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Abstract

This paper outlines the opportunities and pitfalls for risk analysts in interpreting the information embedded in international and sectoral balance sheets. It emphasises the different risks posed by net financial stock imbalances and the cross-holding of large stocks of gross financial assets and gross financial liabilities. It argues that it is important to supplement sectoral-level data with more disaggregated levels of data, in view of the importance of intra-sectoral financial linkages and the heterogeneity in portfolios and funding mechanisms within sectors. Finally, the growing internationalisation of financial balance sheets means that it is important to take a unified approach to the joint analysis of international and sectoral balance sheets.

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1 Introduction

The global financial crisis had led to renewed interest in the information content of international and sectoral balance sheets. During the pre-crisis period, there was rapid growth in gross stocks of financial assets and financial liabilities, especially for advanced economies. Moreover, the financial globalisation process meant that cross-border positions accounted for a growing share of total holdings, while net external imbalances also expanded. Once the crisis took hold, these balance sheet properties have influenced the international and inter-sectoral transmission of crisis-related shocks, while also shaping domestic and international approaches to crisis management (Lane 2013). Moreover, there is much concern that various types of debt overhang at international and sectoral levels may limit the speed and nature of economic recovery (see, amongst many others, Reinhart and Rogoff 2009, Brown and Lane 2011, Reinhart et al 2012, Jorda et al 2013).

At the same time, balance sheet data has become much more widely available over the last decade. In relation to the external dimension, international investment position data are more extensive than was historically the case (Lane and Milesi-Ferretti 2001, 2007). Especially among advanced economies, sectoral balance sheet data has also become much more available. In addition, the BIS data on cross-border banking, the Coordinated Portfolio Investment Survey (CPIS) data on cross-border portfolio assets and the Coordinated Direct Investment Survey (CDIS) on foreign direct investment provide valuable additional information about geographical patterns in international holdings. (Still, this paper will argue that data availability and quality remains far from adequate.)

Accordingly, the aim of this paper is to review how international and sectoral balance sheet data can be exploited by risk analysts. The rest of this paper is structured as follows. Section 2 reviews the risk analysis of international balance sheets. We turn to the evaluation of sectoral balance sheets in Section 3. Section 4 concludes.

2 Risks in the International Balance Sheet

In this section, I analyse the information content of international balance sheets, as captured by data on international investment positions. The international investment position is the “stock” counterpart to the cross-border financial flows that are recorded in the balance of payments. I first review the implications of large net external stock imbalances. Second, I outline the issues involved in assessing the risks embedded in gross stocks of foreign assets and foreign liabilities. Third, I explore the evolution of international currency exposures.

2.1 Net External Stock Imbalances

Figure 1 plots an index of global net international investment position imbalances (the average of global creditor and debtor net positions).¹ It shows the scale of “stock” imbalances has increased steadily and has more than doubled since the mid-1990s. As illustrated in Figure 2, this expansion reflects the increased dispersion in current account (“flow”) imbalances, together with the operation of valuation effects.

There is a large literature on the risks associated with large external imbalances (see, for example, Blanchard 2007). While most of the literature has concentrated on current account imbalances, much of the analysis carries over to the analysis of external stock imbalances. Indeed, even if a country is no longer running a current account deficit, a large stock of external liabilities leaves it exposed to rollover risk and may generate a risk premium in funding costs. Indeed, recent empirical work indicates that a country’s vulnerability to global or domestic financial shocks is increasing in the stock of net external debt liabilities, while the reversal of capital flows since 2008 has been larger for those countries with large net external liabilities (Catao and Milesi-Ferretti 2013, Lane and Milesi-Ferretti 2012, Lane and Milesi-Ferretti 2013). For these reasons, the new European “macroeconomics imbalance

¹In principle, the stock of net foreign assets held by creditor countries should equal the stock of net foreign liabilities owed by debtor countries. Since there is a global discrepancy, we take the average to construct the index of global “stock” imbalances. The data are drawn from the updated version of Lane and Milesi-Ferretti (2007).

procedure” surveillance framework includes the net international investment position and the stock of net external debt among its risk indicators.

2.2 The Composition of Foreign Assets and Foreign Liabilities

Following Lane and Milesi-Ferretti (2007), Figure 3 shows the expansion in the gross size of international balance sheets over 1995-2012, where the IFI ratio is the sum of foreign assets and foreign liabilities (expressed as a ratio to GDP). While the IFI ratio has grown steadily for the emerging market group, the growth in cross-border holdings has been far more rapid for the advanced economies. Lane and Milesi-Ferretti (2008) attribute this asymmetric pattern to several factors, including differences in income per capita, financial depth, the creation of the euro and a more liberal regulatory attitude to financial innovations. Still, regardless of the underlying driving forces, the dramatic increase in international financial integration means that the cross-border transmission of financial shocks through the balance sheet channel is now much larger than in earlier periods.

In working out the risk exposures that are embedded in international balance sheets, it is necessary to inspect the detailed composition of the underlying gross flows and gross positions (Lane and Milesi-Ferretti 2007, Gourinchas and Rey 2007, Lane and Shambaugh 2010, Acharya and Schnabl 2010, Borio and Disyatat 2011, Obstfeld 2012a, 2012b, Shin 2012). The risk checklist includes: the mix of debt and equity in foreign assets and foreign liabilities; the maturity structure and currency composition of debt; the sectoral counterparts to external financial transactions (banks, governments, non-financial corporates, households); and the geographical patterns in external counterparties and external assets.

For instance, the debt-equity ratios in foreign assets and foreign liabilities are critical in determining risk exposures. While debt instruments entail a stream of contractually-specified payments, the returns on equity instruments are state-contingent such that much of the risk is carried by the foreign investor (presumably in exchange for a corresponding risk premium). Furthermore, within the debt category, the split between domestic-currency debt and foreign-currency debt is important in determining the balance sheet impact of

currency movements (Lane and Shambaugh 2010). Similarly, the split between short-term debt and long-term debt determines exposure to rollover risk, while the level of default risk varies with the investment grade of the debt issuer.

Figure 4 shows the debt-equity ratio in foreign liabilities for advanced economies and emerging economies. There is a clear asymmetry across the two groups, with a marked increase in the debt-equity ratio for advanced economies but a sharp downward trend evident for emerging economies. In related fashion, Figure 5 shows the configuration of net debt and net equity positions for advanced economies in 2007 (just prior to the global financial crisis). It confirms the pattern identified by Lane and Milesi-Ferretti (2007), with a significant number of advanced economies in the “long equity, short debt” upper left quadrant. While this combination might deliver positive net returns during normal times, it is a risky combination during a financial crisis, since the value of foreign equity assets declines at the same time as funding conditions get tighter.

By way of contrast, Figure 6 shows that many developing countries were “long debt, short equity” which was a much safer portfolio structure during the crisis. For instance, Milesi-Ferretti (2009) calculates that emerging economies enjoyed a \$2 trillion external valuation gain during 2008, which was the mirror image of the losses suffered by many advanced economies. The importance of differentiating between net equity and net debt positions is further underlined by Catao and Milesi-Ferretti (2013), which finds that the stock of net external debt is a robust correlate of the incidence of external funding crises.

In working out the international balance sheet impact of financial shocks, the valuation channel is a primary transmission mechanism. At a general level, the role of the valuation channel in the dynamics of the external position can be expressed using the following accounting framework. The change in the net foreign asset position between periods $t - 1$ and t can be written as

$$NIIP_t - NIIP_{t-1} = CA_t + SFA_t \quad (1)$$

where CA_t is the current account balance and SFA_t is the stock-flow adjustment term. In

turn, the stock-flow adjustment term can be written as

$$SFA_t = NETVAL_t + NETOTH_t \quad (2)$$

where $NETVAL_t$ is the net capital gain on the existing holdings of foreign assets and liabilities and $NETOTH_t$ captures other non-flow changes to the net international investment position (for example, due to changes in reporting methods and data revisions).

At a conceptual level, the $NETVAL_t$ term is a key variable, since it captures the net balance sheet impact of changes in asset prices and market prices (see Gourinchas and Rey 2013 for a survey of the related literature). Accordingly, it should convey useful information in relation to the international transmission of financial shocks. Regrettably, just the overall SFA_t term is reported for most countries, so that it is not directly possible to infer the values for $NETVAL_t$ and $NETOTH_t$.²

In terms of analysing the operation of valuation effects in practice, one approach is to track the valuation impact of especially important episodes by examining more detailed sources of information about international exposures to specific shocks. For instance, in relation to the global financial crisis, several studies have established that foreign investors absorbed much of the losses that were incurred during the meltdown of US asset-backed securities markets (Acharya and Schnabl 2010, Bernanke et al 2011, Shin 2012, Gourinchas et al 2012). An important lesson from these event studies is that it is essential to examine the subcomponents of international debt holdings, since foreign investors differed in their preferences between riskier types of dollar bonds and Treasury bonds. In particular, European banks were especially exposed to asset-backed securities, whereas official foreign investors (central banks in emerging Asia) were more concentrated in the safer Treasury segment.

However, a drawback of this approach is that data coverage may not be as complete as in the overall balance of payments. For instance, if the primary information sources are the

²The United States is an important exception in providing the decomposition. See Curcuru et al (2008, 2013), Lane and Milesi-Ferretti (2009) and Gohrband and Howell (2010) on the important role of the OTH_t term in explaining the evolution of the US net international investment position.

balance sheets of the banking sector, this will miss valuation effects that emanate from the foreign investors held by non-bank entities. As a second example, the data released by the European Banking Authority provided very useful information about international bank exposures to the sovereign debts of individual European countries but there is little direct information about the identities of non-bank foreign investors in European sovereign debt.

Accordingly, it may still be useful to examine the overall stock-flow adjustment term, even if it does not directly reveal the impact of valuation effects. For instance, Lane (2013) examines the dynamics of the SFA_t term during the 2002-2007 pre-crisis period and the 2007-2011 crisis period by estimating

$$SFA_{it} = \alpha + \beta NETFLOW_{it} + \varepsilon_{it} \quad (3)$$

where a positive value for β means that those countries making net acquisitions of foreign assets also enjoy positive stock-flow adjustment terms, which increases the dispersion in net international investment positions.³ In contrast, a negative value for β means that the distribution of net international investment positions is more compressed than would be suggested by the patterns in net financial flows.

In addition, Lane (2013) also estimates

$$SFA_{it} = \alpha + \delta SFA_{it-1} + \varepsilon_{it} \quad (4)$$

where a positive value for δ means that those countries enjoying positive stock-flow adjustments in period $t - 1$ are also likely to enjoy positive stock-flow adjustments in period t . In contrast, a negative value for δ means that there is a mean reversion tendency with positive stock-flow adjustments followed by negative stock-flow adjustments in subsequent periods.

To illustrate the quantitative importance of the SFA_t term, Table 1 shows the data for the euro area member countries for 2002-2007 and 2007-2011. The regression analysis is

³This approach does not address lines of causality between net financial flows and stock-flow adjustments but rather just captures the covariation pattern.

reported in Table 2 which considers both a narrow sample of euro area member countries and a wider sample of 31 advanced countries.⁴

Table 2 shows a striking pattern for the euro area countries. Column (1) shows that there was a positive correlation between net financial flows and the stock-flow adjustment term during 2002-2007, whereas column (2) shows a negative correlation during 2007-2011. That is, the pattern of stock-flow adjustments tended to increase dispersion in net international investment positions during the pre-crisis period but has contributed to the compression of net international investment positions during the crisis period. Furthermore, the results in column (3) are consistent with this pattern, with negative covariation between the stock-flow adjustment terms in 2002-2007 and 2007-2011.

This stabilising pattern during 2007-2011 may be interpreted as risk sharing in action, with part of the burden of crises in the euro periphery absorbed by foreign investors.⁵ In addition to losses on equity positions, foreign investors also experienced losses on holdings of peripheral sovereign debt during this period.

However, a striking finding in columns (4)-(6) of Table 2 is that these patterns are not generally evident in the wider sample of advanced economies. Rather, the relation between net financial flows and stock-flow adjustments is orthogonal in the wider sample, while there is also no covariation pattern between stock-flow adjustments across periods. Working out the differences in the results across samples remains a topic for further research.

