Gross Capital Flows by Banks, Corporates and Sovereigns

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Abstract

We construct a new data set for gross capital flows at the quarterly frequency for 85 countries for inflows during 1996–2014 and for 31 countries for outflows during 2004–2014, decomposing flows by borrower and lender type. We present dynamic and cross sectional patterns in capital flows by banks, corporates and sovereigns focusing on three themes: role of global risk appetite, cyclical properties with respect to local business cycles, and the comovement of capital inflows and outflows. We show that patterns evident in aggregate capital flows data do not hold up across different borrower and lender sectors, and private and public capital flows move in opposite directions for most countries. When global risk appetite is low, capital flows into banks, corporates and sovereigns decline with the exception of sovereigns in advanced economies (AE). During such periods of high uncertainty, capital outflows by banks and corporates also decline. Banks' borrowing, both in emerging markets (EM) and in AE is procyclical, but corporates borrow procylically only in EM. EM's sovereigns exhibit counter-cyclical borrowing and AE's sovereign borrowing is acylical. Banks' lending is procylical in AE but not in EM. Our results show that banks' borrowing and lending induces a positive correlation between capital inflows and outflows.

JEL-Codes: F21, F41, O1
Keywords: Quarterly Capital Flows, Business Cycles, External Corporate and Bank Debt, Sovereign Debt, VIX, Systemic Risk, Emerging Markets

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1 Introduction

International capital flows have nontrivial consequences for the transmission of real and financial shocks across borders, the distribution of global risk, and countries' own macroeconomic outcomes. It is apparent from the history of financial crises that the vulnerability to external shocks as well as their mechanisms of propagation and amplification can vary greatly depending on which economic sector(s) are on the receiving side of capital inflows. For example, sovereign debt proved to be the Achilles' heel in the Latin American crises, while private sector debt financed by capital inflows was the key source of fragility in the Asian financial crises. The latest global financial crisis also highlights this fact. In the US, the culprit was the domestic household debt held by US and global banks. By contrast, in the European countries, sovereigns' and banks' external borrowing played the central role.

Most of the existing empirical work on capital flows has focused on the behavior of net flows, defined as the difference between purchases of domestic assets by foreign residents (gross capital inflows by foreigners) and the purchases of foreign assets by domestic residents (gross capital outflows by domestic agents). Researchers usually measure net flows as the current account balance with a reversed sign, sometimes excluding changes in reserves.

Recently there have been attempts to investigate the behavior of domestic and foreign investors separately, focusing on gross inflows and gross outflows around crisis events. Forbes and Warnock (2012), Broner, Didier, Erce, and Schmukler (2013), Milesi-Ferretti and Tille (2011), and Bluedorn, Duttagupta, Guajardo, and Topalova (2013), are some examples. These papers document that gross flows are much larger and more volatile than net flows, tend to be procyclical, and respond systematically to changes in global conditions.[1] Hence gross flows are first order for financial stability issues.[2]

[1] Broner et al. (2013) use annual Balance of Payments (BOP) data from the International Monetary Fund (IMF), while Forbes and Warnock (2012), Milesi-Ferretti and Tille (2011), and Bluedorn et al. (2013) use quarterly BOP data.

[2] Caballero (2016) finds that capital flow bonanzas, whether stated in terms of gross or net flows, significantly raise the incidence of banking crises, especially when the boom is in the form of flows other than FDI. Obstfeld (2012) suggests that current account imbalances are still an important source of financial stress in a world of large gross capital flows. Catão and Milesi-Ferretti (2014) find that net external liabilities, and net debt in particular, are the most important for understanding the risk of external sovereign crises. See also Borio and Disyatat (2011).

So far there has been no attempt to provide a thorough documentation of the patterns of gross inflows and outflows by sector, i.e., by borrower and lender type.[3] Aguiar and Amador (2011), Gourinchas and Jeanne (2013), and Alfaro, Kalemli-Özcan, and Volosovych (2014) separate public and private flows at an annual frequency. However, all these studies focus on *net* flows. These papers show, net capital might be flowing out of a country in the aggregate (i.e., the country may run a current account surplus), but one of the two sectors considered might still be engaging in net borrowing.[4]

We improve upon the existing literature on the dynamics of gross capital flows by constructing a dataset on *gross* capital inflows and outflows at the *quarterly* frequency for a balanced panel of 85 countries for inflows and 31 countries for outflows and document several stylized facts from the perspective of the borrower and lender type.[5] The large number of developing countries and emerging markets is a big advantage of our capital inflows dataset relative to standard sources. Our sectoral breakdown splits debt inflows into 4 borrowing groups: government, central bank, banks, and corporates. Disaggregating debt flows by borrower is of utmost importance since, in general, increased financial integration increases the risk of crises through debt linkages.[6]

Figure 1 shows the composition of external debt stocks.[7] We use a balanced sample

[3] Galstyan, Lane, Mehigan, and Mercado (2016) use data after 2013 from IMF's CPIS to examine portfolio debt and portfolio equity stocks by the sectoral identity of the issuer and holder of the security. We focus on the flow of portfolio debt by sector over a much longer time horizon in quarterly data and analyze it in conjunction with other investment debt inflows by sector over the same time horizon. Arslanalp and Tsuda (2014b) and Arslanalp and Tsuda (2014a) decompose sovereign/government loan and bond debt by creditor, both foreign and domestic. They employ QEDS data to split by foreign and domestic and BIS data to identify external bank lenders, similar to our approach. Broner, Erce, Martin, and Ventura (2014) identify the creditors for external sovereign bonds using data derived from national sources and the OECD.

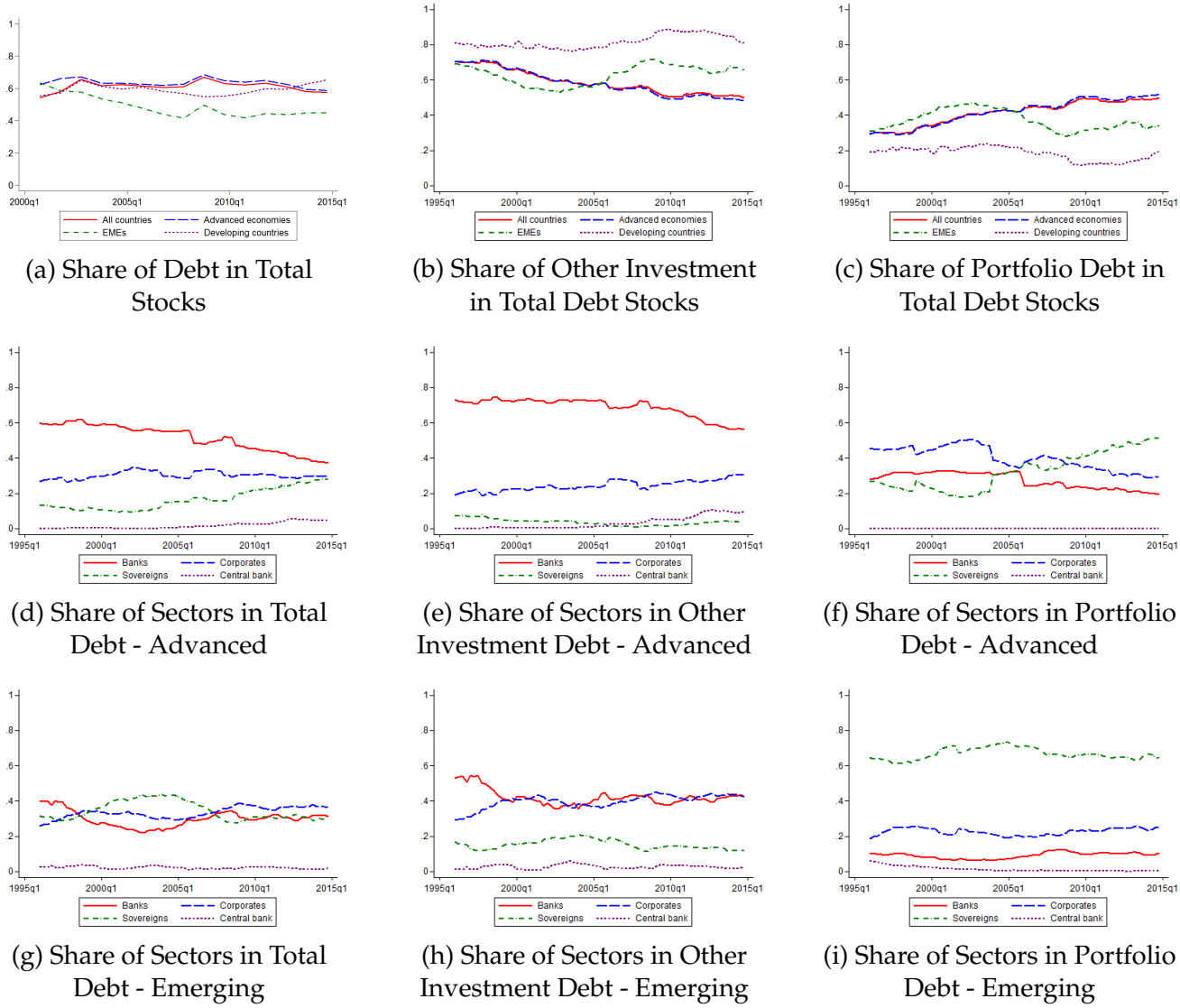
[4] This can also be the case for a particular asset class (capital flow type) instead of the borrowing sector. See, for example, Ju and Wei (2010), who show that FDI can flow in on net and reserves can flow out on net, generating two-way capital flows.

[5] The set of countries in our 85 country capital inflows data includes 25 advanced, 34 emerging, and 26 developing economies from 1996q1 to 2014q4. If we go to an annual frequency, we can have 89 countries for inflows, adding 4 more developing economies. For capital outflows data we have 16 advanced and 15 emerging economies for 2004q1–2014q4. This is because of the fact that foreign assets of lender types are poorly recorded. For total outflows one can have of course more countries but our aim here is to decompose outflows by banks, corporates and sovereigns as we do inflows. We combine the general government and central bank sectors into a single public sector in order to increase data coverage.

[6] Lane (2013) discusses the importance and difficulty of analyzing sectoral financial positions for understanding and assessing risk. See also Lane (2015).

[7] Flow versions deliver a similar picture, though more noisy, and are plotted in Appendix F in Figure F1.

Figure 1: Composition of External Debt Stocks - Share by Sector



(a) Share of Debt in Total Stocks

(b) Share of Other Investment in Total Debt Stocks

(c) Share of Portfolio Debt in Total Debt Stocks

(d) Share of Sectors in Total Debt - Advanced

(e) Share of Sectors in Other Investment Debt - Advanced

(f) Share of Sectors in Portfolio Debt - Advanced

(g) Share of Sectors in Total Debt - Emerging

(h) Share of Sectors in Other Investment Debt - Emerging

(i) Share of Sectors in Portfolio Debt - Emerging

Source: IIP, QEDS, and BIS, authors' calculations.

of countries to prevent entry/exit of countries into the sample from distorting time series patterns in the composition of debt.

Panel (a) shows the share of total debt in total external liabilities to underline the importance of decomposing debt. Debt represents the majority of external liabilities, except in EM, whose debt and non-debt liabilities are of similar magnitude. Panel (b) highlights that other investment debt (usually bank credit or loans) is the bulk of debt stocks, but portfolio debt (bonds) in panel (c) represents nearly half of AE external debt and around a third of EM external debt. Thus, it is important to consider both types of external debt.

In terms of sectoral composition of debt, panels (d)-(i) highlight the sectoral share of external debt stocks for each flow type and country group. In AE, banks hold the lion's share of external debt liabilities, whereas in EM corporates, banks and sovereigns have more or less equal shares. This is interesting since in general it is thought that all types of agents enjoy easier access to international capital markets in AE than in EM. It seems that banks do most of the intermediation of external funds in AE, while corporates and sovereigns might be borrowing more domestically. What is more surprising is that the conventional wisdom that most other investment debt is held by banks, and most portfolio debt is held by corporates, holds for AE but not for EM. In the latter, most of the portfolio debt is held by sovereigns, and banks and corporates hold equal shares in other investment debt.

The composition of external debt is remarkably stable, with few exceptions. The share of other investment debt in total external liabilities is decreasing and the share of portfolio debt is increasing in AE over time. This seems to be partly driven by the global financial crisis: in these countries, the share of bank-held debt declines and that of sovereign debt increases following the crisis. For EM, sector shares are more stable over time, although prior to the crisis there is a declining trend in the share of debt vis-a-vis equity.

Figure 2 shows the counterpart of Figure 1 for the composition of external asset stocks in debt instruments. Panel (a) shows the share of debt in total external assets. Debt assets represents the majority of external assets; 80 percent in EM and 60 percent in AE on average during 2000s, though share of debt assets in total external assets is on a declining trend for both set of countries. Panel (b) highlights that other investment debt is the bulk of debt asset stocks in AE, whereas portfolio debt assets in panel (c) represents only 40 percent of the AE economies external debt assets. For EM, other investment debt assets represent half of the external debt assets and portfolio debt assets are not important.

In terms of sectoral composition, panels (d)-(i) highlight the sectoral share of external debt asset stocks for each flow type and country group. In AE banks do the lion's share of external debt lending, whereas in EM public sector is overwhelmingly the main lender

to other countries. This is primarily driven by their accumulation of reserve assets, which are included in the total debt figure. As in the case of borrowing, banks do most of the intermediation of external funds in AE in terms of lending, while corporates also have a big share in lending in portfolio debt assets for AE. For EM, banks and corporates do about an equal share of lending in other investment debt, while corporates lead in terms of portfolio debt. The composition of external debt assets is also very stable over time, as in the case of debt liabilities.

These figures highlight the importance of separating external debt liabilities and assets by sector, for a more complete understanding of the nature and drivers of capital flows. To build our dataset, we combine and harmonize several publicly available sources: Balance of Payments (BOP) and International Investment Position (IIP) statistics of the International Monetary Fund (IMF), Locational Bank Statistics (LBS) and Consolidated Bank Statistics (CBS) from Bank for International Settlements (BIS), International Debt Securities (IDS) from BIS, Quarterly External Debt Statistics (QEDS) of IMF and World Bank (WB), and Debt Reporting System (DRS) data of WB.[8]

The standard source of capital flow data is the IMF's BOP database. The BOP data is available at either an annual or a quarterly frequency and captures both liability flows (inflows) and asset flows (outflows). This forms the core of our dataset. Figure 3 illustrates the structure of the BOP data (using the BPM6 structure and definitions). It is broken first by type of flow (i.e. the asset class), and then by sector (i.e. the borrower type or lender type). Only one type of capital flow, other investment debt, can also be split first by instrument (such as trade credit or accounts receivable) and then by sector.

In theory, each type of capital flow can be disaggregated by sector (borrower and lender type). In practice, however, the coverage tends to be sparse, especially for EM/developing countries and earlier years. To be absolutely clear, capital flow types (asset classes) are gener-

[8]It should be noted that, even though combining different data sources to complement BOP/IIP statistics is rarely done at the global level, this is exactly what many country-level BOP/IIP compilers do on a regular basis (e.g. many country BOP/IIP compilers use the BIS IBS data series on banks' cross-border deposit liabilities to the residents of their respective countries in order to enhance their BOP/IIP compilation).

ally very well reported in aggregate terms in the BOP data, and the reporting of the sectoral breakdowns has improved in recent years. Nevertheless, for most emerging/developing countries and years before 2005 the reporting of the data by sector is much less exhaustive. This constitutes a problem for researchers who want to establish stylized facts across time and countries on the patterns of capital flows by borrower and lender type and also by capital flow type.

To construct our capital inflows dataset, we start with BOP data by sector, and incorporate data from the BIS and the WB on external bond and loan flows to expand the limited quarterly sectoral coverage available in the BOP.[9] We similarly construct our dataset for outflows, and incorporate data from the BIS to complement coverage for portfolio debt and other investment debt outflows of the bank sector. Our outflows data also incorporates flows of official reserves. Other investment debt flows are important since the vast majority of external bank flows are in this category.[10] Crucially, this category also includes some cross-border loans to corporates and loans to sovereigns, such as IMF credit.[11] In most countries, sovereigns tend to borrow externally primarily via bonds, which appear under the portfolio debt category. When bond financing to emerging market borrowers, including governments, dries up, emerging market sovereigns rely more on loans.[12]

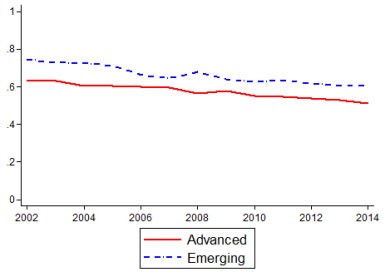
[9]The IMF's Coordinated Investment Portfolio Survey (CPIS) database also reports data on sectoral breakdowns for portfolio equity and portfolio debt flows. However, these breakdowns are available only since 2013 and, more importantly, the CPIS does not have data on other investment debt flows.

[10]Milesi-Ferretti and Tille (2011) and Cerutti, Claessens, and Puy (2015) separate out the banking sector within other investment debt category to investigate this category on its own.

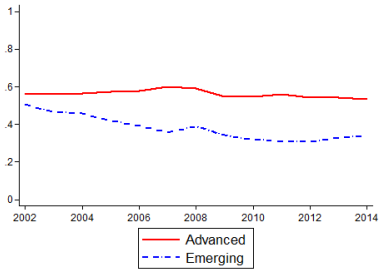
[11]Other studies examining gross capital inflows using only BOP data sometimes exclude official reserves and IMF credit in order to focus on private inflows (see Forbes and Warnock (2012), Bluedorn et al. (2013), and Milesi-Ferretti and Tille (2011) for example). Milesi-Ferretti and Tille (2011) additionally exclude central bank loans and deposits. Bluedorn et al. (2013) analyze private flows by removing from total flows reserves, IMF credit, and most government-related components included under the other investment debt category.

