sdw.ecb.europa.eu/reports.do?node=100000215>

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.²⁰

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

Table 1 presents available data sources, planned enhancements, and main data gaps for the external flow of funds matrix.

²⁰ See IMF WP/11/222 which was also published as BIS WP 376 and NBER WP 18531.

Table 1: 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).

Green Data encouraged and so reported on voluntary basis

Yellow Expected enhancements

Red Data gaps without current plans to fill

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."²² 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.

²² March 2013 version of the BIS, *Guidelines to the International Locational Banking Statistics*.

References

- Adrian, Tobias and Adam B. Ashcraft (2012) "Shadow Banking: A Review of the Literature" Federal Reserve Bank of New York Staff Report No. 580
http://www.newyorkfed.org/research/staff_reports/sr580.pdf
- Adrian, Tobias, Adam B. Ashcraft and Nicola Cetorelli (2013) "Shadow Bank Monitoring" Federal Reserve Bank of New York Staff Report No. 638
http://www.newyorkfed.org/research/staff_reports/sr638.pdf
- Adrian, Tobias and Hyun Song Shin (2010) "The Changing Nature of Financial Intermediation and the Financial Crisis of 2007-09" Annual Review of Economics, 2, 603-618.
- Bank for International Settlements (2010) "Funding patterns and liquidity management of internationally active banks", CGFS paper 39, May 2010,
<http://www.bis.org/publ/cgfs39.htm>
- Bank for International Settlements (2011) "Global liquidity -- concept, measurement and policy implications" CGFS Papers 45, Committee on the Global Financial System
<http://www.bis.org/publ/cgfs45.pdf>
- Bank for International Settlements (2013) Quarterly Review, September 2013, Box 2 on offshore issuance of international debt securities by emerging economy borrowers.
- Calvo, Guillermo A., Leonardo Leiderman, and Carmen Reinhart (1993) "Capital Inflows and Real Exchange Rate Appreciation in Latin America: The Role of External Factors," IMF Staff Papers, 40 (1), 108-151.
- Calvo, Guillermo A., Leonardo Leiderman, and Carmen Reinhart (1996) "Capital Flows to Developing Countries in the 1990s: Causes and Effects," Journal of Economic Perspectives, 10, Spring 1996, 123-139.
- Chamon, Marcos and Christopher Crowe (2012) "Evidence on Financial Globalization and Crisis: "Predictive" indicators of crises - macroprudential indicators, institutional environment, micro" working paper, International Monetary Fund
- Cetorelli, Nicola and Linda S. Goldberg (2012) "Banking Globalization and Monetary Transmission" Journal of Finance 67(5), 1811-1843
- Claessens, Stijn, Giovanni Dell'Ariccia, Deniz Igan and Luc Laeven (2010) "Cross-Country Experiences and Policy Implications from the Global Financial Crisis" Economic Policy, 62, 267-293

Edge, Rochelle M., and Ralf R. Meisenzahl (2011) "The Unreliability of Credit-to-GDP Ratio Gaps in Real Time: Implications for Countercyclical Capital Buffers," *International Journal of Central Banking*, vol. 7, pp. 261-298.

Errico, Luca, Richard Walton, Alicia Hierro, Hanan AbuShanab and Goran Amidzic, Statistics Department, International Monetary Fund (2013) "Global Flow of Funds: Mapping Bilateral Geographic Flows", 59th International Statistical Institute (ISI) World Statistics Congress. <http://www.statistics.gov.hk/wsc/STS083-P1-S.pdf>

Financial Stability Board (2011) "Shadow Banking: Strengthening Oversight and Regulation" http://www.financialstabilityboard.org/publications/r_111027a.pdf

Financial Stability Board (2013) "Strengthening Oversight and Regulation of Shadow Banking: An Overview of Policy Recommendations" August 2013 http://www.financialstabilityboard.org/publications/r_130829a.pdf

Friedman, Benjamin, M. (1988) "Lessons on Monetary Policy from the 1980s" *Journal of Economic Perspectives*, 2, 51-72

Friedman, Milton (1956) "The Quantity Theory of Money - A Restatement" in *Studies in the Quantity Theory of Money* (ed) Milton Friedman, Chicago University Press, Chicago.

Goldstein, Itay (2010) "Fundamentals or Panic: Lessons from the Empirical Literature on Financial Crises" forthcoming in *Encyclopedia of Financial Globalization*

Gourinchas, Pierre-Olivier and Maurice Obstfeld (2012) "Stories of the Twentieth Century for the Twenty-First," *American Economic Journal: Macroeconomics*, 4(1), 226-65.

Hahm, Joon-Ho, Hyun Song Shin and Kwanho Shin (2011) "Noncore Bank Liabilities and Financial Vulnerability" NBER working paper 18428, forthcoming in the *Journal of Money, Credit and Banking*.

Hahm, Joon-Ho, Hyun Song Shin and Kwanho Shin (2013) "Noncore Bank Liabilities and Financial Vulnerability"

International Monetary Fund (2009) *Handbook on Securities Statistics, Part 1: Debt Securities Issues*, <http://www.imf.org/external/np/sta/wgsd/pdf/051309.pdf>

International Monetary Fund (2000) *Monetary and Financial Statistics Manual*, <http://www.imf.org/external/pubs/ft/mfs/manual/index.htm>

International Monetary Fund (2008) *Monetary and Financial Statistics Compilation Guide*, <http://www.imf.org/external/pubs/ft/mfs/manual/index.htm>

International Monetary Fund (2010) The IMF-FSB Early Warning Exercise: Design and Methodological Toolkit, available at www.imf.org/external/np/pp/eng/2010/090110.pdf

Shin, Hyun Song (2012) "Global Banking Glut and Loan Risk Premium" Mundell-Fleming Lecture, IMF Economic Review 60 (2), 155-192.

Shin, Hyun Song and Kwanho Shin (2010) "Procyclicality and Monetary Aggregates" NBER working paper w16836

Shin, Hyun Song and Yi Zhao (2013) "Monetary Aggregates and Global Liquidity: Evidence from Individual Firm Data from Asia" working paper for ADB interim conference, Hong Kong, January 2013