2.3 International Currency Exposures

Exchange rate movements represent an important potential source of cross-border valuation effects, since the currency composition of foreign assets and foreign liabilities will typically be highly asymmetric. Indeed, the rapid expansion in the scale of cross-border investment positions means that currency movements can have potentially large balance sheet effects,

⁴The expanded sample includes the EU27, Switzerland, Norway, Iceland, United States, Canada, Japan, Australia and New Zealand.

⁵See also European Commission (2010, 2012a, 2012b). Ireland is an important exception, with the stock-flow adjustment term turning extremely negative during the crisis period (Lane 2012).

in addition to operating through the traditional trade balance channel (Lane and Milesi-Ferretti 2005).

Importantly, international currency exposures vary across countries and over time, due to differences in the scale and composition of international balance sheets. For instance, unanticipated dollar depreciation improves the net international investment position of the United States by increasing the dollar value of its foreign assets relative to its foreign liabilities.⁶ In contrast, many emerging markets historically issued significant amounts of foreign-currency debt, with relatively little by way of offsetting foreign-currency assets: for these countries, an extensive literature has highlighted that currency depreciation induced adverse balance sheet effects.⁷

While the official balance of payments and international investment position data do not record the currency composition of foreign assets and foreign liabilities, Lane and Shambaugh (2010) and Benetrix and Lane (2013) show how it is possible to construct estimates of international currency exposures by drawing on a range of datasets and inferential techniques. This involved a two-step process in which the currency composition within individual investment categories are first calculated before obtaining aggregate exposures by weighting across categories in line with their shares in the international balance sheet.

For equity-type assets, this approach asserts that currency exposures track geographic exposures.⁸ Information on the geographical patterns in foreign assets can be obtained from the Coordinated Portfolio Investment Survey (CPIS) for portfolio equity assets, with the Coordinated Direct Investment Survey (CDIS) and the UNCTAD bilateral FDI database provide similar data for FDI holdings.

The CPIS dataset also provides the geographical pattern in portfolio debt assets, while

⁶Tille (2003), Gourinchas and Rey (2007a, 2007b) and Lane and Milesi-Ferretti (2005, 2007b) have highlighted that the foreign liabilities of the United States are mostly denominated in dollars while there is a substantial non-dollar component in its foreign assets.

⁷See, amongst many others, Calvo and Reinhart (2002), Eichengreen et al (2003), Goldstein and Turner (2004) and Eichengreen and Hausmann (2005).

⁸The process by which estimates of the currency composition of foreign liabilities are constructed is essentially symmetric.

the BIS locational banking statistics contain information on the geography of bank-type debt assets.⁹ Since debt issuers in a given country can issue in foreign currencies as well as in domestic currency, the geographical data is combined with country-level and BIS data on the currency denomination of debt instruments to work out the currency exposures in cross-border debt positions. Finally, estimates of the currency composition of official reserve assets are calculated through a combination of national data sources, COFER data and the implementation of the empirical model developed by Eichengreen and Mathieson (2000).

In the second step, the currency composition data for each category within foreign assets and foreign liabilities are combined to create aggregate weights, using the External Wealth of Nations dataset on the composition of international balance sheets. The currency weights are given by the formulae

$$\omega_{ijt}^A = \sum_{k=1}^{k=N} \lambda_{it}^{Ak} * \omega_{ijt}^{Ak}; \quad \omega_{ijt}^L = \sum_{k=1}^{k=N} \lambda_{it}^{Lk} * \omega_{ijt}^{Lk} \quad (5)$$

where $\omega_{ijt}^A, \omega_{ijt}^L$ are the weights for currency j in period t in country i 's foreign assets and foreign liabilities, $\lambda_{it}^{Ak}, \lambda_{it}^{Lk}$ are the relative importance of category k (portfolio equity, FDI, debt, reserves) in country i 's assets and liabilities in period t and $\omega_{ijt}^{Ak}, \omega_{ijt}^{Lk}$ are the weights for currency j in period t in category k for country i 's assets and liabilities respectively. Accordingly, the aggregate weights are a function of the weights for currency j in period t for a particular k asset-class of country i 's assets or liabilities, and the weights across the k asset classes (represented by λ_{it}^k).

It is possible to define aggregate net financial weights

$$\omega_{ijt}^F = \omega_{ijt}^A s_{it}^A - \omega_{ijt}^L s_{it}^L \quad (6)$$

where $s_{it}^A = A_{it}/(A_{it} + L_{it})$ and $s_{it}^L = L_{it}/(A_{it} + L_{it})$ are the shares of foreign assets and foreign liabilities in total cross-border holdings. These weights indicate the direction of the

⁹The BIS Statistics Department facilitated access to the underlying geographical and currency patterns in the locational banking data.

valuation impact of a movement in currency j . If the net foreign asset position is zero, this reduces to simply subtracting the liability weights from the asset weights.

It is also helpful to develop a measure of aggregate foreign-currency exposure, which captures the sensitivity of a country's external balance sheet to a uniform movement of its domestic currency against all foreign currencies. We define aggregate foreign currency exposure at the end of period t by

$$FX_{it}^{AGG} = \omega_{it}^A s_{it}^A - \omega_{it}^L s_{it}^L \quad (7)$$

where ω_{it}^A is the share of foreign assets denominated in foreign currencies, s_{it}^A is the share of foreign assets in the sum of foreign assets and foreign liabilities and ω_{it}^L, s_{it}^L are defined analogously. The $FXAGG$ index is bounded by $(-1, 1)$, with $FXAGG = -1$ representing the extreme form of the traditional caricature of an emerging economy loaded with foreign-currency debt and no offsetting foreign-currency assets and $FXAGG = 1$ representing a reserve-issuing country that has only domestic-currency liabilities and foreign-currency assets.

Aggregate foreign currency exposure captures the sensitivity of a country's portfolio to a uniform currency movement by which the home currency moves proportionally against all foreign currencies. In turn, the net valuation impact of a uniform shift in the value of the domestic currency against all foreign currencies is given by

$$NETFX_{it} = FX_{it}^{AGG} * IFI_{it} \quad (8)$$

Following Lane and Shambaugh (2010), Benetrix and Lane (2013) show that the aggregate net foreign currency position has improved markedly for many countries since the mid-1990s. Figure 7 shows the cross-country distribution of the $FXAGG$ variable for 1994, 2002, 2007 and 2011. While 65 percent of countries had negative $FXAGG$ values in 1994, the distribution has shifted rightwards over time. By 2002, only 55 percent of countries had negative $FXAGG$ values, further declining to 27 percent by 2007 and only reversing slightly during the global crisis to 34 percent by 2011.

The shift is even starker in relation to severely-negative *FXAGG* values: 42 percent of countries had values below minus 0.3 in 1994 but this had dropped to 27 percent by 2002, 5 percent by 2007 and 4 percent by 2011. Accordingly, the stereotype of the typical emerging market economy suffering from a high net dependence on foreign-currency liabilities looks quite outdated. Moreover, this had a direct policy payoff during the global financial crisis, since economies with improved net foreign currency positions could better tolerate currency depreciations during this period.

The top panel of Table 3 shows that the improvements in *FXAGG* values were most dramatic for emerging market economies and developing economies, with advanced economies experiencing a smaller increase.¹⁰ Indeed, it is noteworthy that *FXAGG* values were more positive for the emerging group than for the advanced group by 2007, although that ranking may be interpreted as consistent with greater underlying vulnerability to currency and financial shocks in the former group.

As outlined in Lane and Shambaugh (2010, 2011) and re-confirmed in Benetrix and Lane (2013), the improvement in the *FXAGG* value for emerging and developing countries was driven by two main factors. First, a sequence of current account surpluses meant an improvement in the ratio of foreign assets to foreign liabilities. Second, there was a shift in the composition of foreign liabilities, with foreign-currency debt liabilities replaced by equity-type liabilities.¹¹

The bottom panel of Table 3 shows the evolution of *NETFX* values. As was shown in equation NETFX, the *NETFX* variable is just the *FXAGG* index multiplied by the ratio of foreign assets and foreign liabilities to GDP — it expresses the stock of net foreign currency assets as a ratio to GDP. For emerging markets and developing economies, the trend in *NETFX* is very similar to *FXAGG*, since the scale of international balance sheets

¹⁰As highlighted by Lane and Shambaugh (2011), there are large differences within the advanced group, especially between the euro area and other advanced countries. In particular, the foreign assets and foreign liabilities of euro area member countries are largely denominated in euro.

¹¹The increased issuance by emerging economies of domestic-currency debt liabilities to foreign investors was only a minor contributor to the overall shift. (Domestic residents are the main investors in domestic-currency bond markets.)

for these groups remained relatively stable over this interval.

However, there is a large increase in the *NETFX* value for advanced economies despite the minor change in the *FAXAGG* index, since the overall holdings of foreign assets and foreign liabilities expanded so rapidly during this period: the combination of a relatively-stable currency mix and an expansion in the total scale of the international balance sheet mapped into a much larger net foreign currency position relative to GDP for the typical advanced economy. With this combination, unanticipated currency depreciation (as experienced by advanced countries such as the United Kingdom, Australia and New Zealand during the global crisis) conferred a much larger net valuation gain during this episode relative to historical norms.

2.4 Summary

In summary, Section 2 has outlined how data on international investment positions can be analysed to assess both domestic vulnerability to international financial shocks and the international financial transmission channel. While large net external stock imbalances pose a variety of acute and chronic risks (especially for debtor countries), the rapid increase in the gross scale of international balance sheets means that even countries with zero net positions need to monitor closely the risks embedded in foreign asset and foreign liability positions. Finally, Section 2.3 has shown that the nature and direction of international currency exposures has shifted tremendously over the last fifteen years, with attendant implications for optimal exchange rate policies.

3 Sectoral Balance Sheets

In this section, we turn to the analysis of sectoral financial balance sheets. By way of illustration, Figures 8 and 9 show the distribution of financial assets and financial liabilities across the different sectors (financial corporations, non-financial corporations, government

and households) for the euro area over 2002-2012.¹² These plots show the growing financialisation of the economy, with gross stocks of financial assets and financial liabilities (relative to the size of the economy) increasing by about 50 percent over the last decade. (Since the data are non-consolidated, the values also include intra-sectoral positions, which are especially relevant for the financial sector.)

In terms of sectoral composition, the financial sector plays a central intermediation role and is responsible for the largest share of both financial assets and financial liabilities. Households and non-financial corporates display opposing patterns, with households holding significantly positive net financial assets, while non-financial corporates have significantly net financial liabilities. Finally, the government sector is responsible for a relatively minor proportion of financial assets but is a significant issuer of financial liabilities.

In relation to inter-sectoral linkages, each domestic sector has cross-positions vis-a-vis the other domestic sectors but also holds foreign assets and foreign liabilities so that each domestic sector is also directly and indirectly linked to an array of foreign counterpart sectors.

3.1 Net Sectoral Financial Positions

The net international investment position is linked to the net financial positions of the individual sectors by the adding-up condition

$$NIIP_{it} = NFINA_{it}^{FC} + NFINA_{it}^{NFC} + NFINA_{it}^{HH} + NFINA_{it}^{GOVT} \quad (9)$$

where the net financial assets of the individual sectors sums to the net international investment position.¹³

¹²Here, the euro area balance sheet is obtained by aggregating the balance sheets of the individual member countries. The sectoral data are not consolidated. The household sector incorporates the “non-profit institutions serving households” (NPISH) sector.

¹³In this expression, the aggregated sectors are: financial corporates - including banks (FC); non-financial corporates (NFC); households (HH); and the general government (GOVT). The household sector includes the “nonprofit institutions serving households” (NPISH) subsector.

The discipline imposed by examining the joint dynamics of sectoral and international net positions can be helpful in identifying broad trends in risk patterns. For instance, an increase in net foreign liabilities that is matched by growth in the net liabilities of non-financial corporations may be interpreted as more sustainable than if the sectoral counterpart is the household or government sector, to the extent that the firms are creating extra production capacity in the traded sector (Giavazzi and Spaventa 2011). Conversely, by avoiding increased dependence on foreign investors, an increase in public debt that is matched by an increase in the net financial assets of the household sector may be less risky than if it is financed by an increase in net foreign liabilities.