[12]Figure F1 in Appendix F shows that this is the case during the global financial crisis.

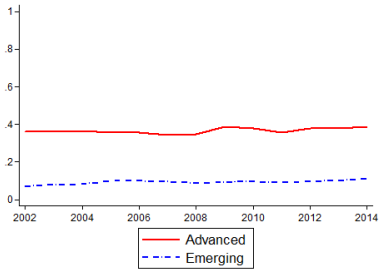
Figure 2: Composition of External Debt Asset Stocks



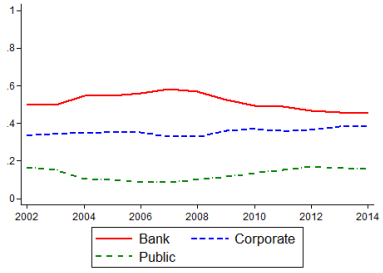
(a) Share of Debt in Total Asset Stocks



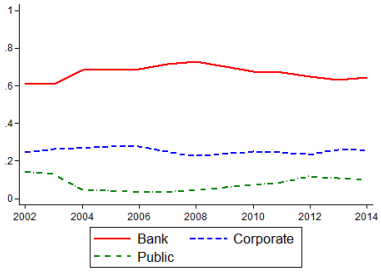
(b) Share of Other Investment Debt in Total Debt Assets



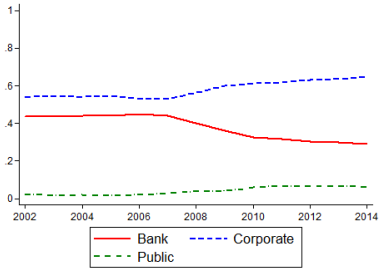
(c) Share of Portfolio Debt in Total Debt Assets



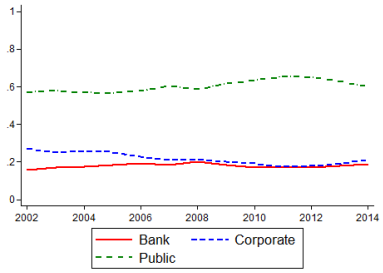
(d) Sector Shares of Total Debt Assets - Advanced



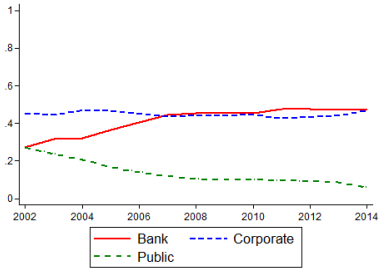
(e) Sector Shares of Other Investment Debt Assets - Advanced



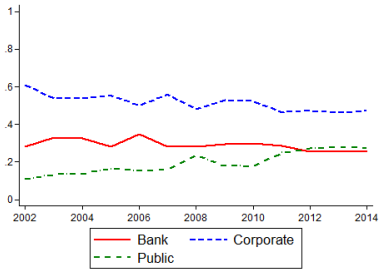
(f) Sector Shares of Portfolio Debt Assets - Advanced



(g) Sector Shares of Total Debt Assets - Emerging



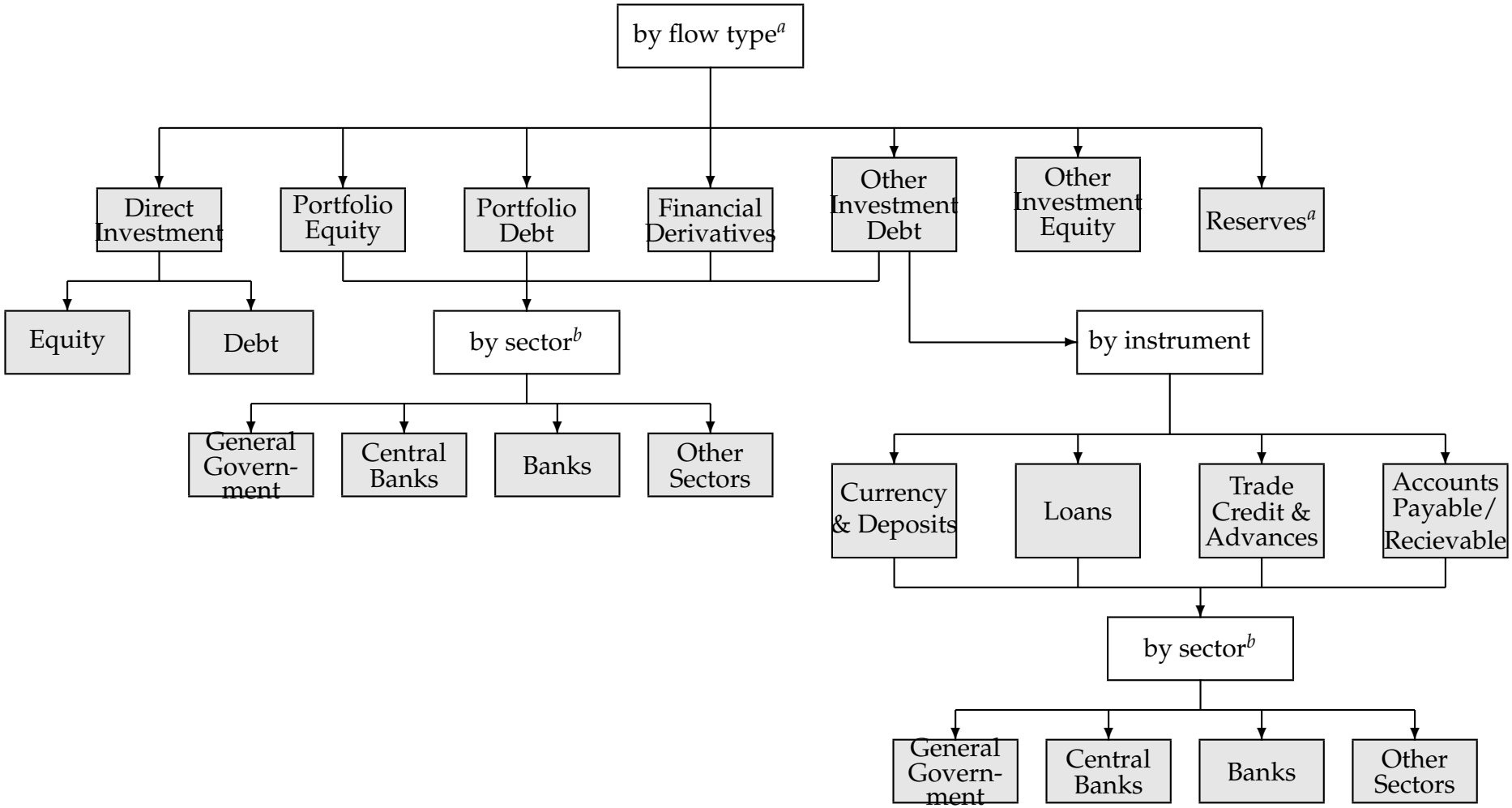
(h) Sector Shares of Other Investment Debt Assets - Emerging



(i) Sector Shares of Portfolio Debt Assets - Emerging

Source: IIP and BIS, authors' calculations. Total Debt includes official reserves. Note that Norway is dropped from the asset sample due to lack of stock data.

Figure 3: BOP Data Structure



[a] This structure is the same for inflows and outflows. Reserves are only classified as outflows.
[b] The breakdowns of these variables by sector exist in the BOP data but the coverage is sparse for many countries and quarters.

We undertake a "filling" exercise to complete the missing sectoral data on debt inflows. Assuming missing data is zero may or may not be accurate depending on the country under consideration, so we fill missing values with data from other sources.[13] We start by identifying the appropriate variables from the BOP data. This is not as easy as it sounds since, unfortunately, in the public download of the BOP data the sector breakdown of other investment debt category is shown under other investment equity category.[14,15] For our outflow sample, we are only able to fill few missing observations for the banking sector. Otherwise, we rely wholly on the BOP data.

Our inflow dataset exhibits some important differences relative to the BOP data along both time series and cross sectional dimensions. When we compare time series patterns in total debt inflows aggregated across country groups, corporates' external borrowing in AE leading up to the crisis appears to be higher in our database, due to our filling data for corporate sector in countries like the US and Spain. In a similar vein, after the 2008 crisis emerging market banks and corporates show much larger flows in our data than in the BOP data due to our filling data for countries like China and India.

For the smaller sample where we have balanced outflow data, we investigate the co-movement between inflows and outflows. The literature shows a high degree of correlation between capital inflows and outflows (Bluedorn et al., 2013; Broner et al., 2013; Forbes & Warnock, 2012). We find that the inflow-outflow correlation is driven mainly by the banking sector. This is true for both unconditional correlations and correlations controlling for conditional for the VIX and GDP growth. In general, public inflows show a negative correlation with private inflows and public outflows are negatively correlated with private outflows.

To analyze the factors driving capital flows, we run separate quarterly panel regressions of capital inflows and outflows on lagged global risk appetite (VIX) and countries' own GDP growth. We run country fixed effect specifications, which means the identifying information

[13] It is difficult to distinguish missing from a true zero in the BOP data.

[14] In reality, other investment equity (which is usually very small) is the only category within other investment that is not split by borrowing sector, and the sectoral split under other equity investment is really the sectoral split of the other investment debt category.

[15] We thank Gian-Maria Milesi-Ferretti and IMF Statistics for helping us uncover this.

comes from changes in VIX, GDP growth and capital flows.[16] Our panel regressions show that when global risk appetite is low, as proxied by high VIX, banks and corporates borrow less from international markets both in AE and EM. This pattern is the same if we regress other investment debt inflows instead of total debt inflows. This is not surprising given the dominance of banks in the other investment debt category. Total debt borrowing by sovereigns does not respond to VIX neither in EM nor in AE. In contrast, borrowing in terms of other investment debt by EM sovereigns responds positively to the VIX. This is driven by the fact that, EM sovereigns might get loans to smooth out the effect of global shocks. Sovereign borrowing in terms of portfolio debt also does not respond to VIX neither in AE nor in EM once we condition on countries' own business cycle.[17]

We find similar results for total debt outflows. During periods of high global uncertainty, banks and corporates lend less externally. This pattern holds both in EM and AE. Similar to inflows regressions, when we regress other investment debt outflows instead of total debt outflows, we find similar results, with the exception that in AE, only banks' foreign investment responds to VIX.

In terms of the business cycle properties of capital inflows, banks and corporates borrow procylically in EM, whereas in AE, only banks borrow procylically. AE sovereigns borrowing is acyclical and EM sovereigns borrowing is countercylical. Public debt inflows seem to do most of the risk sharing when private debt markets collapse in EM during recessions. When we look at regressions of other investment debt inflows, both in EM and in AE, banks

[16] Cerutti et al. (2015) uses quarterly BOP data aggregated for a group of emerging economies, and shows in time series regressions that VIX is negatively correlated with their estimated common factor for all types of capital flows. Nevertheless, the correlation is not robust to including GDP growth. (Cerutti, Claessens, & Puy, 2016) find that inflows to emerging economies have strong co-movement with VIX and that this link is stronger in bank flows.

[17] Unconditional correlations of VIX and aggregate capital inflows, shown in Appendix F, deliver similar results in terms of sign of the relationship but different results in terms of size and significance. Two main differences driving this are the use of cross country variation used in the panel instead of aggregates, and controlling for domestic GDP growth in the regressions. The correlations show that all private debt flows (that is, borrowing by banks and corporates in both portfolio debt and other investment debt) are negatively correlated with global risk appetite, as measured by the VIX. By contrast, borrowing by sovereigns is positively correlated with the VIX. Rey (2013) uses quarterly BOP data and shows that across all geographic regions, portfolio equity, portfolio debt, and other investment debt are all negatively correlated with the VIX. Nier, Sedik, and Mondino (2014) and Forbes and Warnock (2012) find similar results to Rey.

and corporates borrow procylically.[18] When we look at outflows, it seems banks in AEs invest procylically and in EM only sovereigns' reserves are positively correlated with GDP growth.

The rest of the paper is organized as follows: Section 2 describes our dataset and construction; Section 3 illustrates the trends and analyzes the data; Section 4 presents the results from our empirical analysis; Section 5 concludes.

2 Dataset Construction

In this section, we describe the construction of our dataset of gross inflows. Note that what is commonly called "gross flows" in the literature is actually more accurately described as "net inflows" and "net outflows". Net inflows are gross liability flows, net of repayments. Net outflows are gross asset flows, net of disinvestment. Capital flows data found in the BOP and elsehwere usually conform to this definition. Thus, although these measures are often called "gross", they can be positive or negative. The separation of flows into asset and liability flows allows interpreting liability flows as net inflows from foreign agents, and asset flows as net outflows by domestic agents. This is the primary working definition of capital flows, which we use across all data sources for consistency.[19]

The focus of this paper is on the differentiation of capital flows by sector in the domestic economy. The term "sector" is used here to refer to institutional sectors: general government, central banks, depository corporations except the central bank ("banks"), and other sectors ("corporates").[20]

[18]The results on the response of capital flows to GDP growth are robust and resonate with the theoretical and empirical results in Blanchard, Ostry, Ghosh, and Chamon (2015). These authors find, in a sample of 19 EM, that other investment debt flows are positively correlated with GDP growth and portfolio debt flows are negatively correlated or not robustly correlated. Due to their instrumentation strategy they interpret their results causally as loans (other investment debt flows) being expansionary, whereas bond flows (portfolio debt) being contractionary. Our results show that their result on other investment debt flows is driven by private sector inflows, both banks and corporates. We also explain their non-robust zero/negative correlation of bond flows (portfolio debt) with GDP growth in EM. This is due to the fact that in EM, public and corporate bond flows are correlated with GDP growth with opposite signs.

[19]See Section A in the appendix for more discussion about the definitions and terms associated with the capital flow literature and capital flow data.

[20]It should be noted that the BOP category "other sectors" is broader than what is captured than the term "corporates". Nevertheless, in most cases, there is fairly broad overlap between the two categories. That is why,

Our primary dataset is the Balance of Payments (BOP) data produced by the IMF, which is the most comprehensive dataset on international capital flows. This data is reported to the IMF by country statistical offices. The BOP data captures capital flows into and out of a country. The accompanying stock measures of external assets and liabilities are captured in the IMF's International Investment Position (IIP) data. Capital flows are measured as asset flows (outflows), liability flows (inflows), and net flows. We focus on the financial account portion of the data and the BPM6 version. More details on the BOP data, along with its different presentations and versions, are given in Appendix B.[21]

Figure 3 illustrates the structure of the BOP data. In simple terms, capital flows in the BOP are split into three main categories: direct investment, portfolio investment, and other investment.[22] Each of these categories can be split into debt and equity components. For portfolio investment debt and equity and other investment debt, the flows can be further subdivided by domestic sector: banks, corporates, government, and central bank. Other investment debt can also be decomposed by instrument (loans, currency and deposits, trade credit and advances, and other accounts payable/receivable[23]) and then by sector.[24]

We focus on debt inflows by sector. To get debt inflows by sector, we need to sum portfolio debt liability flows by sector with other investment debt liability flows by sector. The total for each of these categories is very well reported in the BOP data, though the sector breakdowns are not reported as often, especially for earlier years. To supplement the BOP data by sector when it is missing, we draw from other datasets, described below.

in the rest of this paper, we use the two terms interchangeably for presentational convenience.

[21] See also Appendix 8 of the 6th Edition Balance of Payments Manual for more details on the differences between BPM5 and BPM6.

[22] Other categories include reserves (asset flows to the central bank) and financial derivatives (small and sparsely reported, previously a part of portfolio investment).

[23] Another instrument, insurance and pensions schemes, is also detailed, though it is very small and sparsely reported.

[24] In the public download of the BOP data, available from the IMF's website, the variables for other investment debt by sector are mislabeled, and so may be difficult to find. They are labeled as "...Other Investment, Other Equity..., Debt Instruments, ...". For example, the full label for other investment debt for Other Sectors (which we refer to as "Corporates") is "Financial Account, Other Investment, Other Equity, Net Incurrence of Liabilities, Debt Instruments, Other Sectors, US Dollars". The letter codes (EDD2 Codes) for these variables are BFOLOO_BP6_USD, BFOLOGFR_BP6_USD, BFOLODC_BP6_USD, and BFOLOCBFR_BP6_USD. On the asset flow side, these variables are BFOADO_BP6_USD, BFOADG_BP6_USD, BFOADDC_BP6_USD, and BFOADCB_BP6_USD.

2.1 Important Details for BOP Data

We remove exceptional financing flows to banks and corporates, within portfolio debt and other investment debt, and reassign them to the central bank. Exceptional financing captures financial flows made or fostered by the authorities for balance of payments needs. Thus, they can be seen as a substitute for reserves or IMF Credit.[25]

Direct investment contains both debt and equity flows and is split by debt and equity components in the BOP data. However, it is not disaggregated by sector in the BOP data. Nevertheless, debt flows between related enterprises are recorded as direct investment debt only when at least one counterparty is a non-financial firm. Direct investment debt flows between two financial firms (including banks) are instead classified as either portfolio investment debt or other investment debt. If direct investment debt flows from non-financial firms to financial firms are negligible, then we can think all direct investment debt as flows either from financial firms to non-financial firms or flows from non-financial firms to non-financial firms. In either case, the borrowing sector is the non-financial sector and hence direct investment debt inflows can be assigned in full to the debt inflows of the corporate sector. We include direct investment debt in total debt in our regression analysis of inflows, while more particular detail of the contribution of direct investment debt is discussed in Appendix F.3.

2.2 Filling Missing Data in BOP

In order to get a larger, longer, and balanced panel of countries with debt flows split by sector, we proceed with a data filling exercise. When the BOP data reports the total for the category and reports data for 3 out of the 4 sectors, we take the total and subtract the 3 reported sectors in order to obtain the fourth sector. If there is still missing data, we construct measures of portfolio debt and other investment debt inflows by sector from several alternative datasets.[26] One such dataset is the data from BIS on debt securities issued in

[25] See the 6th Edition BOP Manual, paragraph A1.1.