This economy-level resource constraint determines the menu of options facing policymakers in managing balance sheet risk. For instance, the impact of sovereign bailouts of the banking sector has to be understood in the context of the aggregate position: if the overall economy has a severely negative net international investment position, the transfer of assets and liabilities from banks to the sovereign has a much more limited impact relative to an economy that has a more positive external position, since the compromised net financial position of the overall economy is not affected by this type of domestic inter-sectoral transfer.¹⁴

In similar vein, the macroeconomic impact of proposals to write down household mortgage debt (whether financed by banks or by the government) will have a limited impact if the economy's overall net international investment position remains unchanged.¹⁵ The importance of this aggregate resource constraint helps to explain the focus placed on the net international investment position in risk analysis. It is noteworthy that the main European crisis countries (Greece, Portugal, Spain and Ireland) each have negative net international investment positions in the neighbourhood of minus 100 percent of GDP.

Following equation (9), we can also link the stock-flow adjustment term in the net international investment position to the stock-flow adjustment terms in the individual sectors

¹⁴See also Lane (2010a, 2010b, 2013) and Jorda et al (2013).

¹⁵See also Laeven and Laryea (2009), Laryea (2010), Brown and Lane (2011).

$$SFA_{it}^{NIIP} = SFA_{it}^{FC} + SFA_{it}^{NFC} + SFA_{it}^{HH} + SFA_{it}^{GOVT} \quad (10)$$

where the stock-flow adjustment term is the sum of valuation effects and other adjustment factors. This equation is useful in tracking the sectoral counterparts of external valuation shocks; equally, it is also helpful in identifying the covariation patterns across the various sectoral shocks.

As an illustration, Table 4 shows the correlation matrices for 2002-2007 and 2007-2011 in relation to the cross-country distribution of sectoral *SFA* shocks for a sample of European Union member countries. A striking feature of Table 4 is that the correlation between the *SFA* terms between foreign ('rest of world') investors and the different types of domestic investors is generally negative, which is consistent with cross-border risk sharing. However, during the crisis period, the *SFA* terms for both foreign investors and domestic households showed negative comovements patterns with the *SFA* terms for the corporate sectors and the government sector.

Table 5 shows the correlations across the two time periods for each sectoral *SFA* term. There is evidence of significant negative autocorrelation in each case, although the correlation is quite small for the household sector. This is a noteworthy time pattern, since it suggests that a positive *SFA* term in one phase is likely to be subsequently followed by a negative *SFA* term. This mean-reverting pattern in the *SFA* term suggests that the long-term trend in net financial positions will tend to track the long-term trend in accumulated net sectoral financial flows.¹⁶

Of course, it is inevitable that highly-aggregated sectoral balance sheets convey only limited information. As was discussed in Section 2, it is essential to understand the detailed composition of the international balance sheet. Similarly, understanding risk exposures at the sectoral level can only be effectively understood by probing the details of the underlying portfolios and funding structures for each sector.

¹⁶Obstfeld (2012) makes a similar point in terms of the long-run relation between cumulated current account positions and net international investment positions.

3.2 The Financial Sector

In relation to individual sectors, the balance sheet of the financial sector is the most complex and opaque. Given its intermediary status, the net financial position of the financial sector is typically small. However, there is huge variation in the gross size of its balance sheet across time and across countries. In addition, the composition of its assets and liabilities is quite heterogeneous. On the asset side, the geographic and industrial composition of its loan book and bond holdings determines its exposure to various types of credit and financial shocks. Similarly, the maturity structure and instrument structure of its liabilities determines its vulnerability to funding shocks.

In relation to asset composition, problems can arise from excessive concentration in particular sectors (for example, real estate in Spain or asset-based securities in the United States) or vis-a-vis a small set of counterparties (individual entrepreneurs in Iceland, property developers in Ireland, the domestic sovereign in many episodes). A lack of geographical diversification is another obvious risk factor (regional banks in the United States, locally-orientated small banks in Europe). However, it is also important to appreciate that a portfolio shift that apparently reduces risk along one dimension can magnify other types of risk. For instance, the rapid increase in cross-border banking during the mid-2000s might have reduced geographic risk but may have increased overall risk exposures, since many banks opted to increase the overall scale of their balance sheets in response to the opportunities provided by international diversification (CGFS 2010).

For instance, Broadbent (2012) calculates that 75 percent of the losses of the major UK banks during the crisis were related to their foreign asset holdings, while Section 2 highlighted that European banks incurred heavy losses on holdings of US-located asset-backed securities. Moreover, the leveraged purchase of foreign assets by domestic investors can amplify the risks associated with a domestic lending boom: a significant proportion of the losses of the Icelandic banking system related to foreign acquisitions by Icelandic entrepreneurs, while overseas expansion by property developers was an aggravating factor in the Irish financial crisis.

In terms of liability risk management, a myriad of indicative ratios require close monitoring (debt-equity ratio, the ratio of non-deposit to deposit debt funding, the ratio of short-term wholesale debt to long-term bond funding, the ratio of senior bonds to subordinated bonds). In addition, understanding the composition of the investor base is essential in working out funding vulnerabilities. This includes the mix between domestic and foreign investors, bank and non-bank sources of wholesale funding, long-only and leveraged investors, large-scale and small-scale depositors, local-currency and foreign-currency depositors. In related fashion, understanding the determinants of inter-office funding is essential for banking systems in which foreign-owned banks have a significant market share.¹⁷

The pervasive extent of intra-sectoral financial linkages means that sectoral-level data for the financial sector is of limited value in assessing risks to financial stability. The inter-bank wholesale market foster a high degree of interconnectedness within the banking subsector, while there are also deep links with other financial intermediaries. Furthermore, as has been vividly illustrated since the onset of the global financial crisis, the deployment of central bank balance sheets in stabilising financial systems has generated much more extensive intra-sectoral linkages between monetary authorities and banks (see, amongst many others, Giannone et al 2012).

The importance of intra-sectoral cross-holdings is also a central feature in understanding the international risk distribution. For instance, as is illustrated in Figure 10, bank-to-bank lending is the dominant type of cross-border banking activity. This provides a key mechanism by which financial distress in one country can be transmitted to other countries, since creditor banks are exposed in the event that the foreign counterparty banks becomes distressed. Of course, it is precisely the fear of contagion through such cross-border inter-bank losses is an important motivating factor behind official international bailouts.

In working out the nature of these cross-border bank-related risks, it is also important to recognise that different types of banks have different propensities to purchase foreign assets and issue foreign liabilities. For instance, Hills and Hoggarth (2013) emphasise the

¹⁷See also Cetorelli and Goldberg (2010, 2011), Claessens and Van Horen (2013), Goldberg (2013), Hills and Hoggarth (2013), Hoggarth et al (2013).

differences in behaviour across foreign-owned banks and domestically-owned banks in the UK banking system.

More generally, banks that are focused on international financial intermediation may have extensive foreign assets and foreign liabilities but relatively few linkages with domestically-orientated banks. This is especially true in economies that operate as international financial centres.

For instance, Figure 11 presents a decomposition of the foreign liabilities of the Irish banking system. While the foreign liabilities of the overall banking system peaked at 400 percent of GDP in 2008, externally-orientated banks with no domestic lending activity accounted for most of these foreign liabilities. In contrast, the foreign liabilities of domestically-active banks peaked at 180 percent of GDP. Furthermore, within the domestically-active sector, it is possible to identify the foreign liabilities of Irish-owned banks by excluding the affiliates and branches of foreign-owned banks - these peaked at around 140 percent of GDP. This example vividly illustrates the importance of disaggregating the overall sectoral data in order to identify the scale and distribution of risk exposures. In particular, the general pattern by which foreign liabilities were mainly raised by externally-orientated, foreign-owned banks obscured the rapid increase in the foreign liabilities of domestically-active, domestically-owned banks during the mid-2000s. (Until July 2010, only the data for the aggregate banking system were published, so that it was not easy to separately identify the dynamics of foreign liabilities for the Irish-owned banks.)¹⁸

In interpreting the dynamics of the asset and liability positions of the financial sector, it is also important to recognise the elastic nature of bank balance sheets, such that changes in funding opportunities influence lending behaviour (Borio and Disyatat 2011, Shin 2012). In particular, cross-border debt inflows into the domestic banking system can amplify and prolong a domestic credit boom by providing the marginal funding for an expansion in domestic lending (Allen et al 2011, Borio et al 2011, Adjiev et al 2012, CIEPR 2012, Bruno and Shin 2013). This mechanism operated strongly during the mid-2000s. Following

¹⁸See McElligott and O'Brien (2011).

Lane and McQuade (2013), Figure 12 illustrates the strong correlation between net foreign debt inflows and domestic credit growth in the 2003-2008 period. This pattern is also consistent with the evidence reported by Mendoza and Terrones (2012) and Calderon and Kubota (2012) in relation to the covariation pattern between international debt inflows and domestic credit booms.

The increasing importance of foreign assets and foreign liabilities in bank balance sheets helps to explain the loss of explanatory power contained in domestic monetary aggregates in modelling domestic credit growth (Hoggarth et al 2010, Schularick and Taylor 2012, Baeriswyl and Ganarin 2012). In parallel, there is increasing interest in measuring and monitoring indicators of global liquidity indicators that proxy the ease of international funding available to financial intermediaries (Chen et al 2012, Bruno and Shin 2013a, Bruno and Shin 2013b, Eickmeier et al 2013, Rey 2013).¹⁹

Furthermore, in assessing the domestic macro-financial risks posed by excessive risk taking by domestic banks, it is also important to take into account the potential for substitutability across different funding lines. While most domestic non-financial corporations and households rely on domestic banks for funding, the government and large corporates can directly obtain funding from non-bank domestic intermediaries, international banks and the international bond market. Moreover, direct cross-border lending to households and small and medium enterprises can partially replace domestic credit if there is a squeeze on domestic credit provision (Ranciere et al 2010, Lanau 2011). As emphasised by Drehmann (2013), these adjustment margins mean that it is important to analyse the dynamics of total credit (including funds raised through the issuance of debt securities and direct cross-border credit), in addition to domestic credit.

So far, we have focused on the bank subcomponent of the “financial corporates” sector. In addition, it is necessary to also monitor the balance sheets of “other financial intermediaries” (OFIs). The OFI subsector includes insurance firms, investment funds, pension funds and assorted financial auxiliaries. The size and interconnectedness of these entities

¹⁹See also the new BIS dataset on global liquidity indicators (www.bis.org/statistics/gli.htm).

in key financial markets means that shocks to the balance sheet of the OFI subsector can be an important independent risk factor.

3.3 Households

Turning to the household sector, the net wealth of households matters for consumption dynamics and overall macroeconomic performance (Cooper and Dynan 2013). Since households hold significant non-financial assets (housing) and overall wealth also depends on the value of human capital (projected future earnings), the analysis of the financial balance sheet of the household sector has to incorporate shocks to these non-financial wealth factors. Furthermore, differences in the financial wealth of households across countries and over time also have to be interpreted in the context of cross-country and cross-time differences in social safety nets (state-provided pensions and social insurance).

Taking due note of these caveats, Figure 13 illustrates the heterogeneity across countries in the level and composition of financial assets by showing the financial asset holdings of households in a selection of European countries in 2007 (just prior to the acute phase of the global financial crisis). For instance, direct bond holdings were much larger in Italy than in the other countries, while direct equity holdings were especially large in Spain and the “insurance technical reserves” category (which includes pension funds and life assurance policies) was relatively larger in Germany, France and Ireland. Finally, Greek households allocated the greatest share to the deposits category. Such differences in asset composition contribute to heterogeneous household wealth effects across countries in response to shocks to specific asset categories.