[26] The capital flight literature also uses techniques of internal filling with the BOP and external filling with other datasets in order to identify unreported private capital flows. See Chang, Claessens, and Cumby (1997) for

international markets, which we use to fill in portfolio debt flows. Another one is the BIS dataset on cross-border banking, which we use to fill the missing data under other investment debt.[27] Here, we only use loan lending by BIS reporting banks, so as not to capture direct investment flows or debt securities holdings.[28,29] We then complement these loans with any other non-missing data from the BOP for particular instruments within other investment debt (trade credit, IMF credit, etc.) to get a more complete and accurate measure of other investment debt flows for each sector.[30,31]

While the BIS data has extensive coverage and captures a vast amount of capital flows, in some cases it may not match well with the BOP data.[32] In these cases, we rely first on measures derived from IIP, produced concurrently with the BOP data by the IMF, and the Quarterly External Debt Statistics (QEDS) data, produced jointly by the IMF and World bank. These data have the same sectoral and capital flow definitions and breakdowns, making them comparable to the BOP data. These are stock measures, which we first difference with a simple currency adjustment to approximate flows. While imperfect, these stock derived measures often line up very well with reported BOP data and allow us to be more accurate as we fill missing data.

a discussion. See also Claessens and Naudé (1993).

[27] Note that it takes a few steps to construct estimates by sector from the BIS loan data. We detail this process in the Appendix. The BIS bank data captures the overwhelming majority of cross-border banking activity (BIS, 2015), but some banking flows between non-BIS reporting EM may not be captured (e.g. Chinese banks lending to Nigeria, etc.).

[28] Debt security flows would already be captured in portfolio debt (or the equivalent filling series). In principle, there could be an overlap between "direct investment debt" series and the "BIS loans" series if the loan is from a BIS reporting bank to an offshore non-financial entity in which it has at least a 10% ownership stake. In practice, we expect this to be small.

[29] A few AE have had some discrepancies between the BOP data and the BIS Bank data, in particular Japan, Switzerland, and the US. These are isolated cases that are well known. We make sure to use BOP data, which is generally well reported for these cases, and other data sources first to avoid these issues.

[30] It is almost always the case that when the total is missing, the underlying instruments are also missing, except for perhaps IMF credit.

[31] In some cases, the flows for other investment debt, by sector or for total, is reported as coming from just one instrument (usually loans) even though in reality it reflects flows from other instruments as well (e.g. trade credit). So, summing these instruments can capture the proper total in some cases (this almost always not necessary since other investment debt itself is reported when the underlying instruments have non-missing data). We thank Gian-Maria Milesi-Ferretti for bringing this to our attention.

[32] An important example is advanced economy government bonds, which are issued domestically and then traded abroad. These flows would not be captured by the BIS debt securities data, which captures bonds that are issued in international markets.

Combining the IIP, QEDS, and BIS series, we construct estimates of capital flows by flow type and sector. Then we use these estimates to fill missing BOP data. We deflate GDP and all capital flows to 1996 USD and express them in billions.[33] Additionally, we construct accompanying stock measures of external debt by sector. Here, we rely first on the IIP data as the main source. When this is missing after the internal fill, we rely on QEDS data on external debt by sector. We fill any remaining observations with our BIS estimates. For most of this paper, however, we focus on our measures of debt flows.

A detailed description of these datasets and our construction of the estimates to fill missing data can be found in the Appendix. Here, we briefly illustrate the validity of our approach. To gauge how well our estimates capture the true inflows, we undertake a counterfactual exercise. We take a sample of countries where BOP data by sector is non-missing over 2006q1-2013q4. Then we compare this data to our estimates done for this period as if the BOP data was missing. Then, for each country group, we plot the aggregate flows for each sector and capital flow type using non-missing BOP data, and our constructed estimates. Figures D1 and D2 in Appendix D report these plots for both other investment debt flows and portfolio debt flows for each sector.

Notice that this period can be good and bad for this comparison exercise of our data with BOP data. It is good since this is the post-2006 period where BOP data by sector is in general well-reported, allowing a healthy BOP sample for comparison. It is bad given the effect of the 2008 financial crisis on global capital flows. The 2008 crisis has extremes in capital flows, so the fact that we match pretty well the aggregate is notable and speaks to the quality of our constructed estimates to fill missing data over the entire sample. The correlation between the two series is over 98 percent. On the whole, our filled series capture most of the volume and variation of inflows for most countries and allow us to extend substantially the coverage of our sample.

[33] Quarterly GDP data is from Datastrem and national sources. We deflate series using US CPI from FRED.

2.3 Coverage of Filled Data

We divide the countries into three groups by level of development: Advanced, Emerging, and Developing.[34] See Appendix E for specific details about the countries. For reference, our primary sample of capital inflows using the annual data consists of the following 89 countries:

Advanced (25): Australia, Austria, Belgium, Canada, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Korea, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States

Emerging (34): Argentina, Brazil, Bulgaria, Chile, China, Colombia, Croatia, Czech Republic, Egypt, Estonia, Hungary, India, Indonesia, Jordan, Kazakhstan, Latvia, Lebanon, Lithuania, Macedonia, Malaysia, Mexico, Peru, Philippines, Poland, Romania, Russian Federation, Slovak Republic, Slovenia, South Africa, Thailand, Turkey, Ukraine, Uruguay, Venezuela

Developing (30): Albania, Angola, Bangladesh, Belarus, Bolivia, Costa Rica, Cote d'Ivoire, Dominican Republic, Ecuador, El Salvador, Gabon, Ghana, Guatemala, Jamaica, Kenya, Liberia, Mongolia, Montenegro, Morocco, Namibia, Nigeria, Pakistan, Papua New Guinea, Paraguay, Serbia, Sri Lanka, Sudan, Trinidad and Tobago, Tunisia, Vietnam

At the quarterly frequency, our sample drops to 85 countries, leaving off El Salvador, Mongolia, Montenegro, and Serbia. For the regression and correlation analysis below where we use quarterly GDP, our sample is further limited due to unavailability of quarterly GDP for many emerging/developing countries.

Table 1 illustrates the impact of our data filling exercise on sample coverage. For each capital flow type, sector, and country group, the table shows the percentage of observations in our balanced panel that come from the raw BOP data, from our internal filling procedure, and from our filling from external data sources. Generally speaking, developing countries, central banks, and portfolio debt tend to have less data available in the original BOP. Our

[34] We rely on the 2000 IMF WEO classification to define the group of advanced economies. Generally, the WEO does not divide emerging and developing countries into separate groups. We use the MSCI and IEO-IMF classifications to define our EM group.

internal filling procedure makes a large difference for the coverage of central banks, but otherwise does not provide many more observations for portfolio debt and/or developing countries. Our external filling procedure, on the other hand, makes a large difference, especially for the quarterly data, where 25-40 percent of observations for EM and 75-90 percent of observations for developing countries that were missing under portfolio debt are filled. In the case of other investment debt, only 11 percent of observations are filled for EM, but for developing countries 40-50 percent of observations are filled. A sizeable number of observations are filled by external data also for advanced economies: 20-30 percent for portfolio debt observations, and 15-18 percent of other investment debt.

Our filling exercise has a dramatic impact on the time and country coverage of the data. A balanced sample requires that portfolio debt and other investment debt not be missing for any of the 4 sectors in any period. With 8 components required to be non-missing in each period, the probability that at least one is missing is high. With no adjustments to the BOP data, we have 0 countries in our sample (12 in the annual data). After our internal BOP fill, our sample of countries increases to 10 (16 in the annual data). After incorporating the IIP, BIS, and QEDS data, our balanced sample increases to 85 countries (89 in the annual data). Given the advantages of a balanced country sample for cross-section and panel regression analysis, the impact of our data filling on sample size can be very consequential.

Figure 4 compares aggregate inflows as measured by our filled data and from the BOP alone, for total external debt for banks and corporates in our samples of AE and EM. We plot annual flows here for clarity. These graphs show that generally both series tell the same story, but there are periods in which accounting for the missing data makes a significant difference. For advanced economy corporates, a significant expansion leading up to the 2008 crisis and a contraction following it is missed. This is due primarily to filling in portfolio debt data for the US and Spain for the 2008 surge, as well as a few other AE for the earlier 2001 peak. For EM, both banks and corporates had much larger flows relative to the BOP measure following the 2008 collapse, driven primarily by filling data for other investment

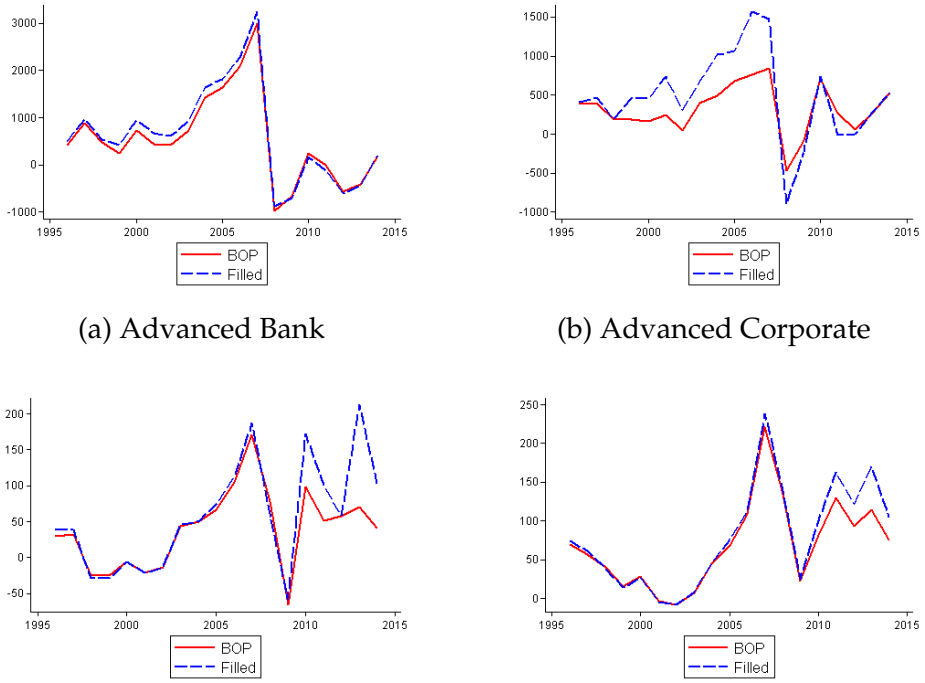
Table 1: Data Filling Summary

			Annual			Quarterly		
Flow	Sect.	Group	BOP	Int. Fill	Ext. Fill	BOP	Int. Fill	Ext. Fill
PD	GG	Adv.	80.6	0.0	19.4	79.4	0.0	20.6
PD	GG	Em.	82.4	0.3	17.3	74.2	0.8	25.0
PD	GG	Dev.	40.2	0.7	59.1	25.0	0.1	74.9
PD	CB	Adv.	9.5	58.3	32.2	7.5	60.5	32.0
PD	CB	Em.	23.5	40.6	35.9	19.5	35.6	44.9
PD	CB	Dev.	11.2	8.2	80.5	2.6	4.8	92.7
PD	DC	Adv.	67.6	3.6	28.8	67.7	3.4	28.8
PD	DC	Em.	61.7	4.1	34.3	55.6	3.5	40.9
PD	DC	Dev.	18.6	1.6	79.8	10.3	0.7	89.0
PD	OS	Adv.	75.4	0.0	24.6	74.7	0.0	25.3
PD	OS	Em.	69.8	2.3	28.0	64.4	1.9	33.6
PD	OS	Dev.	29.3	0.5	70.2	13.3	0.3	86.5
OID	GG	Adv.	80.0	2.1	17.9	78.4	3.2	18.4
OID	GG	Em.	93.7	0.8	5.6	88.1	0.9	11.0
OID	GG	Dev.	87.7	0.0	12.3	49.7	0.0	50.3
OID	CB	Adv.	68.2	13.9	17.9	65.8	15.4	18.7
OID	CB	Em.	87.4	6.6	6.0	79.2	9.8	11.0
OID	CB	Dev.	74.6	13.3	12.1	46.0	6.7	47.3
OID	DC	Adv.	81.9	0.0	18.1	81.4	0.0	18.6
OID	DC	Em.	94.0	0.0	6.0	89.0	0.0	11.0
OID	DC	Dev.	77.7	6.1	16.1	48.0	1.8	50.2
OID	OS	Adv.	84.0	0.4	15.6	82.8	0.1	17.2
OID	OS	Em.	94.4	0.0	5.6	89.0	0.0	11.0
OID	OS	Dev.	88.4	1.1	10.5	52.5	0.7	46.8
Balanced Sample			12	16	89	0	10	85

This table displays the percentage of total observations in our final sample of Advanced (Adv.), Emerging (Em.) and Developing (Dev.) countries (89 for annual, 85 for quarterly) that is derived from each step of our data construction. BOP = Percent coverage of sample from raw BOP data; Int. Fill = Percent coverage of sample from Internal Filling exercise; Ext. Fill = Percent coverage of sample from non BOP data sources. OID = other investment debt; PD = portfolio debt; GG = General Government; CB = Central Bank; DC = Banks; OS = Corporates. The last line indicates the number of countries in our balanced sample 1996 to 2014 that we have data for each sector non-missing.

debt inflows for China.

Figure 4: Aggregate External Debt Inflows for Banks and Corporates, Billions 1996 USD



(a) Advanced Bank

(b) Advanced Corporate

(c) Emerging Bank

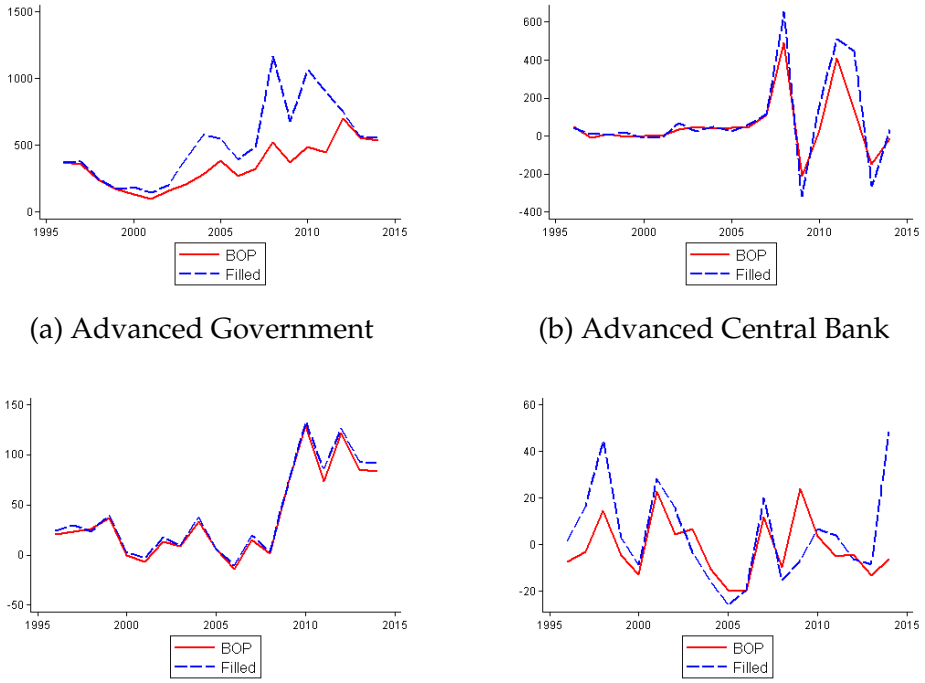
(d) Emerging Corporate

Source: BOP, IIP, QEDS, and BIS, authors' calculations. Debt is portfolio debt + other investment debt. BOP series is only BOP data, Filled is BOP data filled by other data sources when missing.

Figure 5 plots total external debt inflows for government and central bank sectors. Missing U.S. government portfolio debt drives the difference for the AE in panel (a). Emerging market governments and advanced central banks are fairly well represented in terms of volume. Note that net inflows can be negative as well as positive, which is the case for emerging market central banks where some missing data consists of negative net inflows, which brings our filled data below the raw BOP total. The surge at the end of the sample for emerging market central banks is driven by China.

Our dataset captures a large volume of capital inflows by sector that may otherwise be missed. Additionally, our data increases the number of both large and small countries with debt inflow data by sector over a long time horizon at the quarterly frequency.

Figure 5: Aggregate External Debt Inflows for Governments and Central Banks, Billions 1996 USD



(a) Advanced Government

(b) Advanced Central Bank

(c) Emerging Government

(d) Emerging Central Bank

Source: BOP, IIP, QEDS, and BIS, authors' calculations. Debt is portfolio debt + other investment debt. BOP series is only BOP data, Filled is BOP data filled by other data sources when missing.

2.4 Decomposition of Capital Outflows

To complement our extensive dataset on capital inflows, we also construct a dataset of capital outflows. As with the inflows, we primarily use the BOP data. We combine the general government and central bank sectors into a single public sector. As before, we do an internal fill on missing sectors if the remaining two sectors and the total are non-missing.[35] The one external fill that we do is for the bank sector. We fill in portfolio debt asset flows and other investment debt asset flows using the BIS LBS by residency data which has data on bank cross-border claims in each instrument. This data only covers banks domiciled in BIS reporting countries, and so is more limited in terms of coverage.

The result is an outflow sample of 31 countries (15 advanced, 16 emerging) at a quar-

[35]Note that combining government and central banks into a single sector makes the internal filling exercise more fruitful, as only bank and corporates needs to be non-missing in order to fill missing data for the public sector.

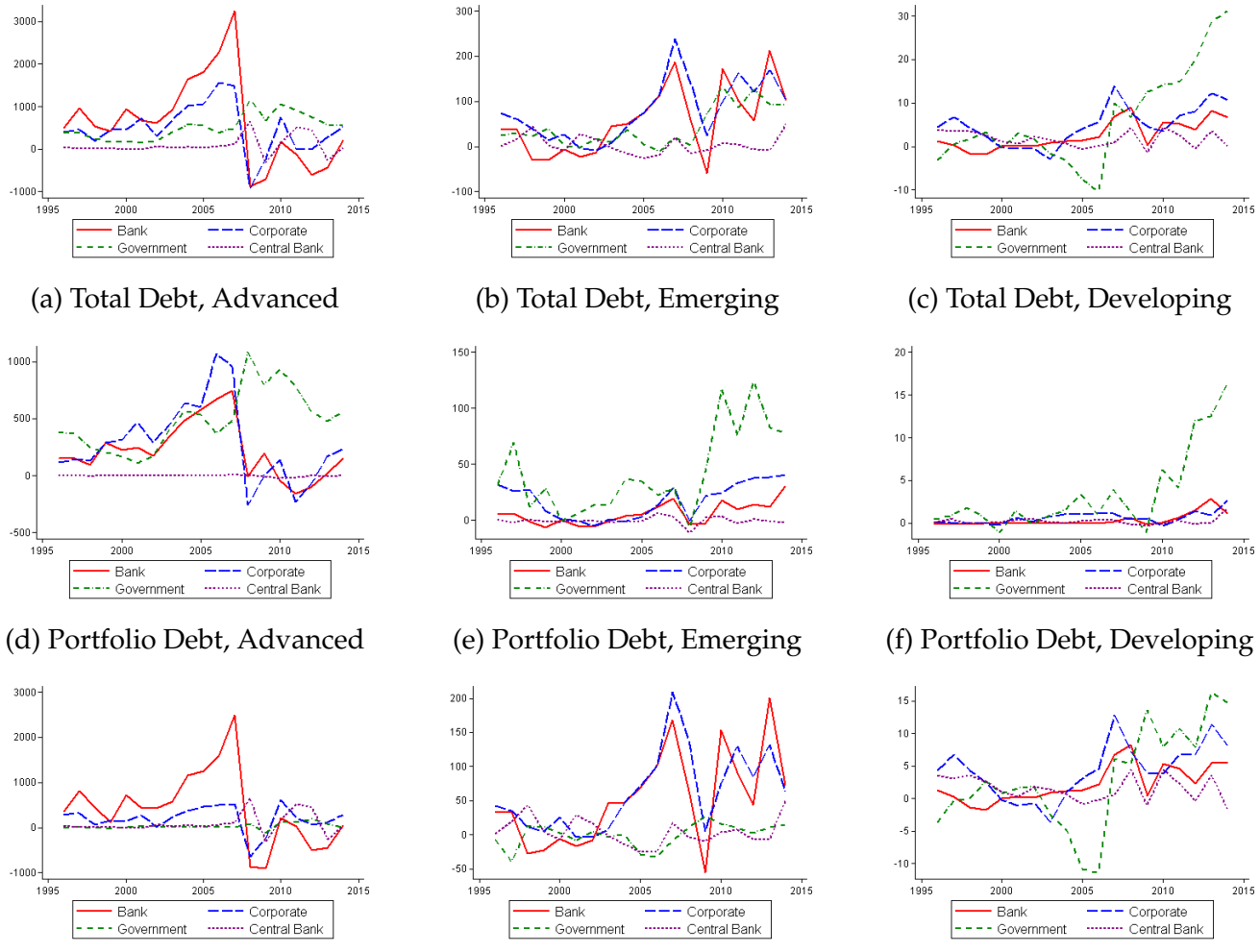
terly frequencey spanning 2004q1-2014q4. For the annual data, we have 31 countries (13 advanced and 18 emerging) spanning 2002-2014. Details on the sample are in Appendix E.

3 Descriptive Patterns in the Data

In this section, we present patterns and trends observed in our data over time. We use the annual version of the dataset for clarity in the figures.

3.1 Aggregate Debt Flows

Figure 6: Aggregate External Debt Inflows, Billions 1996 USD



(a) Total Debt, Advanced

(b) Total Debt, Emerging

(c) Total Debt, Developing

(d) Portfolio Debt, Advanced

(e) Portfolio Debt, Emerging

(f) Portfolio Debt, Developing

(g) Other Investment Debt, Advanced

(h) Other Investment Debt, Emerging

(i) Other Investment Debt, Developing

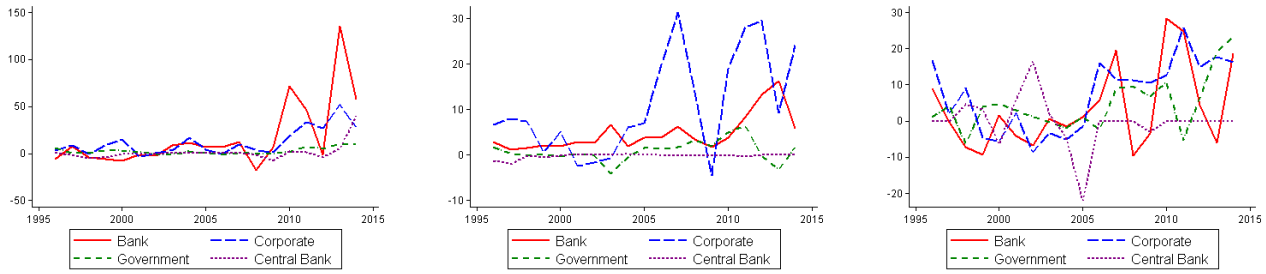
Source: BOP, IIP, QEDS, and BIS, authors' calculations. Total debt is portfolio debt + other investment debt.

Figure 6 (a)-(c) plots the aggregate debt inflows by sector for each country group. The buildup and collapse surrounding the 2008 financial crisis (or global financial crisis, GFC) is the most striking feature in all of these figures. An interesting distinction between AE and EM is the response following the crisis. While advanced country flows collapse and remain fairly low, flows to emerging and developing countries rebound and increase across all sectors. An important difference in flows by sector is in the evolution of debt inflows to governments. Across all country groups, governments see an increase in debt inflows precisely when private flows collapse, with an especially large and sustained increase for developing nations relative to their private flows. Advanced-country central banks also see a small increase as private flows collapse.

Panels (d)-(i) plot portfolio debt and other investment debt flows. We see that the increase in inflows for governments comes primarily in the form of bonds, with the exception of developing country governments who also see an increase in other investment debt funding, that is loans. Advanced economy corporates also have a significant amount of their inflows coming from portfolio debt. Although emerging market banks and corporates see an increase in bond flows in the wake of the GFC, the aggregate pattern of their flows is driven primarily by other investment debt. Advanced country banks get the lion's share of capital inflows prior to 2008, the majority of which is in the form of other investment, but they see consistent negative net inflows for several years following the GFC reflecting the deleveraging of these institutions. Developing country banks and corporates are also primarily receiving inflows in the form of other investment debt.

Much of the increase in emerging-market private debt after 2008 is attributable to a few large EM. Foremost among these is China, whose debt inflows are shown in Figure 7. China is a large country with poor sector coverage in the BOP data, so much of the measured effect is derived from our data filling series. Both bank and corporate borrowing increase substantially, but bank inflows to China have been much larger. In India, the corporate sector has been the dominant recipient of debt flows, though bank flows increased a lot

Figure 7: Emerging Market External Debt Inflows, Billions 1996 USD



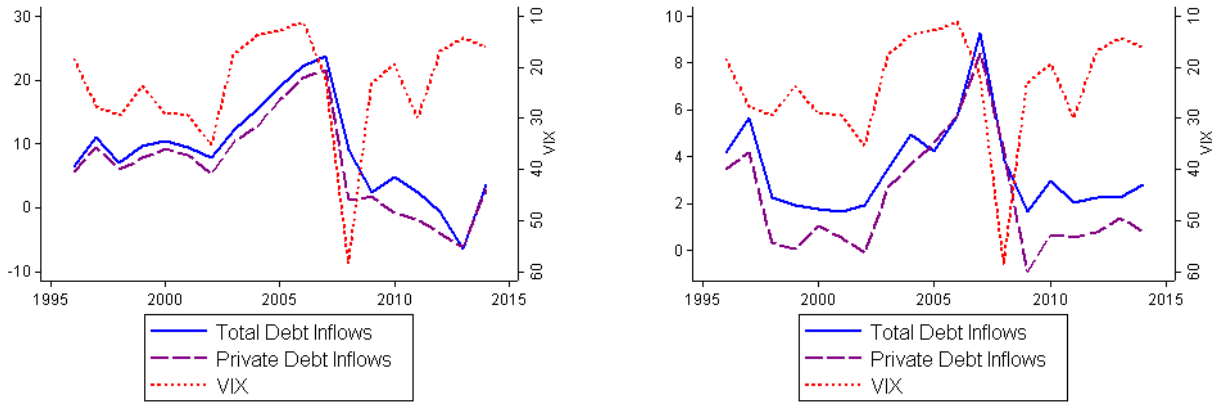
(a) China Debt (b) India Debt (c) Brazil Debt

Source: BOP, IIP, QEDS, and BIS, authors' calculations. Debt is portfolio debt + other investment debt.

after 2010. Brazil saw a sustained increase in corporate debt inflows, and volatile increases in bank and government flows.

The finding that public sector inflows increase when private flows are falling is a significant contribution from our dataset. The public sector is often able to borrow from abroad even as such funding dries up for the private sector. Thus, the public sector acts as a countervailing force to the private sector, smoothing the total debt inflows into the country. Thus far our figures have plotted aggregate flows, but figures showing the dynamic patterns of average flows to GDP are shown in Appendix F. Figure 8 illustrates the impact of the public sector for an individual country using the average of flows to GDP. It plots the cross-country average of total debt flows (portfolio debt + other investment debt) to GDP as compared to flows from just the private sectors (Banks and Corporates) for advanced and emerging countries. The VIX is shown in red (right axis), for reference. For advanced economies, the steep fall in private inflows after the global financial crisis is mitigated by a few years of substantial government borowing from abroad. These public inflows disappear by 2014, where private flows recover. For EM, the story is more pronounced. The crash in total capital flows is much less than that of private capital flows, reflecting increased public sector debt inflows following the crisis. We see a similar pattern, that is more government borrowing when private sector flows had collapsed, during 1998–2002. As private flows recover heading towards 2008, the difference between total and private flows disappears.

Figure 8: Total vs Private Average Debt Inflows, Percent of GDP



(a) Advanced (b) Emerging

Source: BOP, IIP, QEDS, and BIS, authors' calculations.

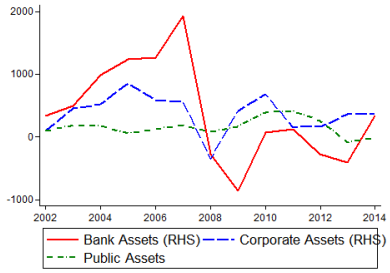
Turning to outflows, Figure 9 plots the debt asset flows for a subset of 31 countries, defined in Appendix E, over 2002-2014. The public sector is the sum of central banks and general government sectors, and total debt asset flows for the public sector include the flow of reserves.

For advanced countries, we see the same pattern for total and other investment debt as we see with inflows, with the landscape of flows dominated by the buildup of private flows in the mid-2000s, led by the banking sector, followed by a sharp contraction at the time of the global financial crisis. The public sector plays a relatively small role for AE outflows. Portfolio debt outflows for AEs show a sharp contraction for banks at the time of the crisis, but there is actually an increase in external portfolio debt investment by the corporate sector, followed by a brief contraction corresponding more closely to the Eurozone crisis.

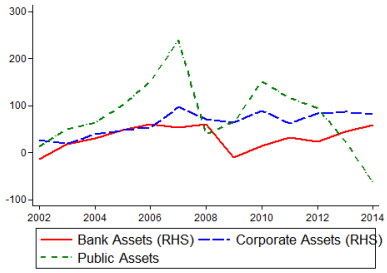
Emerging market banks and corporates show a contraction in their other investment debt outflows followed by a much stronger rebound than that seen in AEs. However, the decline in corporate other investment debt is offset by an increase in corporate portfolio debt outflows. EM public sector sees a drop in both portfolio and other investment outward investment around the crisis, but portfolio debt recovers robustly in the following years. However, public sector outflows, and total EM debt outflows, are clearly dominated by

reserves, as seen in panel (b), with a large buildup and collapse mirroring the private sector inflow and outflows pattern.

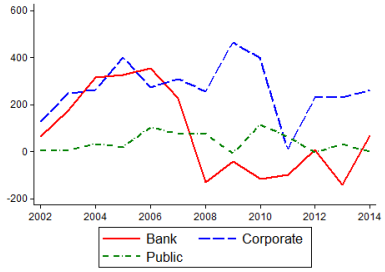
Figure 9: Aggregate Asset Flows, AHKS Outflow Sample, Billions USD



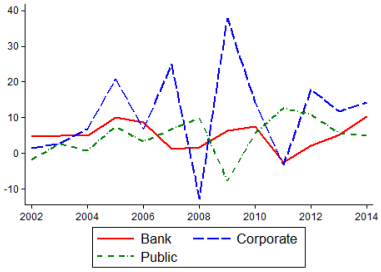
(a) Total Debt Asset Flows, Advanced



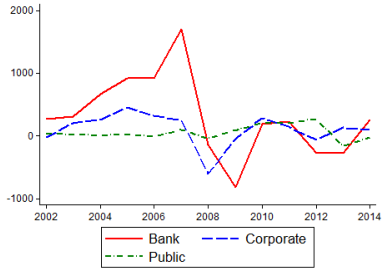
(b) Total Debt Asset Flows, Emerging



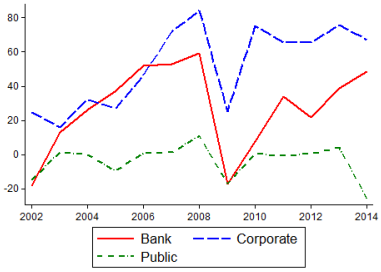
(c) Portfolio Debt Asset Flows, Advanced



(d) Portfolio Debt Asset Flows, Emerging



(e) Other Investment Debt Asset Flows, Advanced



(f) Other Investment Debt Asset Flows, Emerging

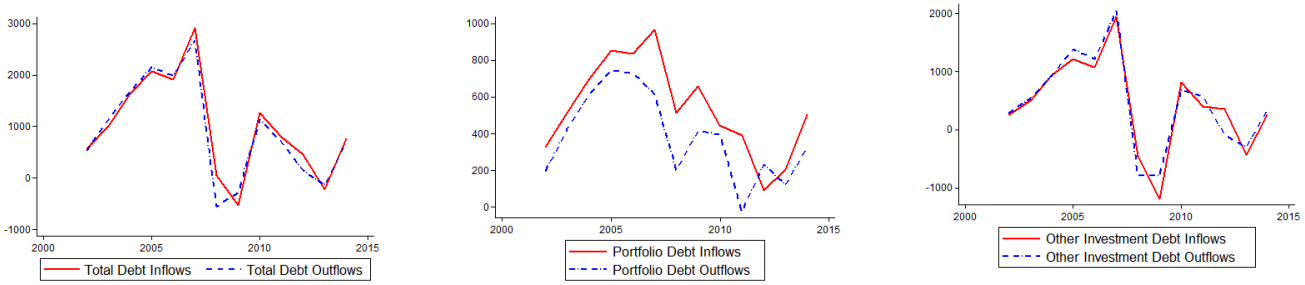
Source: BOP and BIS, authors' calculations.

3.2 Comovement of Capital Inflows and Outflows by Banks, Corporates and Sovereigns

Figures 10-15 present the dynamics of gross inflows and outflows for each country group, starting from the total flows and then breaking down by instrument and sector.

Figure 10 shows the dynamic patterns of aggregate inflows and outflows for total debt,

Figure 10: Aggregate Gross Flows, Advanced Economies, AHKS Outflow Sample, Billions USD



(a) Total Debt Flows

(b) Total Portfolio Debt Flows

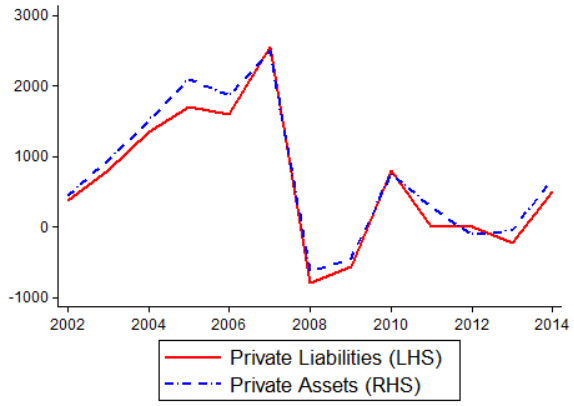
(c) Total Other Investment Debt Flows

Source: BOP and BIS, authors' calculations.

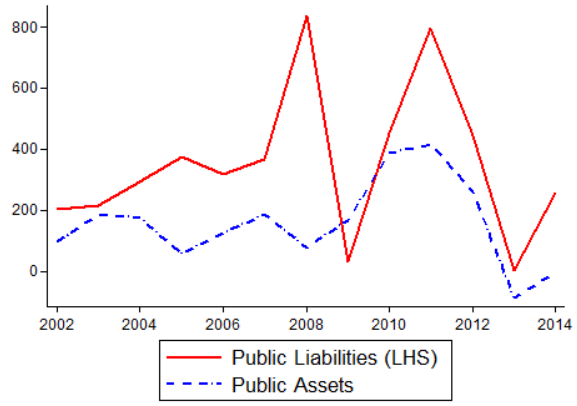
portfolio debt, and other investment debt. Here, total debt includes reserves, though reserves play a very small role in AEs. As we can see, inflows and outflows in AEs are very tightly linked, especially for other investment debt, but also for portfolio debt. If we split this by public vs private as in Figure 11, we see that this is primarily driven by the private sector, with a much looser link for public sector flows. In panels (c) and (d), we see that the tight link of flows of the private sector comovement is driven by the banking sector, which contributes the largest share of the volume of flows and also has a very tight assocaition between inflows and outflows. The corporate sector also displays a high degree of comovement between inflows and outflows, though we see below that this will be due to loans and not bonds.