On the liability side, high levels of household debt poses financial and macroeconomic risks. Since the domestic banking system is the predominant lender to households, non-performing household debt is a destabilising factor for domestic banks. At a macroeconomic level, deleveraging to reduce excessively-high household debt may depress consumption, while debt overhang may distort the operation of the labour market and the housing market. At the same time, policy proposals to foster household debt restructuring must grapple

with the knock-on impact on the balance sheets of banks. In turn, the national welfare implications of household debt restructuring will depend on the ownership structure of banks, with government policies likely to be more household-friendly if banks are mainly foreign-owned and less friendly if banks are domestically-owned, especially if there is a significant public ownership stake.

3.4 Non-Financial Corporations

In evaluating the risks embedded in the financial balance sheets of the non-financial corporate sector, it is important to work out the sectoral composition of its debt and its ownership structure. For instance, firms in the nontraded sector are more exposed to domestic macroeconomic shocks than are export-orientated firms. At an industrial level, the performance of loans to construction firms will be correlated with other property-related loans such as household mortgages. In terms of ownership structure, affiliates of multinational firms may raise funding through the foreign parent corporation rather than relying on the domestic financial system. Similarly, large corporates may bypass domestic banks and raise funding from international banks and from the bond market. A sufficiently-high equity mix in total funding can also limit credit risk from this sector by providing an equity cushion to absorb losses.

3.5 Government Sector

In relation to the government sector, the traditional focus has been on the gross level of sovereign debt. However, this provides an incomplete picture, since governments also hold financial assets and non-financial assets (see Losjch et al 2011 for a comprehensive review). In some cases, the stock of financial assets can be considerable (for instance, sovereign wealth funds and equity stakes in high-value state-owned enterprises). In addition, the financial capabilities of the government also includes the present value of projected future tax revenues.

However, on the other side, it may have implicit liabilities (such as unfunded pension

commitments) and contingent liabilities such as formal or informal guarantees provided to state-owned or private-sector entities (banks, corporates, households). Accordingly, it is important to “see through” the government’s sectoral balance sheet to work out the potential risks associated with implicit and contingent liabilities. For instance, PPP projects may be attractive in relation to low initial financial costs to the government but can have long-term costs in terms of lost future revenue streams or contingent payments to the private investors if negative macroeconomic shocks mean that usage rates fall below threshold levels. Finally, a full risk analysis of the government’s balance sheet should incorporate the financial position of the central bank, which is counted as part of the financial sector in the sectoral accounts. elaborate.

The sovereign balance sheet can be transformed during a financial crisis. In addition to the impact of crisis-induced revenue declines on fiscal balances, bailouts (usually, the banking sector) can lead to discrete changes in the scale of the government’s balance sheet and in its net financial position.²⁰ If the bailout takes the form of financial investments in distressed banks that are priced at market value, this is just an expansion in the size of the government balance sheet, with the extra debt matched by the increase in the value of financial assets. Alternatively, a bailout may take the form of the issuance of contingent liabilities (such as the provision of guarantees). In contrast, if the bailout is classified as a capital transfer, the net position of the government deteriorates.²¹ In the longer term, subsequent recovery in the market value of the government’s stake can generate a net financial gain for the government.

As an illustration, Table 6 shows the impact on government balance sheets of financial bailouts in the euro area over 2009-2012. By 2012, the impact of bailouts was a deterioration in the net financial position of governments by 1.7 percent of GDP, since the increase of 5.5 percent in financial liabilities was partly offset by an increase of 3.8 percent in

²⁰See also Abbas et al (2011) and Weber (2012) on the contribution of the stock-flow adjustment term to the dynamics of public debt.

²¹The decision to classify most of the Irish government’s bailout of Anglo-Irish bank as a capital transfer explains Ireland’s extraordinary fiscal deficit in 2010 of 30.6 percent of GDP.

financial assets. In addition, euro area governments assumed 6.1 percent of GDP in terms of contingent liabilities.

In terms of risk factors emanating from the government sector, sovereign default risk most directly affects the holders of government bonds. In turn, the overall impact depends on the sectoral and geographic identity of the bond holders. Most obviously, the domestic banking sector tends to hold significant volumes of domestic sovereign debt but, as noted above, retail holdings by the domestic household sector can be substantial in some cases. Still, to the extent that there are significant foreign holdings of domestic sovereign debt, this is a relevant factor in calculating the domestic welfare impact of sovereign debt restructuring.

However, sovereign default risk also exerts indirect effects. Domestic residents can anticipate higher future taxes and lower future public spending levels. As documented by Reinhart and Sbrancia (2011), it may also be reasonable to expect financial repression measures, which may damage the balance sheets of other sectors. For instance, domestic financial corporations (banks, pension funds) may be induced to hold more domestic sovereign debt, accommodated by a portfolio shift away from other assets. Finally, the sovereign's role as the backstop for the domestic financial system means that funding costs for private-sector domestic residents typically rise in line with the sovereign risk premium.

3.6 Summary

Section 3 has reviewed the analytics of sectoral financial balance sheets. In relation to net financial positions, Section 3.1 highlighted that the expansion in net external imbalances that was described in Section 2 implies an aggregate net resource constraint on the net financial positions of the individual sectors, which is highly relevant during crisis episodes when various types of sectoral bailout initiatives are proposed. In addition, the link between the aggregate net external position and sectoral net positions is helpful in assessing the sectoral implications of external financial shocks and, in the other direction, the external implications of sectoral financial shocks.

In relation to individual sectors, the balance sheets of the financial sector are especially important, in view of the key intermediation role of this sector. Section 3.2 emphasised intra-sectoral financial linkages within this sector, as well as the increasing internationalisation of financial-sector balance sheets, while Section 3.4 highlighted that the expanded financial intermediary role for the government sector during the crisis means that the gross level of public debt is an inadequate indicator of the government’s overall presence in the financial system.

4 Conclusions

This paper has outlined the opportunities and pitfalls for risk analysts in interpreting the information embedded in international and sectoral balance sheets. It emphasised that net financial stock imbalances and the cross-holding of large stocks of gross financial assets and gross financial liabilities at both international and sectoral levels generates an array of risk exposures. It highlighted that a key transmission mechanism is the valuation channel by which shifts in asset values and exchange rates affect balance sheet values, even if it is not easy to identify in a precise way these valuation effects in the data.

Looking to the future, the risk analysis of international and sectoral balance sheet data would be facilitated by progress on two fronts. First, more informative and more complete datasets are required. For instance, the identification of ultimate beneficial ownership patterns is essential in working out ultimate risk exposures - current data collection methods do not “see through” the various stages of intermediation that obscure the connection between assets and ultimate owners (Ali et al 2012, Borio 2013). In addition, a more disaggregated presentation of the sectoral data is necessary for adequate risk analysis, in view of the importance of intra-sectoral linkages and the heterogeneity of financial positions within sectors.

Second, the risk analysis of balance sheet data should also be supported by the further development of underlying theoretical models. While this presents enormous challenges in view of the inherent nonlinearities of complex, inter-connected balance sheets that are linked

across sectors and across countries, the structural guidance provided by strong theoretical foundations is necessary for a coherent approach to the evaluation of balance sheet risks.

References

- Abbas, S.M. Ali, Nazim Belhocine, Asmaa El-Ganainy and Mark Horton (2011), “Historical Patterns and Dynamics of Public Debt - Evidence From a New Database,” *IMF Economic Review* 59(4), 717-742.
- Acharya, Viral V. and Philipp Schnabl (2010), “Do Global Banks Spread Global Imbalances? Asset-Backed Commercial Paper During the Financial Crisis of 2007–09,” *IMF Economic Review* 58 (1), 37–73.
- Adjiev, Stefan, Robert McCauley and Patrick McGuire (2012), “Rapid Credit Growth and International Credit: Challenges for Asia,” *BIS Working Paper No. 377*.
- Ahmed, Shaghil and Andrei Zlate (2013), “Capital Flows to Emerging Market Economies: A Brave New World?,” *International Finance Discussion Paper No. 1081*, Board of Governors of the Federal Reserve System.
- Ali, Robleh D., Andrew Haldane and Paul Nahai-Williamson (2012), “Towards a Common Financial Language,” *mimeo*, Bank of England.
- Allen, Franklin, Thorsten Beck, Elena Carletti, Philip R. Lane, Dirk Schoenmaker and Wolf Wagner (2011), *Cross-Border Banking in Europe: Implications for Financial Stability and Macroeconomic Policies*, CEPR Report.
- Becker, Chris, and Daniel Fabbro. 2006. “Limiting Foreign Exchange Exposure through Hedging: The Australian Experience.” Reserve Bank of Australia RDP2006-09.
- Benetrix, Agustin and Philip R. Lane (2013), “The Evolution of International Currency Exposures,” *work in progress*, Trinity College Dublin.

- Bernanke, Ben S., Carol Bertaut, Laurie Pounder DeMarco and Steven Kamin (2011), “International Capital Flows and the Returns to Safe Assets in the United States, 2003-2007,” *Banque de France Financial Stability Review* 15, 13-26.
- Blanchard, Olivier (2007), “Current Account Deficits in Rich Countries,” *IMF Staff Papers* 54(2), 191-219.
- Borio, Claudio (2012), “The Financial Cycle and Macroeconomics: What Have We Learnt?,” *BIS Working Paper No. 395*.
- Borio, Claudio (2013), “The Great Financial Crisis: Setting Priorities for New Statistics,” *BIS Working Paper No. 408*.
- Borio, Claudio and Piti Disyatat (2011), “Global Imbalances and the Financial Crisis: Link or No Link?,” *BIS Working Paper No. 346*.
- Borio, Claudio, Robert McCauley and Patrick McGuire (2011), “Global Credit and Domestic Credit Booms,” *BIS Quarterly Review* (September), 43-57.
- Borio, Claudio, Piti Disyatat and Mikael Juselius (2013), “Rethinking Potential Output: Embedding Information about the Financial Cycle,” *BIS Working Paper No. 404*.
- Broadbent, Ben (2012), “Deleveraging,” *mimeo*, Bank of England.
- Brown, Martin and Philip R. Lane (2011), “Debt Overhang in Emerging Europe?,” *World Bank Policy Research Working Paper No. 5784*.
- Bruno, Valentina and Hyun Song Shin (2013), “Capital Flows, Cross-Border Banking and Global Liquidity,” *NBER Working Paper No. 18942*.
- Bruno, Valentina and Hyun Song Shin (2013), “Assessing Macroprudential Policies: The Case of Korea,” *Scandinavian Journal of Economics*, forthcoming.

- Calderon, Cesar and Megumi Kubota (2012), “Gross Inflows Gone Wild: Gross Capital Inflows, Credit Booms and Crises,” *World Bank Policy Research Working Paper No. 6270*.
- Catao, Luis and Gian Maria Milesi-Ferretti (2013), “External Liabilities and Crises,” *IMF Working Paper No. 13-113*.
- Cetorelli, Nicola and Linda S. Goldberg (2011), “Global Banks and International Shock Transmission: Evidence from the Crisis,” *IMF Economic Review* 59(1), 41-76.
- Cetorelli, Nicola and Linda S. Goldberg (2012), “Banking Globalization and Monetary Transmission,” *Journal of Finance* 67(5), 1811-1843.
- Chen, Sally, Philip Liu, Andrea Maechler, Chris Marsh, Sergejs Saksonovs and Hyun S. Shin (2012), “Exploring the Dynamics of Global Liquidity,” *IMF Working Paper No. 12/246*.
- Committee on the Global Financial System (2010a), “Funding Patterns and Liquidity Management of Internationally Active Banks,” *CGFS Paper No. 39*.
- Committee on the Global Financial System (2010b), “Long-Term Issues in International Banking,” *CGFS Paper No. 41*.
- Committee on International Economic Policy and Reform (2012), *Banks and Cross-Border Capital Flows: Policy Challenges and Regulatory Responses*, Brookings Institution / Sloan Foundation.
- Cooper, Daniel and Karen Dynan (2013), “Wealth Shocks and Macroeconomic Dynamics,” *mimeo*, Brookings Institution.
- Curcuro, Stephanie E., Tomas Dvorak and Francis E. Warnock (2008), “Cross-Border Returns Differentials,” *Quarterly Journal of Economics* 123(4), 1495-1530.
- Curcuro, Stephanie E., Charles P. Thomas and Francis E. Warnock (2013), “On Returns Differentials,” *Journal of International Money and Finance* 36, 1-25.