Figure 12 splits the bank and corporate flows into portfolio debt and other investment debt. This illustrates that this tight link from the banking sector is driven by the size and tightness of other investment debt inflows and outflows. Portfolio debt for banks and other investment debt for corporates also show a high degree of correlation, but portfolio debt flows of corporates do not show much comovement in the aggregate series. Together with the findings above, this implies that the co-movement in corporate inflows and outflows is due to external loans which is mostly done via syndicated loan market, where global banks are big players.

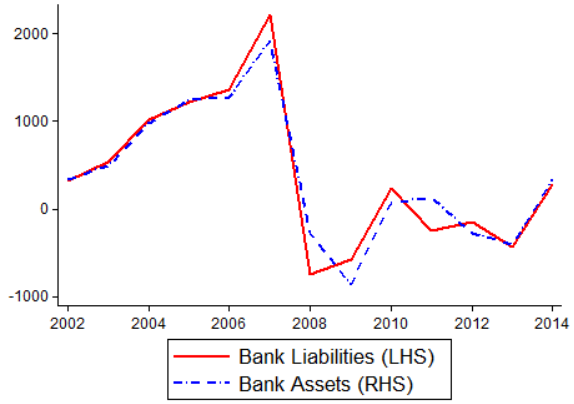
Figure 11: Aggregate Gross Flows by Sector, Advanced Economies, AHKS Outflow Sample, Billions USD



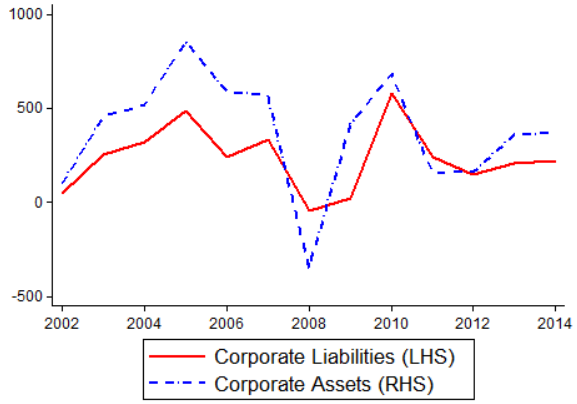
(a) Total Private Debt Flows



(b) Total Public Debt Flows



(c) Total Bank Debt Flows



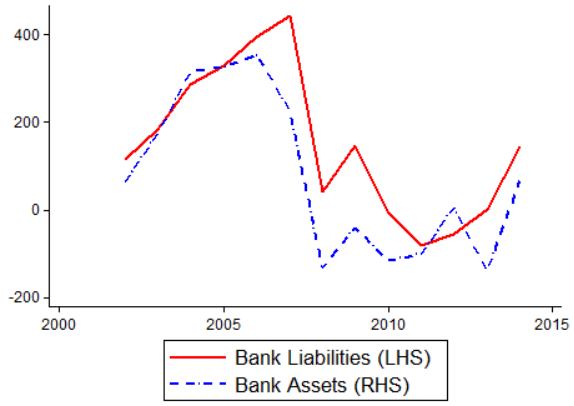
(d) Total Corporate Debt Flows

Source: BOP and BIS, authors' calculations.

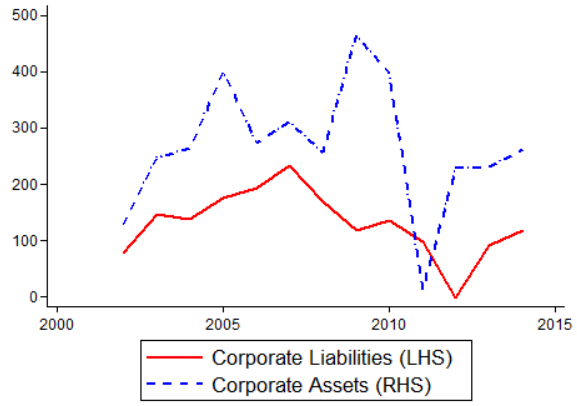
Turning to emerging markets in Figure 13, we see that flows are also highly correlated in total, and especially for other investment debt, though not as tighly as for AEs. Portfolio debt is similar up until 2009, when inflows dramatically depart from outflows. Note that total debt asset flows include reserve flows, which is why total debt outflows are larger than inflows in panel (a), but not in panels (b) or (c).

Figure 14 again splits debt flows into public and private. We see that for EMs the link between private inflows and outflows is much weaker, and there is very little aggregate comovement between public flows. Indeed, the comovement of the total debt inflows and outflows is due to public outflows, primarily reserves, matching private inflows. Panel (c)

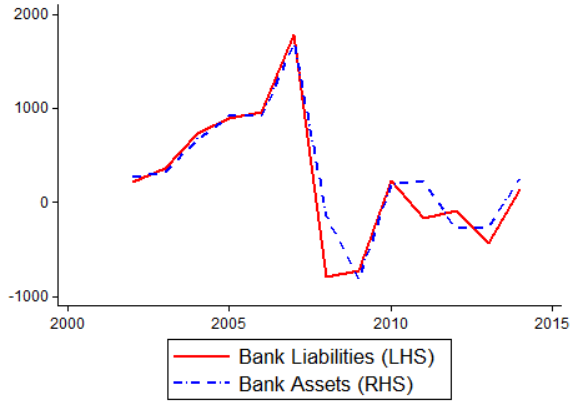
Figure 12: Aggregate Private Gross Flows by Flow Type, Advanced Economies, AHKS Outflow Sample, Billions USD



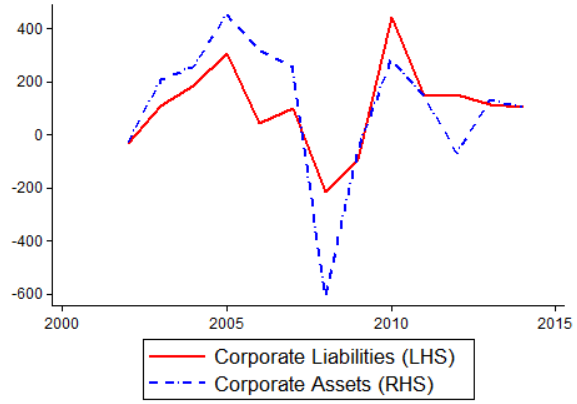
(a) Portfolio Debt, Banks



(b) Portfolio Debt, Corporates



(c) Other Investment Debt, Banks



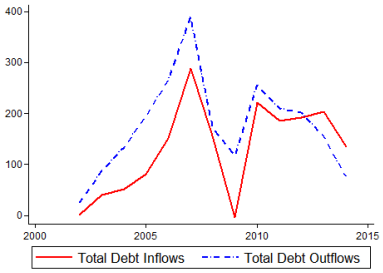
(d) Other Investment Debt, Corporates

Source: BOP and BIS, authors' calculations.

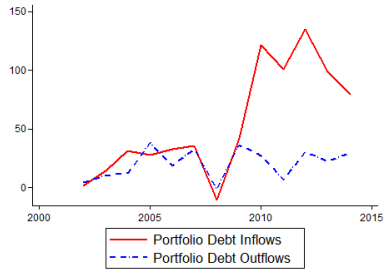
shows that there is still important comovement for aggregate bank flows, but corporate debt flows are less tightly linked.

Splitting bank and corporate flows by instrument in Figure 15 reveals once again that other investment debt shows the strongest comovement for both banks and corporates, though again not as strong as AEs display. Portfolio debt shows very little aggregate co-movement between inflows and outflows for either banks or corporates.

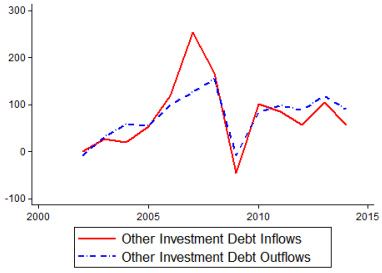
Figure 13: Aggregate Gross Flows, EM, AHKS Outflow Sample, Billions USD



(a) Total Debt Flows



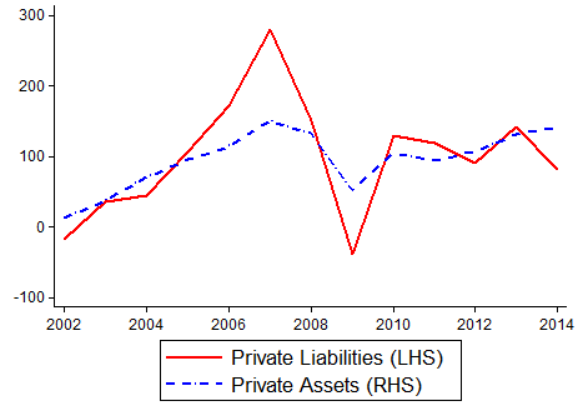
(b) Total Portfolio Debt Flows



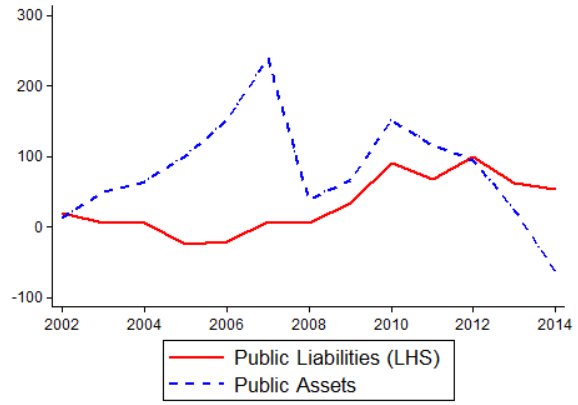
(c) Total Other Investment Debt Flows

Source: BOP and BIS, authors' calculations.

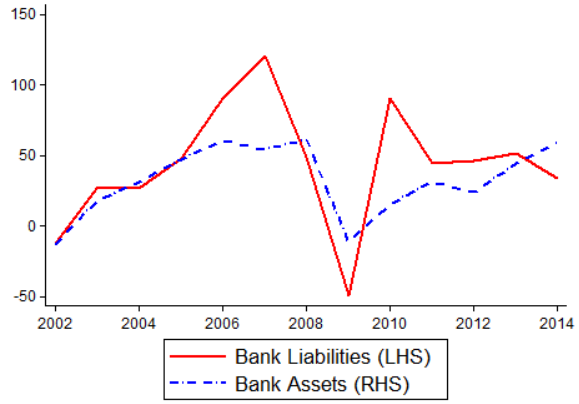
Figure 14: Aggregate Gross Flows by Sector, EM, AHKS Outflow Sample, Billions USD



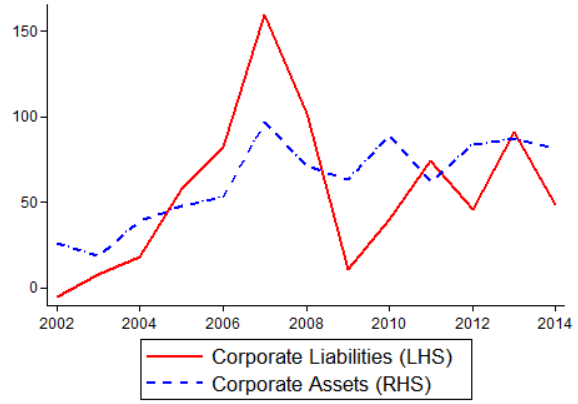
(a) Total Private Debt Flows



(b) Total Public Debt Flows



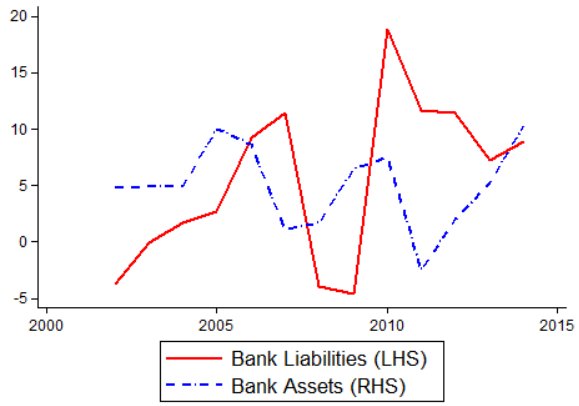
(c) Total Bank Debt Flows



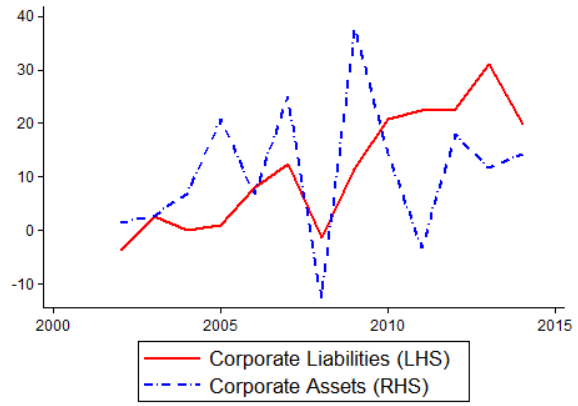
(d) Total Corporate Debt Flows

Source: BOP and BIS, authors' calculations.

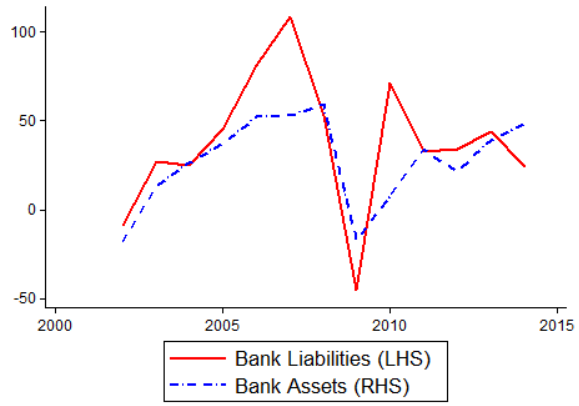
Figure 15: Aggregate Private Gross Flows by Flow Type, EM, AHKS Outflow Sample, Billions USD



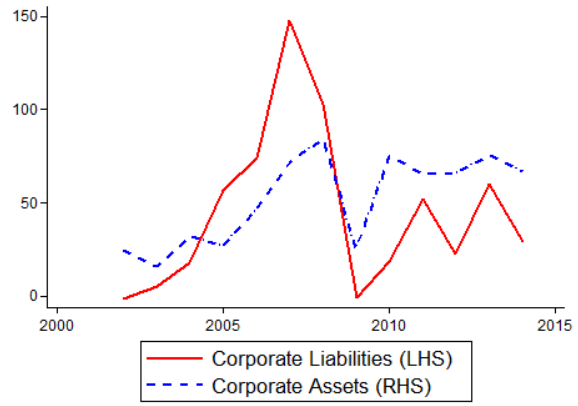
(a) Portfolio Debt, Banks



(b) Portfolio Debt, Corporates



(c) Other Investment Debt, Banks



(d) Other Investment Debt, Corporates

Source: BOP and BIS, authors' calculations.

4 Empirical Analysis

4.1 Conditional Correlations

Table 2 presents correlations of inflows and outflows across sectors. These correlations are partial correlations of debt flows/country GDP, conditional on country fixed effects, lagged log of VIX, and lagged GDP growth.[36] The sample is our asset flow sample detailed in Appendix E, consisting of 31 countries (15 advanced and 16 emerging) over 2004q1-2014q4. The public sector consists of general government and central bank sectors. Debt is the sum of portfolio and other investment debt, and also reserves in the case of public sector outflows.

The strength of inflow-outflow correlation within the bank sector is striking. Even conditioning on GDP growth and VIX, which can drive capital flow behavior as we show below, banks still show a high degree of matching between their inflows and outflows. This is clearly the case in AEs, but banks are still the strongest positive correlation in EMs though with lower magnitude. Within sector correlations are also relatively high for corporates and banks relative to cross-sector correlations. Interestingly, inflows and outflows are always positively correlated regardless of sector, but the key to understanding the inflow-outflow comovement is the banking sector. All of the negative correlations in this table have to do with the public sector, either public inflows with private inflows or public outflows with private outflows. While small, except in the case of EM public outflow with bank inflow, these patterns reinforce the point that the public sector often behaves differently than the private sector.

Table 3 plots these correlations for AE and EM while distinguishing by instrument. The correlations are presented as a heatmap, with blue values indicating positive correlations, red values indicating negative correlations, and darker shading indicating stronger correlations. Examining these heatmaps makes it clear to see that the strongest comovement at this disaggregation is among AE banks, particularly within other investment debt flows. Global banks' borrowing and lending patterns within their internal capital market combined with

[36] Unconditional correlations of aggregated inflows are presented in Appendix F.

Table 2: Correlation of Inflows and Outflows

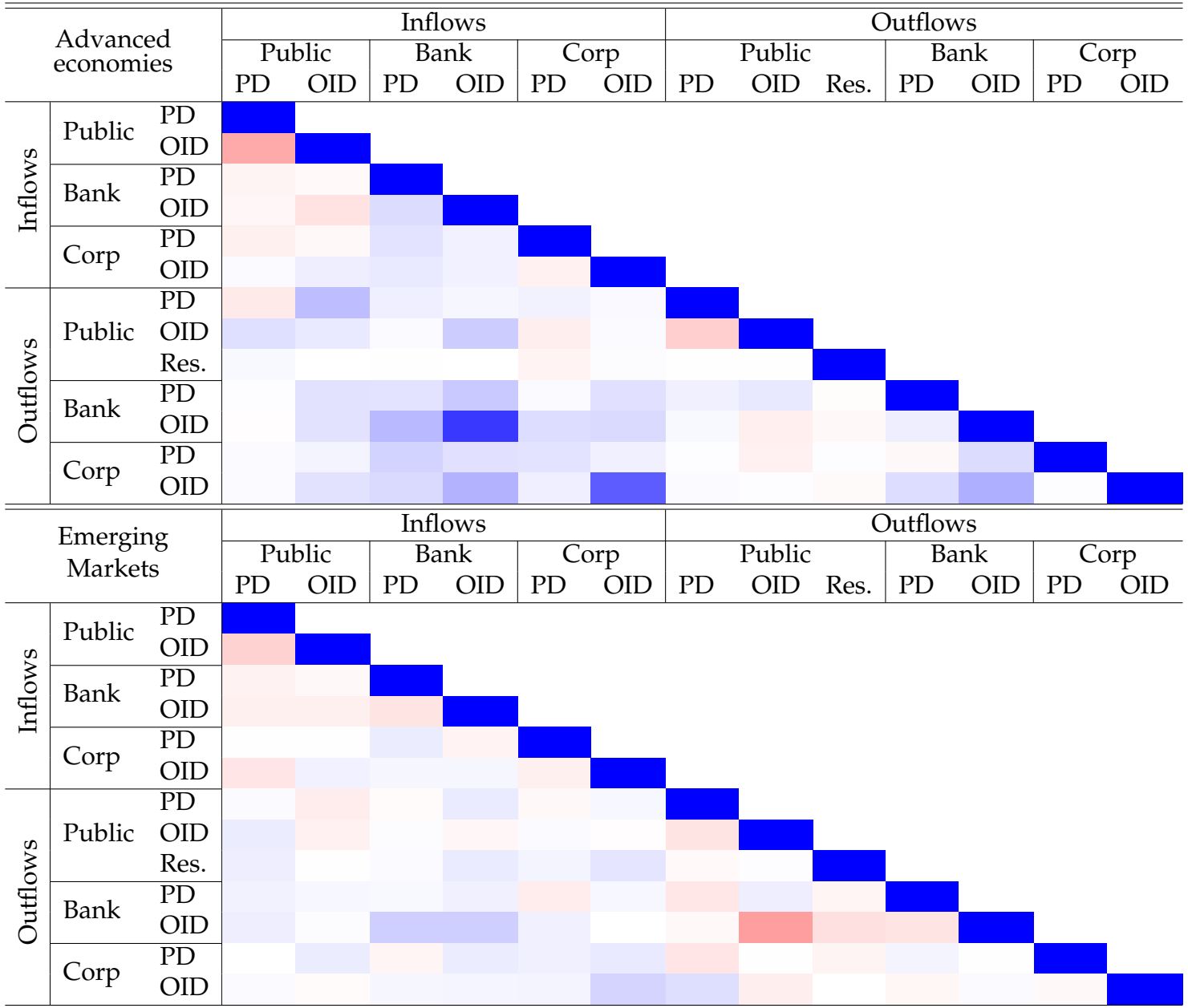
All Countries		Inflows			Outflows		
		Public	Bank	Corp	Public	Bank	Corp
Inflows	Public	1.00					
	Bank	-0.10	1.00				
	Corp	0.04	0.10	1.00			
Outflows	Public	0.24	0.17	0.03	1.00		
	Bank	0.15	0.77	0.19	-0.08	1.00	
	Corp	0.14	0.33	0.50	-0.03	0.32	1.00
Advanced Economies		Inflows			Outflows		
		Public	Bank	Corp	Public	Bank	Corp
Inflows	Public	1.00					
	Bank	-0.14	1.00				
	Corp	0.04	0.10	1.00			
Outflows	Public	0.27	0.20	0.01	1.00		
	Bank	0.14	0.81	0.21	-0.03	1.00	
	Corp	0.14	0.35	0.56	-0.02	0.34	1.00
Emerging Markets		Inflows			Outflows		
		Public	Bank	Corp	Public	Bank	Corp
Inflows	Public	1.00					
	Bank	-0.08	1.00				
	Corp	-0.04	0.04	1.00			
Outflows	Public	0.23	0.18	0.11	1.00		
	Bank	0.08	0.27	0.02	-0.33	1.00	
	Corp	0.03	0.07	0.21	-0.04	0.01	1.00

Sample consists of 31 countries (15 advanced, 16 emerging) over 2004q1-2014q4, and is described in Appendix E. N=1408, 660, and 704 respectively for each panel. Correlations are conditional on country fixed effects, lagged log VIX, and lagged GDP growth.

their hedging motives produce a strong correlation, especially for AE between capital inflows and outflows. Corporate other investment debt flows also appear to be highly correlated, while public sector inflows are broadly negatively correlated with other inflows.

EMs don't display correlations as strong as those of AEs at this disaggregation, but it is still easy to see that the strongest positive correlation is that of other investment debt outflows of banks with bank inflows. Corporate other investment debt flows show some correlation as well. An interesting feature of the emerging markets panel is that outflows of public other investment debt have a strong negative correlation with inflows of other investment to banks. This suggests that there is more to understand about the relationship between the banking sector and the sovereign, particularly when it comes to EM capital flows.

Table 3: Correlation of Inflows and Outflows, by Instrument



Sample consists of 31 countries (15 advanced, 16 emerging) over 2004q1-2014q4, and is described in Appendix E. Correlations are conditional on country fixed effects, lagged log VIX, and lagged GDP growth. Blue indicates a positive correlation, red indicates a negative correlation, with darker shadings indicating stronger correlations.

4.2 Panel Regressions: Capital Inflows by Sector

We next examine the response of capital inflows by sector to global risk apetite measured by the VIX (push factor) in conjunction with the business cycle properties of capital inflows, measured as the response of inflows to GDP growth (pull factor) in a panel regression setup with our quarterly data. We focus on a very simple specification to illustrate our results:

$$\frac{INFLOW_{it}}{GDP_{it}} = \alpha_i + \beta \log(VIX_{t-1}) + \gamma GDPGrowth_{it-1} + \epsilon_{it} \quad (1)$$

Our dependent variable is capital flows as a percent of GDP. $INFLOW_{it}$ is a measure of capital inflows for country i in quarter t. We examine inflows by capital flow type as well as by sector.[37] GDP_{it} is quarterly GDP from the IMF. The dependent variables are capital flows expressed as a percent of GDP. α_i is a country fixed effect. VIX_{t-1} is the implied volatility OF S&P 500 index options, measured in logs. The VIX is often used as a measure of global risk aversion, and is a standard push factor for capital inflows, particularly in EM. $GDPGrowth_{it-1}$ is real GDP growth year-on-year for country i in the previous period, which is a standard pull factor attracting foreign capital to a particular country. Our standard errors are clustered at the country level. Using quarterly GDP data significantly restricts our sample along both country and time dimensions as in the previous section. We use a balanced sample, detailed in Appendix E of 55 countries (23 advanced, 28 emerging, 4 developing) over 2002q4-2014q4.

For total debt inflows, we take direct investment debt (DID) and add it to corporate and total debt to obtain a more complete measure of debt inflows.[38] Table 4 shows our regressions on total debt inflows. Columns (1)-(4) in each panel are portfolio debt plus other investment debt, while columns (5)-(6) add direct investment debt to that total.[39] The public sector is the sum of government and central bank sector flows.

[37] Regressions by capital flow type across all types, without splitting by sector, can be found in Table F9 in the Appendix

[38] Recall that with the assumption that direct investment debt flows from offshore non-financial firms to onshore banks are negligible, we can allocate direct investment debt to the corporate sector.

[39] Observations missing DID data over this time period, 2002q4-2014q4, are dropped in columns (5)-(6). See Appendix F for more discussion of FDI and DID.

Table 4: Drivers of Total Debt Inflows, by Sector (Quarterly AHKS data, missing filled from Public Sources)

Panel A: All Countries						
	(1)	(2)	(3)	(4)	(5)	(6)
	Total	Public	Banks	Corp.	Total w/DI Debt	Corp. w/DI Debt
$\log(VIX_{t-1})$	-4.974***	0.960	-4.362***	-1.572***	-5.744***	-2.003***
	(1.260)	(0.667)	(0.989)	(0.419)	(1.516)	(0.696)
GDP Growth$_{it-1}$	0.232***	-0.00864	0.190***	0.0501***	0.239***	0.0730***
	(0.0650)	(0.0146)	(0.0490)	(0.0156)	(0.0541)	(0.0164)
Observations	2695	2695	2695	2695	2615	2615
R^2	0.041	0.002	0.045	0.028	0.044	0.028
CountryFE	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Advanced Economies						
	(1)	(2)	(3)	(4)	(5)	(6)
	Total	Public	Banks	Corp.	Total w/DI Debt	Corp. w/DI Debt
$\log(VIX_{t-1})$	-9.101***	0.813	-7.630***	-2.284**	-10.57***	-3.196
	(2.676)	(1.400)	(2.068)	(0.962)	(3.132)	(1.563)
GDP Growth$_{it-1}$	0.506***	0.0616	0.363**	0.0819	0.480***	0.101**
	(0.179)	(0.0340)	(0.131)	(0.0466)	(0.141)	(0.0420)
Observations	1127	1127	1127	1127	1109	1109
R^2	0.065	0.002	0.056	0.026	0.065	0.027
CountryFE	Yes	Yes	Yes	Yes	Yes	Yes
Panel C: EM						
	(1)	(2)	(3)	(4)	(5)	(6)
	Total	Public	Banks	Corp.	Total w/DI Debt	Corp. w/DI Debt
$\log(VIX_{t-1})$	-2.261**	1.077	-2.265***	-1.073***	-2.336**	-1.117***
	(0.829)	(0.652)	(0.706)	(0.253)	(0.922)	(0.374)
GDP Growth$_{it-1}$	0.116***	-0.0394***	0.118***	0.0381***	0.142***	0.0635***
	(0.0347)	(0.0123)	(0.0346)	(0.00928)	(0.0416)	(0.0161)
Observations	1372	1372	1372	1372	1310	1310
R^2	0.071	0.021	0.116	0.075	0.073	0.053
CountryFE	Yes	Yes	Yes	Yes	Yes	Yes

Sample is from 2002q4-2014q4, countries as listed in Appendix E. Total Debt is the sum of Portfolio Debt and Other Investment Debt inflow data, constructed by AHKS as described in Section 2. Dependent variables are expressed as a percentage of GDP. VIX is the implied volatility of S&P 500 index options. GDP growth is calculated as a year-on-year percentage growth. Errors are clustered at the country level. ** $p < 0.05$, *** $p < 0.01$

In general, columns (5) and (6) reflect the same patterns as columns (1) and (4) respectively, but with a larger magnitude. Debt inflows in total and to corporates contract as the VIX rises and expand with domestic growth. For advanced economies the measure of VIX impact on corporate debt inflows gets larger but more noisy with the addition of DID, leading to a loss of significance on the VIX coefficient. The coefficient on GDP growth, on the other hand, gains significance. Thus for AE, total debt appears to be more connected to domestic conditions than to global risk aversion as compared to just portfolio and other investment debt.

EM DID flows reinforces the portfolio and other investment debt flows in terms of their movements with the VIX and GDP growth. As the VIX rises or as GDP falls, total debt in columns (5)-(6) falls. This is in contrast to total debt flows to the public sector, which run counter-cyclical to domestic growth and show a positive (though insignificant) coefficient on the VIX.[40] These results are the gross inflows analog to the results found in Alfaro, Kalemli-Özcan, and Volosovych (2014) for net debt flows. They show, using the DRS data explored in Appendix F, that net flows to public sector are counter-cyclical, due primarily to sovereign to sovereign flows, while debt flows to the private sector are procyclical. Our results thus complement theirs and contribute to our understanding of upstream gross capital flows together with net flows.

The global financial crisis (GFC) is a prominent feature in the landscape of capital flows, and it has generated a lot of discussion about how the nature of capital flows may have changed in its wake.[41] Tables F10 and F11 in Appendix F show our regressions for total debt for advanced and emerging economies, split into pre-GFC (2002q4-2007q4) and post-GFC (2008q1-2014q4) periods. For advanced economies, flows are significantly associated with

[40] The results for total debt on GDP growth are robust to the inclusion of a time trend and other pull factors, as shown in Tables F12 and F13 in Appendix F. Results on the VIX are robust to the inclusion of a time trend and the TED spread, but significance drops with the inclusion of other factors capturing US monetary conditions, such as the federal funds rate and the slope of the yield curve. These results are also robust to measuring GDP growth as the differential growth over the advanced economy average growth. We show these results for total debt in Tables F14 and F15

[41] For instance, Cerutti, Claessens, and Ratnovski (2016) find using BIS data that the VIX is significantly associated with bank lending flows to the bank and non-bank sectors, and this was especially the case after the GFC. Shin (2013) highlights how bond flows to EM have increased after the GFC.

the VIX before the GFC with the expected negative sign, but after the crisis they are more strongly driven procylically by GDP growth.[42] EM similarly see a stronger connection to the VIX prior to the GFC and stronger connection to GDP growth after it, with the expected signs. Banking flows in EM move opposite to the VIX in both the pre and post GFC periods.

In Tables 5-6, we use our constructed data (AHKS data), with some noted exceptions for comparison, and separately show regressions for other investment debt and portfolio debt. In Table 5, we see the standard results of a negative relationship with the VIX and a positive relationship with GDP growth for other investment debt inflows. However, public inflows have these signs reversed and do not exhibit significant relationships.

Examining advanced and emerging countries separately reveals more detail on these relationships. Looking at just advanced economies, Panel B shows the same results in the first 4 columns as in Panel A, with the exception that the coefficient on GDP growth for flows to the public sector is now positive. Column (5) shows how our regression on corporate inflows would look if we used only non-missing BOP data. The relationships are still of the same magnitude and direction, but the coefficient on GDP growth is no longer significant.

Panel C shows these results for EM. They exhibit some unexpected features. Total other investment debt flows do not show a significant coefficient on the VIX, but this is because different sectors are pulling in opposite directions. For the public sector we get a positive and significant coefficient on the VIX, while for the private sectors (banks and corporates) the coefficient is negative. GDP growth likewise has a positive relationship with total flows and banks and corporates separately, but flows to the public sector show a negative and insignificant coefficient. For comparison, we also present in column (3) of Panel C the results for the public sector when only the BOP data is used. In this case, significance is overstated, leading to a conclusion of a significant countercyclical relationship for other investment debt flows to the public sector, when an acyclical conclusion may be more appropriate.

Table 6 examines portfolio debt inflows. For all countries and advanced economies in

[42] Avdjiev, Gambacorta, Goldberg, and Schiaffi (2017) similarly find that international bank lending became much less sensitive to global risk conditions following the crisis.

Table 5: Drivers of Other Investment Debt Inflows, by Sector (Quarterly AHKS data, missing filled from Public Sources)

Panel A: All Countries				
	(1) Total	(2) Public	(3) Banks	(4) Corp.
$\log(VIX_{t-1})$	-3.814***	1.017	-3.645***	-1.186***
	(1.148)	(0.636)	(0.878)	(0.301)
GDP Growth$_{it-1}$	0.202***	-0.00423	0.166***	0.0397***
	(0.0459)	(0.0161)	(0.0380)	(0.00780)
Observations	2695	2695	2695	2695
R^2	0.035	0.002	0.043	0.022
CountryFE	Yes	Yes	Yes	Yes

Panel B: Advanced Economies					
	(1) Total	(2) Public	(3) Banks	(4) Corp.	(5) Corp. (BOP Only)
$\log(VIX_{t-1})$	-7.365***	0.287	-6.073***	-1.579**	-1.535**
	(2.380)	(1.269)	(1.817)	(0.672)	(0.597)
GDP Growth$_{it-1}$	0.360***	0.0304	0.294***	0.0353**	0.0473
	(0.120)	(0.0490)	(0.0938)	(0.0159)	(0.0265)
Observations	1127	1127	1127	1127	1008
R^2	0.044	0.001	0.048	0.012	0.014
CountryFE	Yes	Yes	Yes	Yes	Yes

Panel C: EM					
	(1) Total	(2) Public	(3) Public (BOP Only)	(4) Banks	(5) Corp.
$\log(VIX_{t-1})$	-1.511	1.500**	1.502***	-2.130***	-0.880***
	(0.875)	(0.704)	(0.534)	(0.719)	(0.213)
GDP Growth$_{it-1}$	0.140***	-0.0167	-0.0183**	0.113***	0.0440***
	(0.0360)	(0.00855)	(0.00786)	(0.0330)	(0.00917)
Observations	1372	1372	1270	1372	1372
R^2	0.087	0.018	0.028	0.113	0.090
CountryFE	Yes	Yes	Yes	Yes	Yes

Sample is from 2002q4-2014q4, countries as listed in Appendix E. Other Investment Debt inflow data is constructed by AHKS, as described in Section 2. Public inflows are defined as the sum of General Government and Central Bank inflows. Dependent variables are expressed as a percentage of GDP. VIX is the implied volatility of S&P 500 index options. GDP growth is calculated as a year-on-year percentage growth. Column (5) of Panel A and Column (3) of Panel C use data solely from BOP, with missing data left unfilled. Errors are clustered at the country level. ** $p < 0.05$, *** $p < 0.01$

Table 6: Drivers of Portfolio Debt Inflows, by Sector - (Quarterly AHKS data, missing filled from Public Sources)

Panel A: All Countries				
	(1) Total	(2) Public	(3) Banks	(4) Corp.
$\log(VIX_{t-1})$	-1.160**	-0.0572	-0.717	-0.386**
	(0.531)	(0.201)	(0.381)	(0.183)
GDP Growth$_{it-1}$	0.0297	-0.00441	0.0237	0.0104
	(0.0323)	(0.0135)	(0.0156)	(0.0119)
Observations	2695	2695	2695	2695
R^2	0.006	0.000	0.008	0.005
CountryFE	Yes	Yes	Yes	Yes
Panel B: Advanced Economies				
	(1) Total	(2) Public	(3) Banks	(4) Corp.
$\log(VIX_{t-1})$	-1.736	0.526	-1.557	-0.705
	(1.263)	(0.360)	(0.901)	(0.435)
GDP Growth$_{it-1}$	0.147	0.0311	0.0689	0.0466
	(0.0938)	(0.0363)	(0.0476)	(0.0364)
Observations	1127	1127	1127	1127
R^2	0.025	0.004	0.019	0.018
CountryFE	Yes	Yes	Yes	Yes
Panel C: EM				
	(1) Total	(2) Public	(3) Banks	(4) Corp.
$\log(VIX_{t-1})$	-0.750***	-0.423	-0.135	-0.192***
	(0.234)	(0.207)	(0.108)	(0.0567)
GDP Growth$_{it-1}$	-0.0242	-0.0228**	0.00457	-0.00596***
	(0.0121)	(0.00906)	(0.00625)	(0.00170)
Observations	1372	1372	1372	1372
R^2	0.010	0.010	0.003	0.010
CountryFE	Yes	Yes	Yes	Yes

Sample is from 2002q4-2014q4, countries as listed in Appendix E. Portfolio Debt inflow data is constructed by AHKS, as described in Section 2. Dependent variables are expressed as a percentage of GDP. VIX is the implied volatility of S&P 500 index options. GDP growth is calculated as a year-on-year percentage growth. Errors are clustered at the country level. ** $p < 0.05$, *** $p < 0.01$

Panels A and B, there is not much in terms of significant relationships. Total and corporate portfolio debt inflows exhibit a significantly negative relationship to the VIX for the full set of countries, but advanced economies show no systematic relationship of portfolio debt inflows due to either cyclical or global factors

In Panel C for EM, we find our expected negative relationship between the VIX and inflows across all sectors, though the coefficient is again only significant for the total and for the corporate sector. The coefficient on the VIX for public flows is significant only at the 10% level, suggesting that emerging market sovereigns may share the same fate as their corporates in international bond markets, but that may not be uniform for all EM. For GDP growth, we find a negative and significant relationship for public and corporate sectors, but not for banks (who have a positive but insignificant coefficient) or for the total.