- Drehmann, Mathias (2013), “Total Credit as an Early Warning Indicator for Systemic Banking Crises,” *BIS Quarterly Review* (June), 41-45.
- Eichengreen, Barry, Ricardo Hausmann and Ugo Panizza. 2003. *Currency Mismatches, Debt Intolerance and Original Sin: Why They Are Not the Same and Why it Matters*. National Bureau of Economic Research Working Paper 10036.
- Eichengreen, Barry, and Ricardo Hausmann. 2005. *Other People’s Money: Debt Denomination and Financial Instability in Emerging Market Economies*. Chicago, IL: University of Chicago Press.
- Eickmeier, Sandra, Leonardo Gambacorta and Boris Hofmann (2013), “Understanding Global Liquidity,” *BIS Working Paper No. 402*.
- European Commission (2010), “The Importance of Valuation Effects for External Asset Positions in the Euro Area,” *Quarterly Report of the Euro Area* 9(1), 29-36.
- European Commission (2012a), “Current Account Surpluses in the EU,” *European Economy 2012-9*.
- European Commission (2012b), “The Dynamics of International Investment Positions,” *Quarterly Report of the Euro Area* 11(3), 7-20.
- Eurostat (2013), *Supplementary Table for the Financial Crisis*.
- Forbes, Kristin and Francis E. Warnock (2012a), “Capital Flow Waves: Surges, Stops, Flight and Retrenchment,” *Journal of International Economics* 88(2), 235-251.
- Forbes, Kristin and Francis E. Warnock (2012b), “Debt- and Equity-Led Capital Flow Episodes,” *NBER Working Paper No. 18329*.
- Forbes, Kristin, Marcel Fratzscher, Roland Straub, and Thomas Kostka (2012), “Bubble Thy Neighbor: Portfolio Effects and Externalities from Capital Controls,” *NBER Working Paper No. 18052*.

- Forbes, Kristin, Marcel Fratzscher and Roland Straub (2013), “Capital Controls and Macroprudential Measures: What Are They Good For?, ” *mimeo*, MIT.
- Fratzscher, Marcel, Marco Lo Duca and Roland Straub (2013), “On the International Spillovers of US Quantitative Easing,” *DIW Discussion Paper No. 1304*.
- Giannone, Domenico, Michele Lenza, Huw Pill and Lucrezia Reichlin (2013), “The ECB and the Interbank Market,” *Economic Journal* 122, F467-F486.
- Giavazzi, Francesco and Luigi Spaventa (2011), “Why the Current Account Matters in a Monetary Union,” in *The Euro Area and The Financial Crisis* (Miroslav Beblavy, David Cobham and L’udovit Odor, editors), Cambridge University Press, 59-80.
- Gohrband, Christopher A. and Kristy L. Howell (2010), “U.S. International Financial Flows and the U.S. Net Investment Position: New Perspectives Arising from New International Standards,” *mimeo*, Bureau of Economic Analysis.
- Goldberg, Linda S. (2013), “Banking Globalization, Transmission and Monetary Policy Autonomy,” *NBER Working Paper No. 19497*.
- Goldstein, Morris, and Philip Turner. 2004. *Controlling Currency Mismatches in Emerging Markets*. Washington, DC: Institute for International Economics.
- Gourinchas, Pierre-Olivier, Helene Rey and Kai Truempler (2012), “The Financial Crisis and The Geography of Wealth Transfers,” *Journal of International Economics* 88(2), 266-285.
- Gourinchas, Pierre-Olivier, and Helene Rey (2007), “International Financial Adjustment.” *Journal of Political Economy* 115, 665-703.
- Gourinchas, Pierre-Olivier and Helene Rey (2013), “External Adjustment, Global Imbalances and Valuation Effects,” *NBER Working Paper No. 19240*.

- Gourinchas, Pierre-Olivier, Helene Rey and Kai Truempler (2012), “The Financial Crisis and The Geography of Wealth Transfers,” *Journal of International Economics* 88(2), 266-285.
- Hills, Bob and Glenn Hoggarth (2013) “Cross-Border Bank Credit and Global Financial Stability,” *Bank of England Quarterly Bulletin* 2013.Q2, 126-136.
- Hoggarth, Glenn, Lanvan Mahadevaand and Jeremy Martin (2010), “Understanding International Bank Capital Flows During the Recent Financial Crisis,” *Bank of England Financial Stability Paper No.08*.
- Hoggarth, Glenn, John Hooley and Yevgeniya Korniyenko (2013), “Which Way Do Foreign Branches Sway? Evidence from the Recent UK Domestic Credit Cycle,” *Bank of England Financial Stability Paper No. 22*.
- Ivashina, Victoria, David S. Scharfstein and Jeremy C. Stein (2012), “Dollar Funding and the Lending Behavior of Global Banks,” *NBER Working Paper No. 18528*.
- Jorda, Oscar, Moritz Schularick and Alan M. Taylor (2011), “When Credit Bites back: Leverage, Business Cycles, and Crises,” *Federal Reserve Bank of San Francisco Working Paper Series 27*.
- Jorda, Oscar, Moritz Schularick and Alan M. Taylor (2013), “Sovereigns versus Banks: Credit, Crises, and Consequences,” *CESifo Working Paper No. 4431*.
- Laeven, Luc and Thomas Laryea (2009), “Principles of Household Debt Restructuring,” *IMF Staff Position Note 09/15*.
- Lanau, Sergi (2011), “Domestic Financial Regulation and External Borrowing,” *Bank of England Working Paper No. 429*.
- Lane, Philip R. (2010a), “External Imbalances and Fiscal Policy,” in *External Imbalances and Public Finances in the EU* (edited by Salvador Barrios, Servaas Deroose, Sven Langedijk, Lucio Pench), European Economy Occasional Paper No. 66.

- Lane, Philip R. (2010b), "Some Lessons for Fiscal Policy from the Financial Crisis," *Nordic Economic Policy Review* 1(1), 13-34.
- Lane, Philip R. (2012a), "The European Sovereign Debt Crisis," *Journal of Economic Perspectives* 26(3), 49-68.
- Lane, Philip R. (2012b), "The Dynamics of Ireland's Net External Position," *Journal of the Statistical and Social Inquiry Society of Ireland* XLI, 24-34, 2012.
- Lane, Philip R. (2013a), "Capital Flows in the Euro Area," *European Economy Economic Paper No. 497*.
- Lane, Philip R. (2013b), "Financial Globalisation and the Crisis," *Open Economies Review* 24(3), 555-580.
- Lane, Philip R. (2013c), "External Imbalances and Macroeconomic Policy," *New Zealand Economic Papers* 47(1), 53-70
- Lane, Philip R. (2013d), "Credit Dynamics and Financial Globalisation," *National Institute Economic Review* 225, R14-R22.
- Lane, Philip R. and Gian Maria Milesi-Ferretti (2007), "The External Wealth of Nations Mark II," *Journal of International Economics* 73, 223-250.
- Lane, Philip R. and Gian Maria Milesi-Ferretti (2008), "The Drivers of Financial Globalization," *American Economic Review* 98(2), 327-332.
- Lane, Philip R., and Gian Maria Milesi-Ferretti (2008) "International Investment Patterns," *Review of Economics and Statistics* 90(3), 538-549.
- Lane, Philip R., and Gian Maria Milesi-Ferretti (2009), "Where Did All the Borrowing Go? A Forensic Analysis of the U.S. External Position" *Journal of Japanese and International Economies* 23(2), 177-199.

- Lane, Philip R. and Gian Maria Milesi-Ferretti (2011), “The Cross-Country Incidence of the Global Crisis,” *IMF Economic Review* 59, 77-110.
- Lane, Philip R. and Gian Maria Milesi-Ferretti (2012), “External Adjustment and the Global Crisis,” *Journal of International Economics* 88(2), 252-265.
- Lane, Philip R. and Gian Maria Milesi-Ferretti (2013), “Global Imbalances and External Adjustment After the Crisis,” *work in progress*.
- Lane, Philip R. and Peter McQuade (2013), “Domestic Credit Growth and International Capital Flows,” *Scandinavian Journal of Economics*, forthcoming.
- Lane, Philip R. and Jay C. Shambaugh (2010a), “Financial Exchange Rates and International Currency Exposures,” *American Economic Review* 100(1), 518–540.
- Lane, Philip R. and Jay C. Shambaugh (2010b), “The Long or Short of It: Determinants of Foreign Currency Exposure in External Balance Sheets,” *Journal of International Economics* 80(1), 33-44.
- Laryea, Thomas (2010), “Approaches to Corporate Debt Restructuring in the Wake of Financial Crises,” *IMF Staff Discussion Note No. 10/02*.
- Lojsch, Dagmar Hartwig, Marta Rodriguez-Vives and Michal Slavik (2011), “The Size and Composition of Government Debt in the Euro Area,” *ECB Occasional Paper No. 132*.
- McCauley, Robert, Patrick McGuire and Goetz Von Peter (2010), “The Architecture of Global Banking: From International to Multinational?,” *BIS Quarterly Review* (March), 25-37.
- McElligott, Rory and Martin O’Brien (2011), “Irish Money and Banking Statistics: A New Approach,” *Central Bank of Ireland Quarterly Bulletin* 2011-01, 107-122.
- McGuire, Patrick and Goetz von Peter (2012), “The US Dollar Shortage in Global Banking and the International Policy Response,” *International Finance* 15(2), 155-178.

- Mendoza, Enrique and Marco Terrones (2012), “An Anatomy Of Credit Booms and Their Demise,” *NBER Working Paper No. 18379*.
- Milesi-Ferretti, Gian Maria (2009), “A \$2 Trillion Question,” *VOXEU* (28 January 2009).
- Milesi-Ferretti, Gian-Maria and Cédric Tille (2011), “The Great Retrenchment: International Capital Flows during the Global Financial Crisis,” *Economic Policy* 26(66), 285-342.
- Niepmann, Friederike (2013), “Banking Across Borders,” *mimeo*, Federal Reserve Bank of New York.
- Obstfeld, Maurice (2012a), “Financial Flows, Financial Crises, and Global Imbalances,” *Journal of International Money and Finance* 31, 469-480.
- Obstfeld, Maurice (2012b), “Does the Current Account Still Matter?,” *American Economic Review* 102(3), 1-23.
- Obstfeld, Maurice (2013), “On Keeping Your Powder Dry: Fiscal Foundations of Financial and Price Stability,” *mimeo*, University of California at Berkeley.
- Obstfeld, Maurice, Jay C. Shambaugh and Alan M. Taylor (2009), “Financial Stability, Reserves and Central Bank Swap Lines in the Panic of 2008,” *American Economic Review* 99(2), 480-486.
- Ranciere, Romain, Aaron Tornell and Athanasios Vamvikidis (2010), “Currency Mismatch, Systemic Risk and Growth in Emerging Europe,” *Economic Policy* 25, 597-658.
- Reinhart, Carmen M. and Kenneth S. Rogoff (2009), *This Time Is Different: Eight Centuries of Financial Folly*, Princeton University Press.
- Reinhart, Carmen M. and Kenneth S. Rogoff (2011), “From Financial Crash to Debt Crisis,” *American Economic Review* 101(5), 1676-1706.

- Reinhart, Carmen M. and M. Belen Sbrancia (2011), “The Liquidation of Government Debt,” *BIS Working Paper No. 363*.
- Reinhart, Carmen M., Vincent R. Reinhart and Kenneth S. Rogoff (2012), “Public Debt Overhangs: Advanced-Economy Episodes Since 1800,” *Journal of Economic Perspectives* 26(3), 69-86.
- Rey, Helene (2013), “Dilemma not Trilemma: The Global Financial Cycle and Monetary Policy Independence,” *mimeo*, London Business School.
- Schularick, Moritz and Alan M. Taylor (2012), “Credit Booms Gone Bust: Monetary Policy, Leverage Cycles, and Financial Crises, 1870-2008,” *American Economic Review* 102(2), 1029-1061.
- Shin, Hyun Song (2012), “Global Banking Glut and Loan Risk Premium,” *IMF Economic Review* 60, 155-192.
- Stein, Jeremy (2012), “Monetary Policy as Financial-Stability Regulation,” *Quarterly Journal of Economics* 127(1), 57-95.
- Stulz, René M. (2005), “The Limits of Financial Globalization,” *Journal of Finance* 60(4), 1595-1638.
- Weber, Anke (2012), “Stock-Flow Adjustments and Fiscal Transparency: A Cross-Country Comparison,” *IMF Working Paper No. 12/39*.
- Wolf, Martin (2009), *Fixing Global Finance*, Yale University Press.

Table 1: Stock-Flow Adjustments in Net International Investment Position: Euro Area

		2002-2007	
	Δ NIIP	SUMFLOW	SFA
Austria	-8.2	-10.0	-18.2
Belgium	7.6	-8.6	-1.0
Finland	-7.9	-19.4	-27.3
France	-4.8	1.1	-3.6
Germany	23.4	-22.3	1.1
Greece	-74.1	33.3	-40.8
Ireland	-11.5	11.1	-0.4
Italy	-19.7	7.2	-12.5
Netherlands	7.7	-28.9	-21.2
Portugal	-62.6	33.8	-28.8
Spain	-62.0	26.3	-35.7
		2007-2011	
	Δ NIIP	SUMFLOW	SFA
Austria	13.1	-11.9	1.3
Belgium	31.0	3.5	34.5
Finland	38.6	-5.4	33.3
France	-18.6	6.9	-11.6
Germany	1.3	-23.0	-21.7
Greece	26.3	45.5	71.8
Ireland	-66.4	10.7	-55.6
Italy	3.2	11.5	14.7
Netherlands	36.4	-22.4	13.9
Portugal	-8.7	35.5	26.7
Spain	-4.8	20.9	16.1

Note: SUMFLOW and SFA refer to cumulative net financial flow and stock-flow adjustment term respectively (ratios to GDP). Source: Based on IMF BOP data and updated version of Lane and Milesi-Ferretti (2007).

Table 2: Are Stock-Flow Adjustments Stabilising?

	(1) EA 0207	(2) EA 0711	(3) EA 0711	(4) ADV 0207	(5) ADV 0711	(6) ADV 0711
α	-15.10*** (3.90)	6.40 (8.20)	-10.30 (9.50)	-0.15*** (.03)	0.003 (.07)	-0.06 (.07)
SUMFLOW0207	0.43** (.16)			0.19* (0.10)		
SUMFLOW0711		-0.71* (.32)			0.89 (-1.20)	
SFA0207			-1.35** (.44)			-0.20 (.37)
R ²	0.40	0.24	0.49	0.10	0.09	0.003
N	12	12	12	31	31	31

Note: OLS regressions. EA is euro area 12 sample, ADV is 31 country sample of advanced countries. SFA is stock-flow adjustment, SUMFLOW is cumulative net financial flow. Robust standard errors in parentheses. ***, **, * refer to significance at 1, 5 and 10 percent levels respectively.

Table 3: International Currency Exposures

	1994	2002	2007	2011	N
FXAGG					
All	-0.16	-0.06	0.08	0.08	102
Advanced	0.05	0.05	0.08	0.10	22
Emerging	0.01	0.07	0.23	0.19	28
Developing	-0.42	-0.22	0.01	-0.03	52
NETFX					
All	-0.15	-0.05	0.17	0.14	102
Advanced	0.06	0.18	0.39	0.40	22
Emerging	0.01	0.10	0.35	0.27	28
Developing	-0.47	-0.28	0.02	-0.03	52

Note: FXAGG is index of aggregate foreign currency exposure. NETFX is ratio of net foreign currency assets to GDP. N: number of countries. Based on Benetrix and Lane (2013).

Table 4: Stock-Flow Adjustments: Correlation Matrices

	HH	NFC	FC	GOVT	ROW
2002-2007					
HH	1.00				
NFC	-0.55	1.00			
FC	-0.01	-0.28	1.00		
GOVT	-0.16	-0.37	0.20	1.00	
ROW	-0.31	-0.40	-0.30	0.13	1.00
2007-2011					
HH	1.00				
NFC	-0.60	1.00			
FC	-0.36	0.21	1.00		
GOVT	-0.55	0.18	0.23	1.00	
ROW	0.41	-0.71	-0.75	-0.35	1.00

Note: Pair-wise correlations across stock-flow adjustment terms for each sector. HH: households; NFC: non-financial corporates; FC: financial corporates; GOVT: government; ROW: rest of world. Source: Eurostat.

Table 5: Stock-Flow Adjustments: 2002-2007 and 2007-2011

Households	-0.10
Non-Financial Corporates	-0.55
Financial Corporates	-0.50
Government	-0.23
Rest of World	-0.68

Note: Correlation in stock-flow adjustment terms for 2002-2007 and 2007-2011 for each sector.

Table 6: Impact of Financial Crisis on Government Balance Sheets: Euro Area

	2009	2010	2011	2012
Assets (€ billions)	211	387	349	362
Loans	26	25	29	46
Securities other than shares	80	296	223	216
Equity	105	116	97	100
Liabilities (€ billions)				
Loans	39	245	212	191
Securities other than shares	182	224	242	336
Contingent Liabilities (€ billions)				
Guarantees	691	473	491	490
Securities issued under liquidity schemes	5	8	3	3
Special Purpose Entities	78	99	83	86
Assets (%GDP)	2.4	4.2	3.7	3.8
Liabilities (%GDP)	2.5	5.1	4.8	5.5
Contingent Liabilities (%GDP)	8.7	6.3	6.1	6.1

Note: Source is Eurostat (2013).

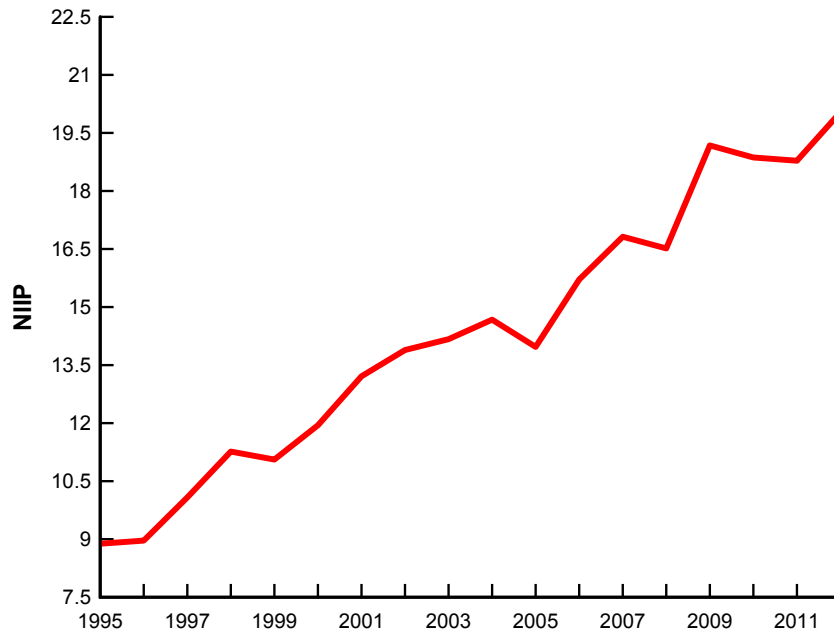


Figure 1: Net International Investment Position Global Index. Note: Average of global net creditor and net debtor positions, expressed as a ratio to global GDP. Based on updated version of Lane and Milesi-Ferretti (2007).

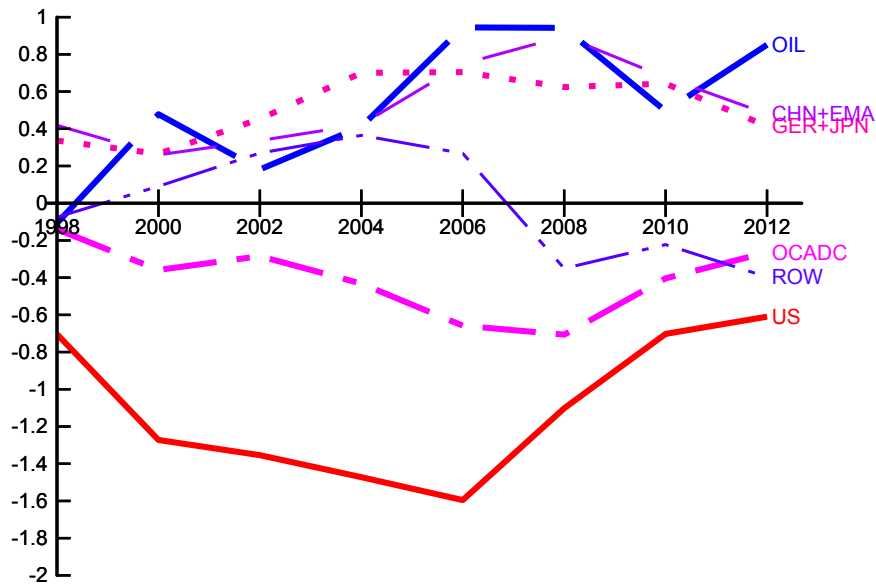


Figure 2: Global Current Account Imbalances, 1998 to 2012. Note: Based on World Economic Outlook (October 2013). CHN+EMA = China, Hong Kong SAR, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan Province of China, Thailand; DEU+JPN = Germany and Japan; IP = industrial production; OCADC = Bulgaria, Croatia, Czech Republic, Estonia, Greece, Hungary, Ireland, Latvia, Lithuania, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Turkey, United Kingdom; OIL = oil exporters; ROW = rest of the world; US = United States.

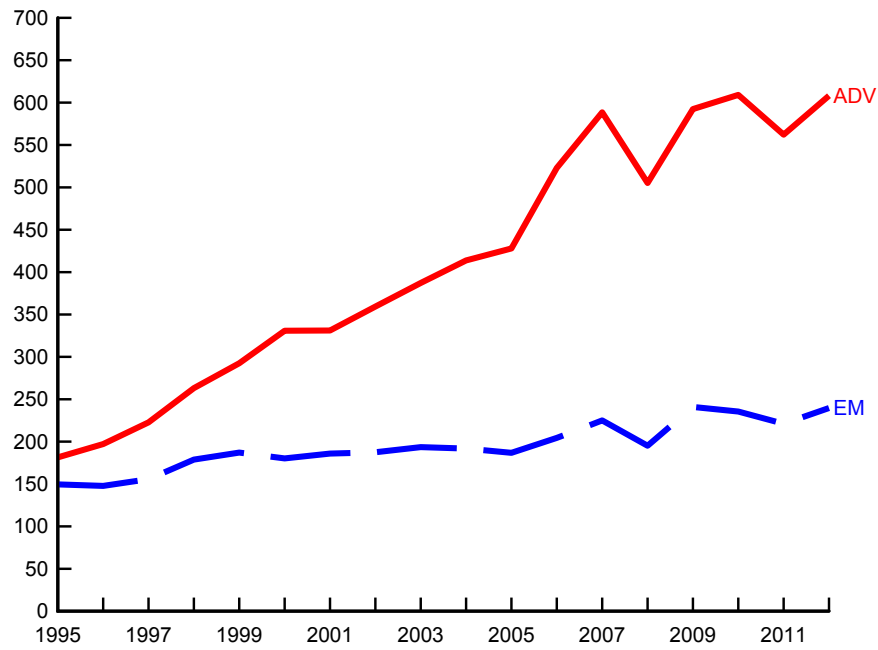


Figure 3: International Financial Integration (IFI) Ratios: Advanced and Emerging Economies, 1995-2012. Note: IFI ratio is sum of foreign assets and foreign liabilities, expressed as a ratio to GDP. Based on updated version of Lane and Milesi-Ferretti (2007).