This decomposition of results by sector helps highlight a possible reason why Blanchard et al. (2015) find a null result on bond inflows: bank sector portfolio debt inflows may be acyclical, perhaps weakly procyclical in some cases, while public and corporate inflows follow a much clearer countercyclical pattern. Indeed, our results suggest that different sectors, and even different flow types to the same sector, can move in different directions relative to domestic or international cycles. These contrasting patterns can be obscured without such a decomposition.

4.3 Panel Regressions: Capital Outflows by Sector

For debt outflows, we use the same regression setup as the inflow regressions. The sample for outflows is somewhat smaller and shorter, covering 31 countries (15 advanced, 16 emerging) over 2004q1-2014q4, with the sample detailed in Appendix E. We focus again on portfolio debt and other investment debt outflows, but we also include flows of official reserves in this analysis.

Table 7 shows our regressions for total debt outflows. Columns (1)-(4) include just the sum of portfolio debt and other investment debt, while columns (5) and (6) add in reserve flows to the total. Debt outflows respond negatively to the VIX, reflecting domestic agents

Table 7: Drivers of Total Debt Outflows, by Sector (Quarterly BOP data, missing Bank data filled from BIS)

Panel A: All Countries						
	(1) Total	(2) Public	(3) Banks	(4) Corp.	(5) Total + Reserves	(6) Public + Reserves
$\log(VIX_{t-1})$	-6.790***	-0.398	-4.986***	-1.407***	-6.675***	-0.282
	(2.054)	(1.135)	(1.759)	(0.503)	(2.091)	(1.313)
GDP Growth$_{it-1}$	0.130***	0.0180	0.0978**	0.0145	0.158***	0.0460**
	(0.0431)	(0.0139)	(0.0359)	(0.00982)	(0.0432)	(0.0172)
Observations	1408	1408	1408	1408	1408	1408
R^2	0.047	0.002	0.043	0.015	0.051	0.006
CountryFE	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Advanced Economies						
	(1) Total	(2) Public	(3) Banks	(4) Corp.	(5) Total + Reserves	(6) Public + Reserves
$\log(VIX_{t-1})$	-11.61***	0.0888	-9.121**	-2.575**	-10.66**	1.040
	(3.772)	(2.400)	(3.233)	(0.966)	(3.965)	(2.606)
GDP Growth$_{it-1}$	0.339**	0.0553	0.263**	0.0204	0.337**	0.0533
	(0.116)	(0.0361)	(0.0969)	(0.0230)	(0.118)	(0.0401)
Observations	660	660	660	660	660	660
R^2	0.082	0.004	0.087	0.025	0.074	0.004
CountryFE	Yes	Yes	Yes	Yes	Yes	Yes
Panel C: EM						
	(1) Total	(2) Public	(3) Banks	(4) Corp.	(5) Total + Reserves	(6) Public + Reserves
$\log(VIX_{t-1})$	-2.223***	-0.813	-1.048***	-0.362**	-2.906***	-1.496
	(0.588)	(0.495)	(0.309)	(0.152)	(0.831)	(0.958)
GDP Growth$_{it-1}$	0.0387	-0.00157	0.0269	0.0135	0.0746***	0.0343**
	(0.0195)	(0.00914)	(0.0154)	(0.00989)	(0.0234)	(0.0159)
Observations	704	704	704	704	704	704
R^2	0.045	0.009	0.017	0.011	0.067	0.020
CountryFE	Yes	Yes	Yes	Yes	Yes	Yes

Sample is from 2004q1-2014q4, countries as listed in Appendix E. Total debt is sum of Other Investment Debt and Portfolio Debt, outflow data is primarily from IMF BOP, as described in the text. Public outflows are defined as the sum of General Government and Central Bank outflows. Dependent variables are expressed as a percentage of GDP. VIX is the implied volatility of S&P 500 index options. GDP growth is calculated as a year-on-year percentage growth. Errors are clustered at the country level. ** $p < 0.05$, *** $p < 0.01$

retracting their external investments when global risk apetite is low. The response is particularly strong for the banking sector and insignificant for the public sector. As for GDP growth, interestingly when the domestic economy is growing faster, total debt outflows (driven by the domestic banking sector) increases. Thus, domestic banks invest more abroad when the domestic economy is stronger.

Advanced economies in Panel B reflect the same patterns as the full sample in Panel A, except the coefficients are much larger. EM in Panel C have the same responses to the VIX as Panel A, with smaller coefficients, but results on GDP growth suggest some different patterns. There is no significance on the relationships for any of the sectors or the total when excluding reserves, but accounting for reserves in the total or in the public sector brings a significant procyclical relationship. This implies possible precautionary saving by the public sector in the form of reserves for EM.

Tables 8 and 9 show the relationships for other investment debt and portfolio debt outflows separately, with reserve flows included in Table 9. Panels A and B of Table 8 reflect the same patterns as total debt outflows. One difference, however, is that the response of the corporate sector to the VIX, while negative, is not significant. For EM, the responses are again similar to those in Table 7, with the exception that the total and corporate sector responses to GDP growth in columns (1) and (4) are significant and positive. The banking sector does have a larger though insignificant coefficient, but the strong procyclical response of corporate outflows in the form of other investment debt is a bit more surprising.

Table 9 shows the response of portfolio debt outflows by sector and reserves. Unlike the other tables, here the full set of countries in Panel A reflects more the behavior of the EM than the advanced economies. The advanced economies in panel A have a negative relationship of total portfolio debt to the VIX, but the response of individual sectors is not strong enough to register significance. EM on the other hand exhibit a significant negative response to VIX that is driven by the banking sector. Outward portfolio debt investment does not show any significant cyclicality across any of the sectors or country groups, but reserve flows are

Table 8: Drivers of Other Investment Debt Outflows, by Sector (Quarterly BOP data, missing Bank data filled from BIS)

Panel A: All Countries				
	(1) Total	(2) Public	(3) Banks	(4) Corp.
$\log(VIX_{t-1})$	-5.321***	0.104	-4.370***	-1.056
	(1.909)	(0.805)	(1.591)	(0.543)
GDP $Growth_{it-1}$	0.126***	0.00452	0.102***	0.0203
	(0.0411)	(0.0152)	(0.0345)	(0.0100)
Observations	1408	1408	1408	1408
R^2	0.041	0.000	0.043	0.016
CountryFE	Yes	Yes	Yes	Yes
Panel B: Advanced Economies				
	(1) Total	(2) Public	(3) Banks	(4) Corp.
$\log(VIX_{t-1})$	-9.375**	0.544	-8.129**	-1.791
	(3.614)	(1.748)	(2.948)	(1.084)
GDP $Growth_{it-1}$	0.306**	0.0219	0.256**	0.0275
	(0.111)	(0.0423)	(0.0876)	(0.0277)
Observations	660	660	660	660
R^2	0.071	0.001	0.084	0.020
CountryFE	Yes	Yes	Yes	Yes
Panel C: EM				
	(1) Total	(2) Public	(3) Banks	(4) Corp.
$\log(VIX_{t-1})$	-1.447***	-0.268	-0.737**	-0.442**
	(0.461)	(0.278)	(0.330)	(0.185)
GDP $Growth_{it-1}$	0.0477**	-0.00515	0.0353	0.0175**
	(0.0187)	(0.00711)	(0.0188)	(0.00805)
Observations	704	704	704	704
R^2	0.040	0.001	0.019	0.022
CountryFE	Yes	Yes	Yes	Yes

Sample is from 2004q1-2014q4, countries as listed in Appendix E. Other Investment Debt outflow data is primarily from IMF BOP, as described in the text. Public outflows are defined as the sum of General Government and Central Bank outflows. Dependent variables are expressed as a percentage of GDP. VIX is the implied volatility of S&P 500 index options. GDP growth is calculated as a year-on-year percentage growth. Errors are clustered at the country level. ** $p < 0.05$, *** $p < 0.01$

Table 9: Drivers of Portfolio Debt Outflows, by Sector (Quarterly BOP data, missing Bank data filled from BIS)

Panel A: All Countries					
	(1) Total	(2) Public	(3) Banks	(4) Corp.	(5) Reserves Only
$\log(VIX_{t-1})$	-1.469***	-0.502	-0.615**	-0.351	0.115
	(0.503)	(0.388)	(0.300)	(0.384)	(0.485)
GDP Growth$_{it-1}$	0.00391	0.0135	-0.00389	-0.00571	0.0280***
	(0.0159)	(0.0100)	(0.00930)	(0.00573)	(0.0100)
Observations	1408	1408	1408	1408	1408
R^2	0.011	0.008	0.005	0.003	0.007
CountryFE	Yes	Yes	Yes	Yes	Yes
Panel B: Advanced Economies					
	(1) Total	(2) Public	(3) Banks	(4) Corp.	(5) Reserves Only
$\log(VIX_{t-1})$	-2.232**	-0.455	-0.992	-0.784	0.951
	(0.958)	(0.734)	(0.595)	(0.778)	(0.583)
GDP Growth$_{it-1}$	0.0329	0.0334	0.00661	-0.00711	-0.00203
	(0.0467)	(0.0291)	(0.0276)	(0.0166)	(0.00951)
Observations	660	660	660	660	660
R^2	0.018	0.010	0.008	0.006	0.021
CountryFE	Yes	Yes	Yes	Yes	Yes
Panel C: EM					
	(1) Total	(2) Public	(3) Banks	(4) Corp.	(5) Reserves Only
$\log(VIX_{t-1})$	-0.775**	-0.545	-0.310**	0.0796	-0.683
	(0.351)	(0.316)	(0.132)	(0.171)	(0.774)
GDP Growth$_{it-1}$	-0.00891	0.00358	-0.00840	-0.00409	0.0358**
	(0.00879)	(0.00559)	(0.00529)	(0.00392)	(0.0129)
Observations	704	704	704	704	704
R^2	0.014	0.018	0.010	0.003	0.017
CountryFE	Yes	Yes	Yes	Yes	Yes

Sample is from 2004q1-2014q4, countries as listed in Appendix E. Portfolio Debt outflow data is primarily from IMF BOP, as described in the text. Public outflows are defined as the sum of General Government and Central Bank outflows. Dependent variables are expressed as a percentage of GDP. VIX is the implied volatility of S&P 500 index options. GDP growth is calculated as a year-on-year percentage growth. Errors are clustered at the country level. ** $p < 0.05$, *** $p < 0.01$

procyclical for EM. This confirms the relationship observed in Table 7 Panel C columns (5) and (6), that reserve flows are an important procyclical capital flow for EM.

5 Conclusion

We construct a new data set for gross capital flows during 1996–2014 for 85 countries at a quarterly frequency. We decompose debt inflows and outflows by borrower and lender type: banks, corporates and sovereigns. Lender decomposition for outflows is limited to 31 countries starting in 2000s. We use the standard BOP data from IMF (BMP6) as the starting source and in order to get a larger, longer, and balanced panel of countries with debt flows split by sector, we proceed with a data filling exercise. When the BOP data by sector is missing, we fill the missing data by using other publicly available data from IMF, WB, and BIS. Our data captures the volume and variation of aggregate flows for most countries and allows us to extend the coverage of the standard samples substantially.

To gauge how well our constructed estimates capture the true flows, we undertake a counterfactual exercise. We take a sample of countries where BOP data by sector is non-missing over 2006q1–2013q4. Then we compare this data to our estimates done for this period as if the BOP data was missing. We match pretty well the aggregate patterns and the correlation between the two series is over 98 percent. At the sector level, our external filling procedure makes a large difference, where 25-40 percent of observations for EM and 75-90 percent of observations for developing countries that are missing in BOP data are filled. A sizeable number of observations for advanced economies – around 15-30 percent, depending on the debt flow type – are filled by external data.

We present dynamic and cross sectional patterns in capital flows by banks, corporates and sovereigns focusing on the role of global risk appetite, VIX, countries' own business cycles and comovement between capital inflows and outflows. When global risk appetite is low, measured as high VIX, capital flows into banks and corporates decline. Capital flows into EM sovereigns also decline but capital flows into AE sovereigns not respond to VIX

and it might even increase in certain AEs who are safe havens like the US. During such periods of high uncertainty, capital outflows by banks and corporates also decline. Banks' borrowing, both in emerging markets (EM) and in advanced economies (AE) are procyclical, but corporates borrow procylically only in EM. EM's sovereigns exhibit counter-cyclical borrowing and AE's sovereign borrowing is acylical. Banks' lending is procylical in AE but not in EM.

Our results shows that the well-known positive correlation between capital inflows and outflows is driven by banks. Global banks borrowing and lending patterns within their internal capital market combined with their hedging motives produce a strong correlation, especially for AE between capital inflows and outflows. We document that positive correlation between capital inflows and outflows come from other investment debt category and within that from banks. This result holds when we also calculate such correlations conditional on VIX and GDP growth.

Our results highlight the importance of separating capital flows by borrower and lender type to understand better the potential systemic risks that capital flows may pose for the borrowing country and the lending country. They also show the difficulty of establishing stylized facts about the business cycle properties of capital flows and the relation between capital flows and global push factors in a sample that combines EM and AE countries. We argue that it is important to decompose both the portfolio debt and the other investment debt categories into borrower and lender types, given the different incentives, the particular properties of each asset class, and the different systemic risk implications that arise depending on whether the borrowing is done by banks, corporates, or sovereigns. This type of data can be very useful to help develop models that better fit the facts, as well as to inform policy makers' decisions, not only in terms of systemic risk considerations, but also in terms of monetary policy spillovers from AE to EM.

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A Capital Flow Data

Some of the presentations and definitions of international capital flow data can be ambiguous or inconsistent across data sources. In order to be clear about what we are doing, we briefly highlight some basic concepts regarding capital flow data generally.

A.1 Net Flows vs Gross Flows

In the literature and in the data, there is some ambiguity of terms when referring to net and gross flows. Essentially, there are three distinctions:

Gross Flows: Strictly speaking, gross inflows and outflows refer to one-way flows without netting out any capital flowing in the opposite direction. This definition of gross flows is generally what comes to mind when the term is used. Nevertheless, data that actually matches this definition are quite scarce.

Net Inflows and Outflows: What is commonly called "gross flows" in the literature is actually more accurately described as "net inflows" and "net outflows". There are no comprehensive datasets on flows that are truly gross. Instead, researchers tend to use net inflows and net outflows, which can be obtained from the IMF's BOP dataset. Net inflows are gross liability flows, net of repayments. Net outflows are gross asset flows, net of disinvestment. Thus, although these measures are often called "gross", they can be positive or negative. The separation of flows into asset and liability flows allows interpreting liability flows as net inflows from foreign agents, and asset flows as net outflows by domestic agents. This is the primary working definition of capital flows, which we use across all data sources for consistency.

Net Flows: This relates to the net movement of capital into and out of a country. This is the equivalent of the negative of the current account, that is, the difference between Net Inflows and Net Outflows (or equivalently the difference between Gross Inflows and Gross Outflows).

Stock/Position Data: In general, there is no standard definition of "net" stocks, as some

countries report outstanding debt net of some financial assets (Arslanalp & Tsuda, 2014b), while others do not. A more widely-agreed view is that the net stock of external wealth should be equivalent to the Net International Investment Position, which is the difference between outstanding external stock of assets and outstanding external stock of liabilities. Gross positions then refer to the outstanding stocks of assets and liabilities separately.

A.2 External Borrowing of Sectors

The focus of this paper is on the differentiation of capital flows by sector in the domestic economy. The term "sector" is used here to refer to institutional sectors: general government, central banks, depository corporations except the central bank ("banks"), and other sectors ("corporates").[43] There are other ways to define the sectors of the economy, but this breakdown is the most common in the data.[44]

These broad sectors can sometimes be decomposed into various institutional subsectors (for example, other sectors are sometimes split into other non-bank financial and other non-financial sectors in the BOP data). Thus, sectors can also be defined differently depending on the dataset or measure. For instance, several datasets such as the WB DRS produce statistics on public and publicly guaranteed (PPG) debt. In this case, public refers to general government, central banks, and the public sector portions of banks and corporates. Publicly guaranteed private sector debt is defined precisely as its name suggests and is the complement to PPG. Otherwise, most datasets using a sectoral breakdown conform to the standard definition of the main institutional sectors and subsectors given above. We will use the standard 4 sector split for most of our analysis, but we separately consider PPG vs. PNG debt in Appendix F.4.