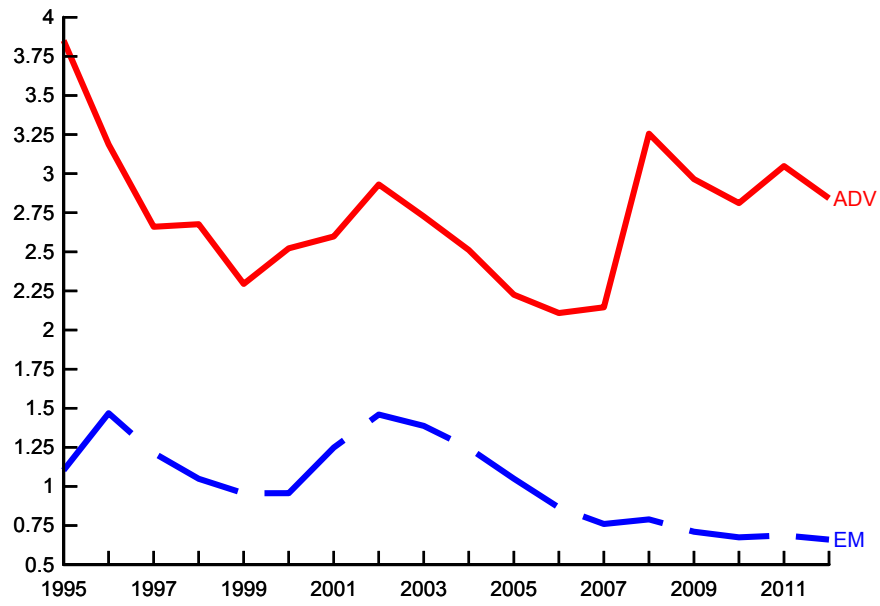


Figure 4: Debt-Equity Ratios in Foreign Liabilities: Advanced and Emerging Economies, 1995-2012. Note: Based on updated version of Lane and Milesi-Ferretti (2007).

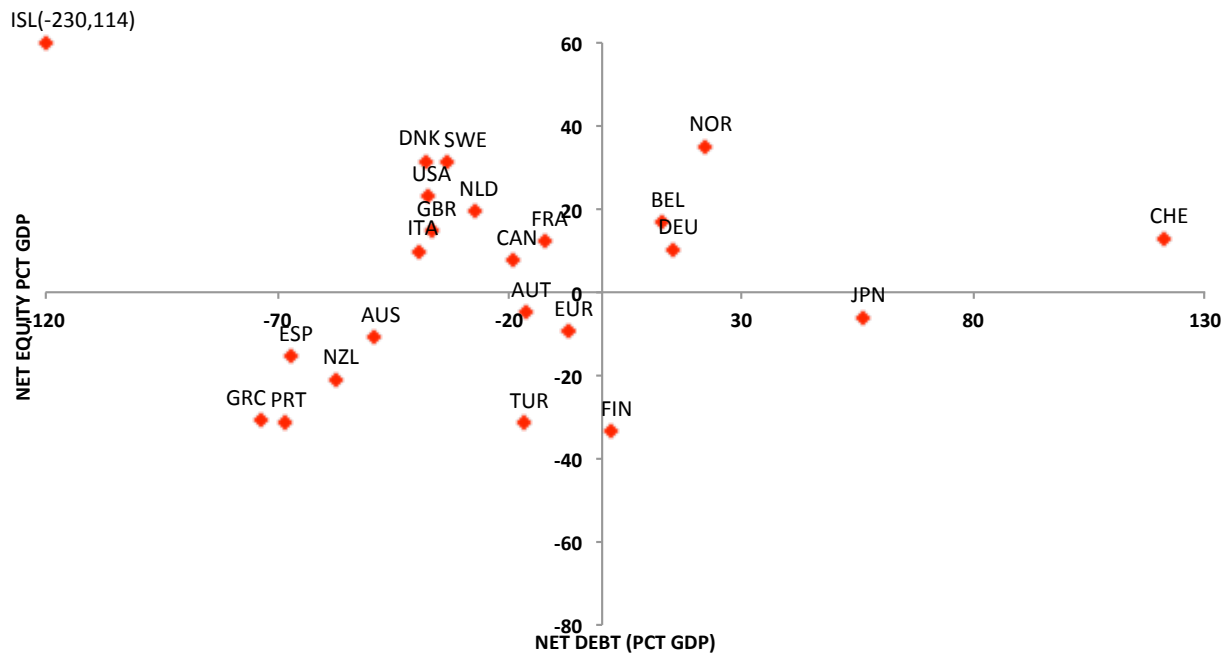


Figure 5: Net Debt and Net Equity Positions: Advanced, 2007. Note: Ratios to GDP. Based on updated version of Lane and Milesi-Ferretti (2007).

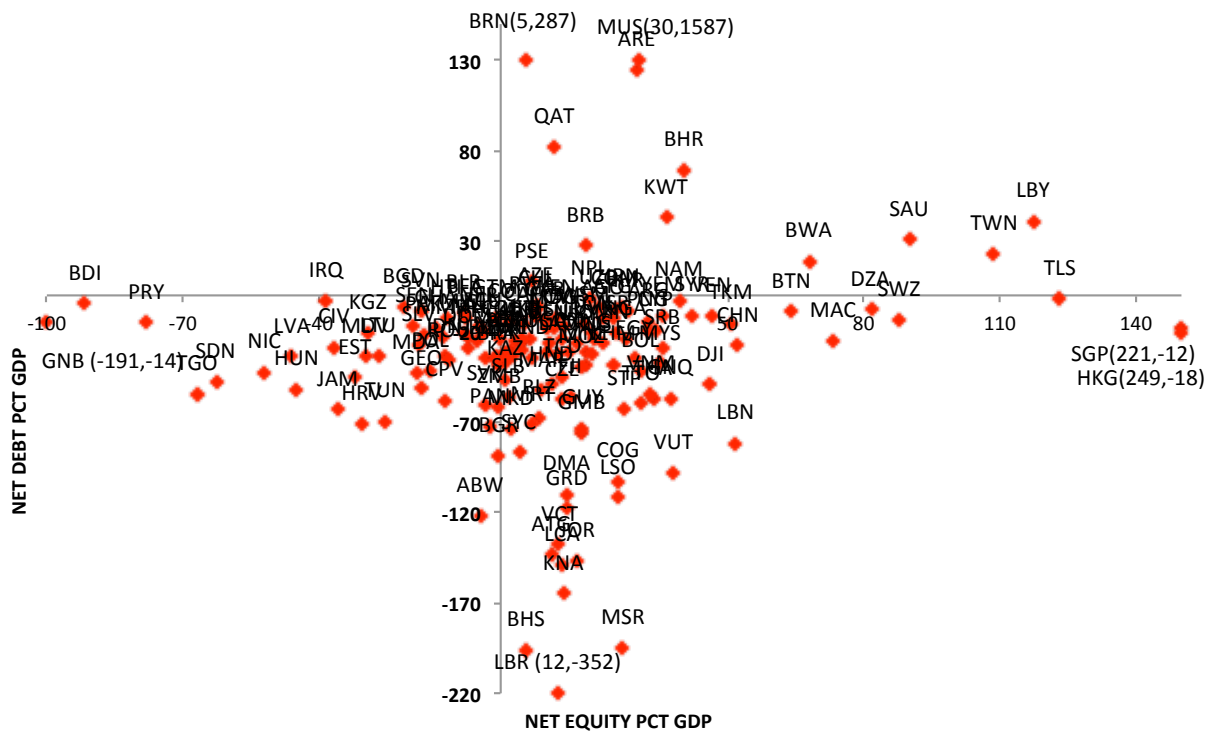


Figure 6: Net Debt and Net Equity Positions: Emerging Markets, 2007. Note: Ratios to GDP. Based on updated version of Lane and Milesi-Ferretti (2007).

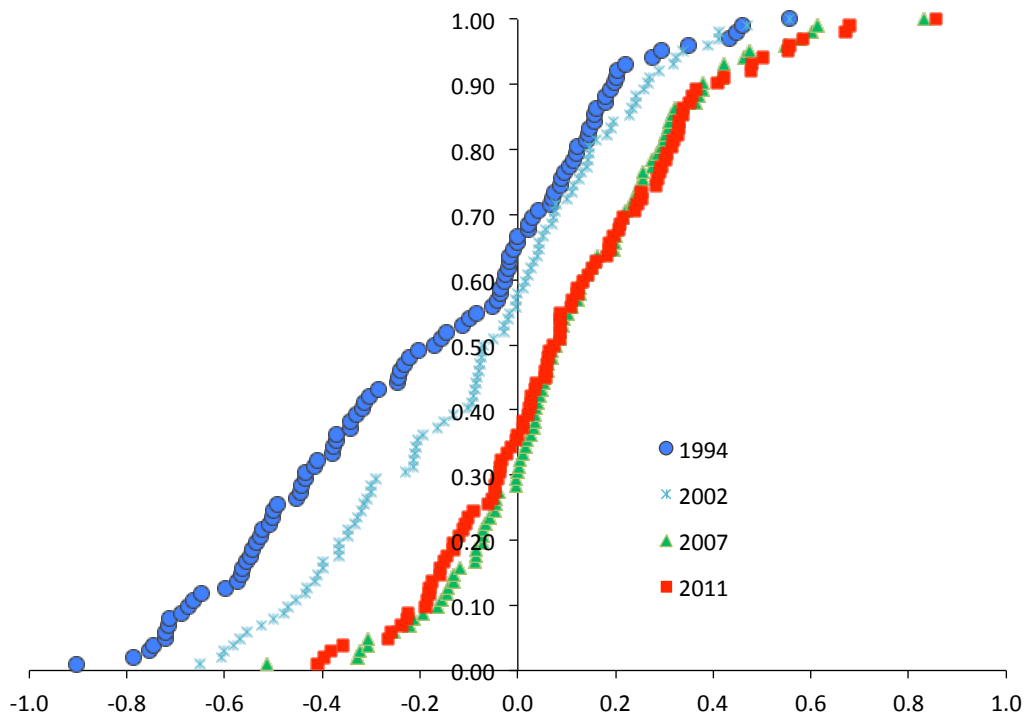


Figure 7: FXAGG Index: Cross-Country Distribution. Note: Drawn from Benetrix and Lane (2013).

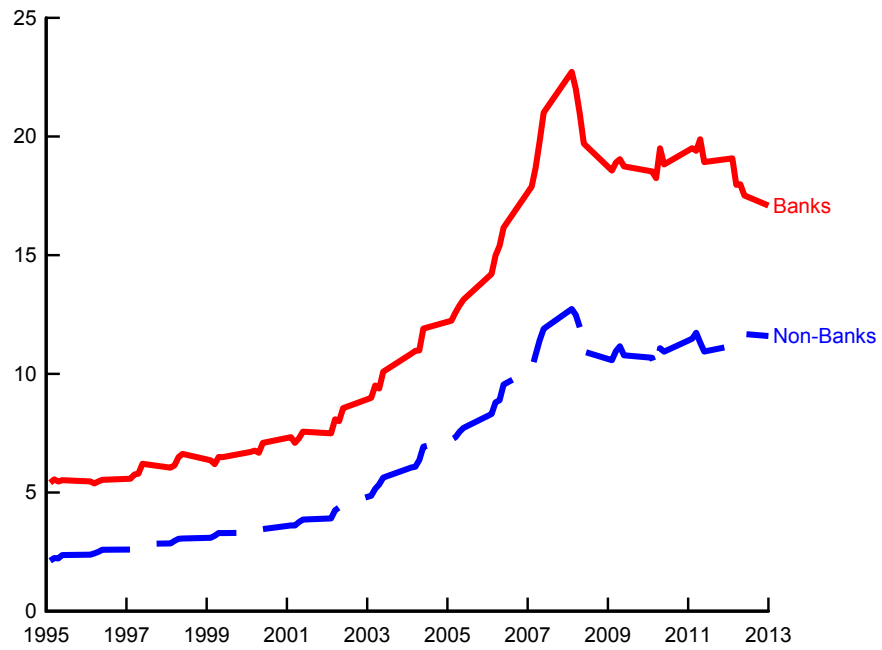


Figure 8: External Assets of BIS-Reporting Banks, 1995.1-2013.2. Note: Based on Table 1 of BIS Locational Banking Statistics. Banks and Non-Banks refer to sector of the counterparties.

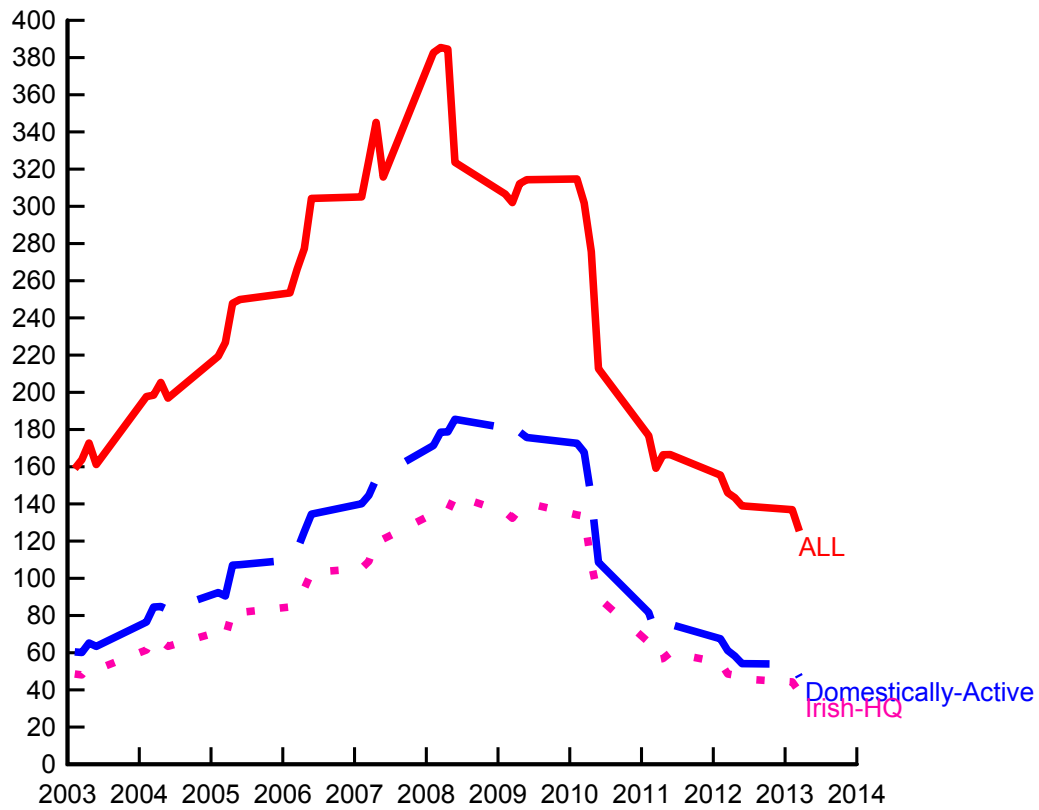


Figure 9: Foreign Liabilities of Irish Banks, 2003.1 to 2013.2. Note: Expressed as ratios to GDP. ALL: Irish-resident banks; Domestically-Active: substantial lending to Irish counterparties; Irish-HQ: banks headquartered in Ireland. Source: Central Bank of Ireland.

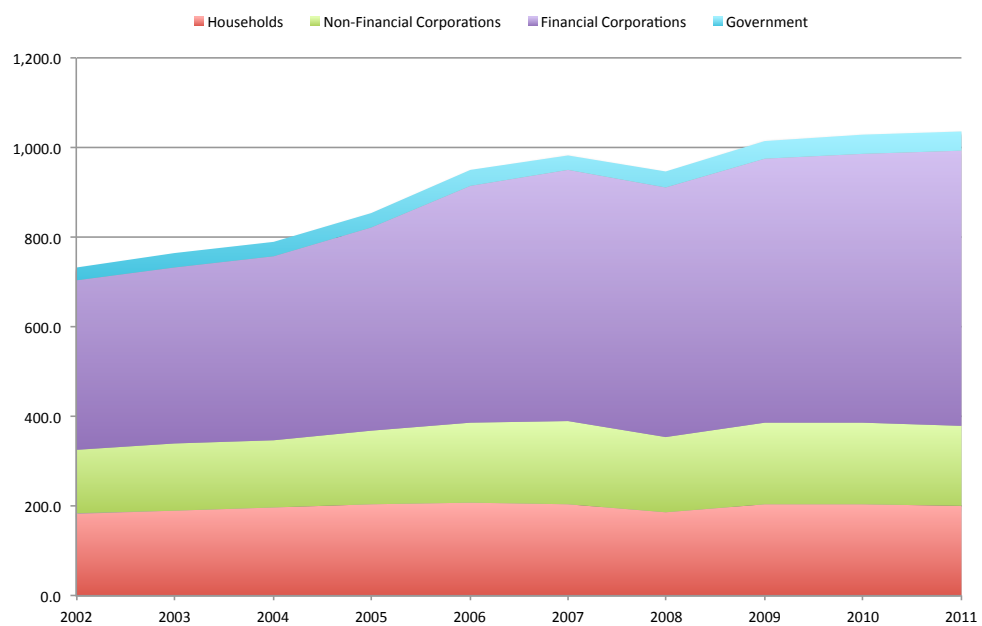


Figure 10: Sectoral Composition of Financial Assets in the Euro Area, 2002-2011. Source: Eurostat.

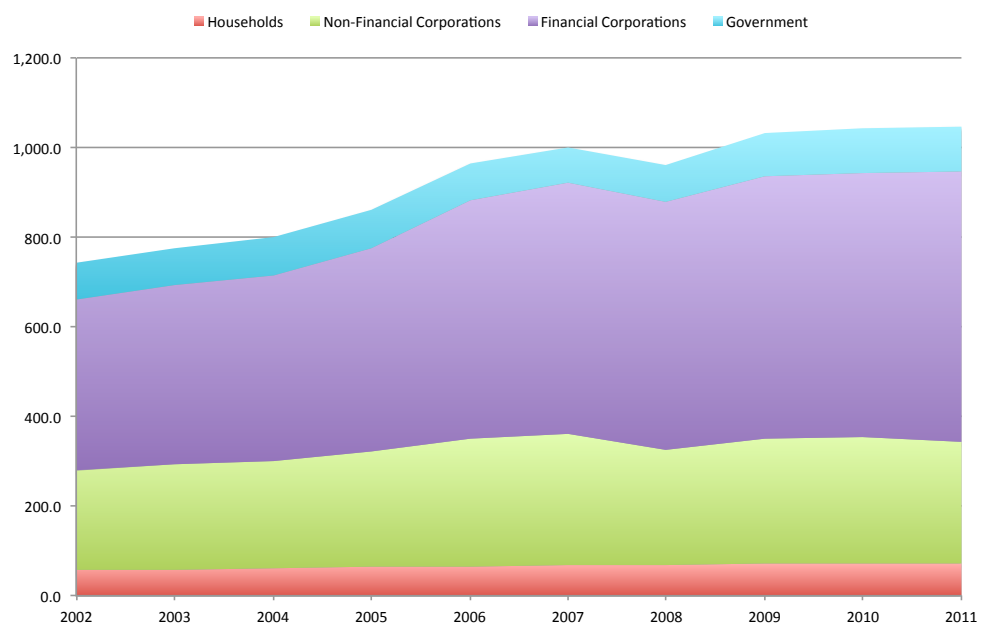


Figure 11: Sectoral Composition of Financial Liabilities in the Euro Area, 2002-2011.

Source: Eurostat.

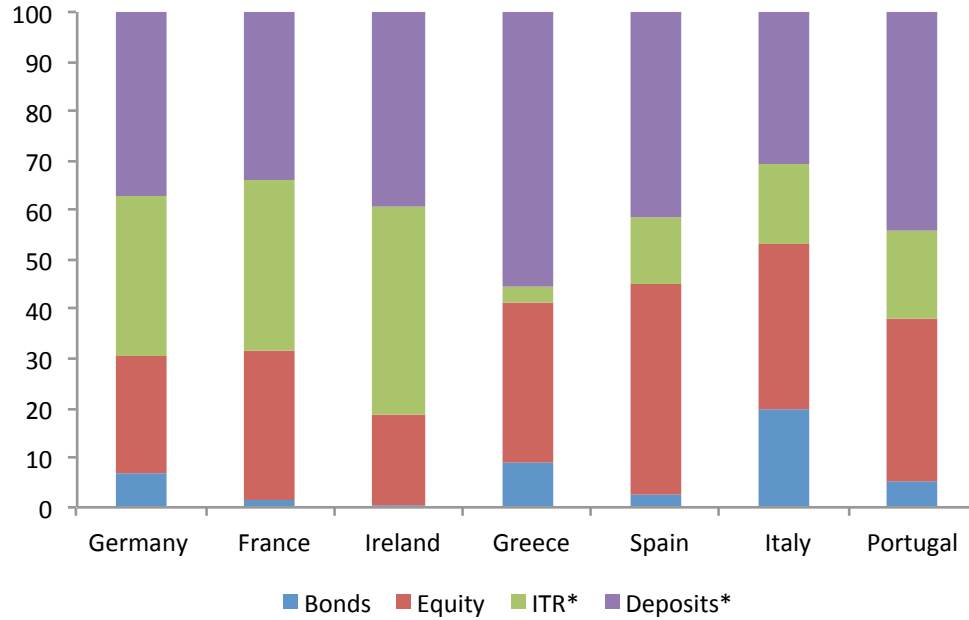


Figure 12: Composition of Household Financial Assets, 2007. Note: Bonds denotes "securities other than shares" category; ITR denotes "insurance technical reserves" category; Deposits* includes residual "other receivables" category in addition to "deposits" category. Source: Eurostat.

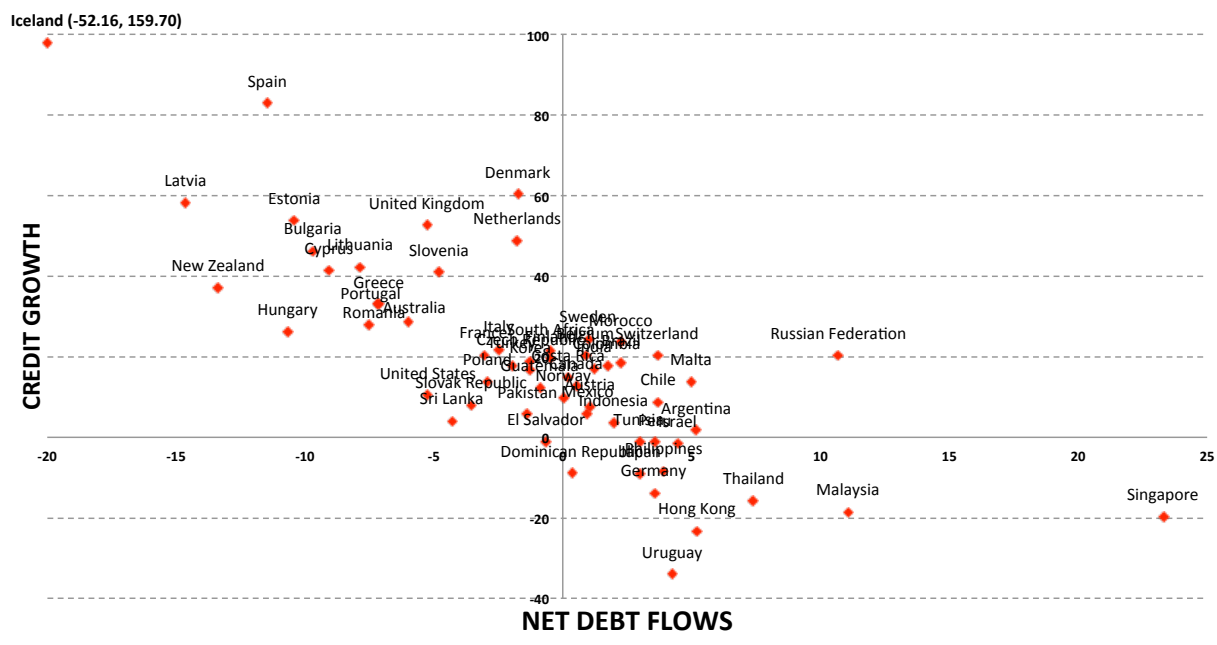


Figure 13: Domestic Credit Growth and International Debt Flows, 2003-2008. Source: Based on Lane and McQuade (2013).