[43] It should be noted that the BoP category "other sectors" is broader than what is captured than the term "corporates". Nevertheless, in most cases, there is fairly broad overlap between the two categories. That is why, in the rest of this paper, we use the two terms interchangeably for presentational convenience.

[44] See Chapter 4 Section D of the 6th Edition Balance of Payments Manual for an overview of Systems of National Accounts sectoral breakdowns, and the sectoral breakdowns used in the BOP (and often other) data sources.

A.3 Sign of Flows

There remains some confusion about the sign of capital inflows and outflows in the data. This is primarily due to a change in sign conventions that occurred when the BOP data switched from the BPM5 to the BPM6 version. In BPM5, a negative sign indicated that capital was leaving the country on net, regardless of whether it was an asset or liability flow. In the current version of the BOP data (BPM6), a positive asset flow represents capital leaving the country on net by domestic residents, while a positive liability flow represents capital entering the country on net by foreigners. We use the updated convention, where a positive sign indicates an increase in either assets or liabilities, and adjust our interpretation accordingly.

B Balance of Payments Data

The IMF's Balance of Payments (BOP) data is the most comprehensive dataset available on international capital flows. It comprises two main accounts – the Current Account and the Financial Account.[45] The current account records transactions from the real side, capturing imports and exports, factor income, and transfer payments. The financial account records transaction from the financial side, capturing the acquisition of financial assets and the incurrence of financial liabilities. We focus on the Financial Account portion of the BOP data.

There are several presentations of the BOP data.[46] The standard presentation disaggregates the data by flow type and instrument. The analytic presentation, which is the one available within the IMF's International Financial Statistics (IFS), reports exceptional financing (used to meet balance-of-payments financing needs) separately from the standard presentation.[47] The analytic presentation can be useful to separate some public flows from

[45] A third account, the Capital Account, is generally much smaller than these two. Since the BOP uses double entry bookkeeping, the sum of the accounts should be zero, so a Balancing Account called "Net errors and omissions" is defined to satisfy the identity: current account + financial account + capital account + net errors and omissions = 0. Errors and omissions are usually interpreted as unrecorded private capital flows (see Forbes and Warnock (2012)).

[46] See Chapter 14 Section C of the 6th edition BOP manual for a description of the various presentations.

[47] Exceptional Financing is usually classified under the other investment category.

private flows, because exceptional financing can be viewed as an alternative instrument to the use of reserve assets or IMF credit to help deal with balance of payments shortfalls.[48] We use the sectoral presentation, which breaks down the standard presentation by domestic institutional sector, but we also use measures of exceptional financing from the analytic presentation to allocate all exceptional financing flows to the public sector.

In theory, the structure of the BOP dataset should allow separating the flows by institutional sector, but the requisite data is sometimes missing. It is difficult to determine if missing data is truly missing, or if it is zero. Data on outflows are generally more sparse than data on inflows. Further, the time coverage of the data varies greatly across countries. Especially for variables with sectoral breakdown, the coverage is weighted heavily towards recent years.

B.1 Types of Flows

Capital flows in the Financial Account of the BOP are disaggregated first by type of flow. The main types are direct investment, portfolio equity, portfolio debt, other investment, financial derivatives, and reserves. For each of these flow types, the BOP reports asset flows and liability flows. We describe each type of flow and how it can be broken down into the various institutional sectors.[49]

Direct Investment: Direct investment, commonly called FDI, captures investment involving at least 10% ownership. It is meant to reflect investment relationships based on control and influence. In addition to equity investment, it also captures other investments under a controlling relationship, including debt and reverse investment.

Direct investment is not broken down by sector. Unlike the BPM5 version of the data, the BPM6 data does have splits according to liability and asset flows for direct investment (con-

[48] See the 6th edition BOP manual Appendix 1 for a description of Exceptional Financing. See Alfaro, Şebnem Kalemli-Özcan, and Volosovych (2014) for discussion and use of IFS data to divide net flows into public and private components.

[49] See Appendix 9 of the Balance of Payments Manual for a list of all the components of the Financial Account with their structure in the BOP data.

sistent with other BOP flows).[50] The debt portion of direct investment can be allocated with some assumptions. Debt flow between affiliated parties are only recorded as direct investment debt if at least one party is a non-financial firm. Thus for inflows, we can attribute all direct investment debt to the Corporate sector if we assume that such lending from offshore non-financial firms to onshore banks is negligible.

Portfolio Equity: Portfolio equity captures investment in equity securities not included in direct investment.[51] It is broken down by institutional sector and, in principle, asset and liability flows are defined for all sectors. Note, however, that liability flows for central banks and general government should equal zero regardless of data reporting.[52]

Portfolio Debt: Portfolio debt consists of all debt securities not captured under direct investment. It is separated into asset and liability flows, and then disaggregated by institutional sector.

Financial Derivatives: Financial derivatives tend to be a quantitatively small category of gross flows, covering derivatives and employee stock options. Financial derivatives that are associated with reserve asset management are excluded. Both asset and liability flows offer breakdowns by institutional sector.[53] Due to its small size and sparse data, we ignore this component in our analysis.

Other Investment: Other investment captures all other investments not included in the previous categories. It is first broken into other investment equity[54] and other investment debt. Other investment debt is then disaggregated as follows: currency and deposits, loans (including use of IMF credit and loans), insurance and pensions,[55]trade credit and advances,

[50]This is one of the main differences between the BPM5 and BPM6 versions of the data.

[51]Equity not in the form of securities is not captured here.

[52]Some countries report positive equity liability flows for the government or central bank, but we believe this is equity from state-owned or quasi-public enterprises (banks or corporates) that was mis-recorded.

[53]Some countries may report financial derivatives on a net basis only. See 6th edition BOP manual paragraphs 6.60 and 8.34.

[54]This is equity investment that is not direct investment or reserve assets, and is not in the form of securities. Equity securities are captured under portfolio equity. This category, introduced with the BPM6 version of the BOP data, is sparsely reported.

[55]This includes non-life insurance technical reserves, life insurance and annuities entitlements, pension entitlements, and provisions for calls under standardized guarantees. This component is likely also small, and very sparsely reported.

other accounts payable/receivable, and SDR allocations.[56]

Other investment debt as a whole, and each of its component instruments, is broken down into asset and liability flows, and then further broken down by institutional sector. However, there is no sectoral breakdown of Other Investment Equity.

Reserves: Reserve Assets are external assets held by the Central Bank or Monetary Authority that are readily available for use to meet Balance of Payments financing needs. These include foreign currency, convertible gold, SDRs, and other reserve assets. Thus, this component is an asset flow of the public sector only. As we are focusing on liability flows in our analysis, this category is excluded.

While in principle the structure of the BOP data contains all the ingredients required to compute each type of flow for each sector, in practice there are some countries which do not exhaustively provide these breakdowns, especially for earlier years.[57] Table B1 in the appendix highlights the coverage by flow type and sector in the quarterly BOP data.[58] For each component, the table displays the number of countries reporting data, the number of quarters with at least one country reporting data, the number of country-quarter observations with non-missing data, and the number of countries that have data for that component in every period over the 1996q1-2014q4 period. Next to each of these numbers, in brackets we report the implied coverage as percentage of the theoretical maximum, given by 190 countries, 144 quarters, and 27360 total observations. The direct investment and reserves lines give us an idea of the coverage of the more standard items that are not disaggregated by sector. Generally, we see that for most sectors and flow types, most countries and periods show some data. However, the data is skewed towards recent years, and few countries

[56] SDR holdings (as opposed to SDR allocations) are included in reserve assets. A one time increase in SDR allocations occurred in the 3rd quarter of 2009 for all IMF member countries, so those flows are removed.

[57] Table B3 lists the BOP variables required to compute each type of capital flow by sector. Variable names are as they are found in the bulk public download of the BP6 version BOP data, as of May 2016. The Balance of Payments data also includes International Investment Position (IIP) data, which is the stock equivalent of the BOP flow measures. Variable names for IIP construction by sector are also included, for reference.

[58] Some items in the BOP data are available back to 1948, but this applies to very few of them. For this table, we consider data only from 1980 onwards. The annual BOP data does have somewhat better coverage. For instance, when shifting from quarterly to annual frequency, the number of countries with full coverage of portfolio debt liability flows over 1996-2014 goes from (1,21,13,19) to (4,32,18,27) for central banks, general government, banks, and other sectors, respectively.

show coverage over the full 1996q1-2014q4 period.

Table B2 shows the coverage breakdown for Other investment Debt by instrument, with each instrument listed separately under Asset and Liability by sector. The table illustrates how more detailed breakdowns tend to result in poorer coverage, as not all countries provide such detail to the IMF. Generally, if other investment debt by sector is missing, then all of the underlying instruments (with the exception of IMF credit) are also missing). When data for instruments is reported, it can be the case that all of other investment debt is recorded under a single instrument (usually loans), despite the number representing other instruments as well (such as trade credit, etc.).[59]

[59] We thank Gian-Maria Milesi-Ferretti for pointing this out.

Table B1: BOP Data Coverage by Sector

Flow Type	A/L	Sector	Country	Quarter	Country-Quarter	Panel
Direct Investment	Assets	All	133 (70%)	143 (99%)	8495 (31%)	35 (18%)
	Liabilities	All	146 (77%)	143 (99%)	10920 (40%)	63 (33%)
Portfolio Equity	Assets	Central Banks	23 (12%)	60 (42%)	309 (1%)	0 (0%)
		General Gov	58 (31%)	91 (63%)	1480 (5%)	0 (0%)
		Banks	84 (44%)	127 (88%)	3611 (13%)	8 (4%)
		Corporates	107 (56%)	143 (99%)	5045 (18%)	13 (7%)
	Liabilities	Central Banks	1 (0.5%)	18 (13%)	18 (0.0%)	0 (0%)
		General Gov	8 (4%)	73 (51%)	98 (0.0%)	0 (0%)
		Banks	71 (37%)	143 (99%)	3283 (12%)	11 (6%)
		Corporates	102 (59%)	143 (99%)	5338 (20%)	27 (14%)
Portfolio Debt	Assets	Central Banks	44 (23%)	86 (60%)	1154 (4%)	0 (0%)
		General Gov	60 (32%)	104 (72%)	1990 (7%)	3 (2%)
		Banks	100 (53%)	134 (93%)	5097 (17%)	18 (9%)
		Corporates	101 (53%)	143 (99%)	5090 (19%)	18 (9%)
	Liabilities	Central Banks	38 (20%)	143 (99%)	981 (4%)	1 (0.5%)
		General Gov	104 (55%)	143 (99%)	6243 (23%)	21 (11%)

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Table B1 – *Continued from previous page*

Flow Type	A/L	Sector	Country	Quarter	Country-Quarter	Panel
		Banks	91 (48%)	143 (99%)	4037 (15%)	13 (7%)
		Corporates	93 (49%)	143 (99%)	5217 (19%)	19 (10%)
Other Investment Debt	Assets	Central Banks	92 (48%)	143 (99%)	3734 (14%)	2 (1%)
		General Gov	104 (55%)	143 (99%)	5653 (21%)	12 (6%)
		Banks	138 (73%)	143 (99%)	9793 (36%)	53 (28%)
		Corporates	135 (71%)	143 (99%)	9209 (34%)	45 (24%)
	Liabilities	Central Banks	130 (68%)	143 (99%)	8768 (32%)	29 (15%)
		General Gov	138 (73%)	143 (99%)	10292 (38%)	47 (25%)
		Banks	137 (72%)	143 (99%)	10372 (38%)	54 (28%)
		Corporates	139 (73%)	143 (99%)	10307 (38%)	56 (29%)
Other Equity	Assets	All	(%)	(%)	(%)	(%)
	Liabilities	All	(%)	(%)	(%)	(%)
Financial Derivatives	Assets	Central Banks	14 (7%)	95 (66%)	225 (1%)	0 (0%)
		General Gov	25 (13%)	86 (60%)	578 (2%)	0 (0%)
		Banks	58 (31%)	103 (72%)	1906 (7%)	3 (2%)
		Corporates	53 (28%)	111 (77%)	1620 (6%)	4 (2%)
	Liabilities	Central Banks	9 (5%)	85 (59%)	136 (0.5%)	0 (0%)

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Table B1 – *Continued from previous page*

Flow Type	**A/L**	**Sector**	**Country**	**Quarter**	**Country-Quarter**	**Panel**
		General Gov	17 (9%)	95 (66%)	346 (1%)	0 (0%)
		Banks	52 (27%)	103 (72%)	1603 (6%)	2 (1%)
		Corporates	49 (26%)	113 (78%)	1400 (5%)	2 (1%)
Reserves	Assets	Central Bank	146 (77%)	143 (99%)	11387 (42%)	65 (34%)

The dataset covers 190 Countries over 1980q1-2015q4 (144 Quarters), yielding 27360 Country-Quarter observations. The first number in each cell is the total number of countries, quarters, observations, and countries (respectively) with non-missing data, while the second number is the percent of total countries, quarters, observations, and countries, respectively. The Panel column is the number (and percent) of countries with non-missing observations over 1996q1-2014q4. Note that, at the time of donwload, most 2015q4 variables have not yet been reported.

Table B2: Other Investment Debt Instrument Coverage by Sector

Instrument	A/L	Sector	Country	Quarter	Country-Quarter	Panel
Currency and Deposits	Assets	Central Banks	60 (32%)	137 (95%)	2212 (8%)	0 (0%)
		General Gov	80 (42%)	143 (99%)	2913 (11%)	4 (2%)
		Banks	140 (74%)	143 (99%)	9377 (34%)	49 (22%)
		Corporates	130 (68%)	143 (99%)	7531 (28%)	30 (16%)
	Liabilities	Central Banks	97 (51%)	143 (99%)	4779 (17%)	9 (5%)
		General Gov	21 (11%)	143 (99%)	627 (2%)	1 (0.5%)
		Banks	137 (72%)	143 (99%)	9413 (34%)	41 (22%)
		Corporates	51 (27%)	143 (99%)	1496 (5%)	2 (1%)
Loans	Assets	Central Banks	37 (19%)	134 (93%)	840 (3%)	0 (0%)
		General Gov	62 (33%)	143 (99%)	2910 (11%)	7 (4%)
		Banks	110 (58%)	143 (99%)	6287 (23%)	24 (13%)
		Corporates	98 (52%)	143 (99%)	5377 (20%)	19 (10%)
	Liabilities	Central Banks	107 (56%)	143 (99%)	5521 (20%)	5 (3%)
		General Gov	140 (74%)	143 (99%)	9918 (36%)	44 (23%)
		Banks	117 (62%)	143 (99%)	6477 (24%)	23 (12%)
		Corporates	136 (72%)	143 (99%)	9835 (36%)	48 (25%)

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Table B2 – *Continued from previous page*

Instrument	A/L	Sector	Country	Quarter	Country-Quarter	Panel
Trade Credit and Advances	Assets	Central Banks	3 (2%)	55 (38%)	113 (0.4%)	0 (0%)
		General Gov	38 (20%)	143 (99%)	1376 (5%)	2 (1%)
		Banks	16 (8%)	107 (74%)	438 (2%)	2 (1%)
		Corporates	108 (57%)	143 (99%)	6423 (23%)	26 (14%)
	Liabilities	Central Banks	5 (3%)	83 (58%)	127 (0.4%)	0 (0%)
		General Gov	39 (21%)	143 (99%)	1177 (4%)	0 (0%)
		Banks	20 (11%)	105 (73%)	456 (2%)	0 (0%)
		Corporates	121 (64%)	143 (99%)	7431 (27%)	34 (18%)
Other Accounts Payable/Receivable	Assets	Central Banks	61 (3%)	143 (99%)	1722 (6%)	1 (0.5%)
		General Gov	82 (43%)	143 (99%)	3235 (12%)	5 (3%)
		Banks	92 (48%)	143 (99%)	4280 (16%)	12 (6%)
		Corporates	105 (55%)	143 (99%)	5256 (19%)	9 (5%)
	Liabilities	Central Banks	81 (43%)	143 (99%)	3305 (12%)	2 (1%)
		General Gov	90 (47%)	143 (99%)	3348 (12%)	7 (4%)
		Banks	95 (50%)	143 (99%)	4257 (16%)	8 (4%)
		Corporates	110 (58%)	143 (99%)	6067 (22%)	13 (7%)

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Table B2 – *Continued from previous page*

Instrument	A/L	Sector	Country	Quarter	Country-Quarter	Panel
Insurance and Pensions	Assets	Central Banks	n/a	n/a	n/a	n/a
		General Gov	n/a	n/a	n/a	n/a
		Banks	1 (0.5%)	4 (3%)	4 (0.0%)	0 (0%)
		Corporates	29 (15%)	107 (74%)	891 (3%)	3 (2%)
	Liabilities	Central Banks	n/a	n/a	n/a	n/a
		General Gov	n/a	n/a	n/a	n/a
		Banks	n/a	n/a	n/a	n/a
		Corporates	34 (18%)	107 (74%)	1030 (4%)	2 (1%)

The dataset covers 190 countries over 1980q1-2015q4 (144 quarters), yielding 27360 country-quarter observations. The first number in each cell is the total number of countries, quarters, observations, and countries (respectively) with non-missing data, while the second number is the percent of total countries, quarters, observations, and countries, respectively. The Panel column is the number (and percent) of countries with non-missing observations over 1996q1-2014q4. Note that, at the time of download, most 2015q4 variables have not yet been reported.

Table B3: BOP Variables by Sector

Flow Type	**A/L**	**Sector**	**New BP6**	**New IIP**
Direct Investment	Assets	All	BFDA_BP6_USD	IAD_BP6_USD
	Liabilities	All	BFDL_BP6_USD	ILD_BP6_USD
Portfolio Equity	Assets	Central Banks	(BFPAECB_BP6_USD + BFPAEMA_BP6_USD)	(IAPECB_BP6_USD + IAPEMA_BP6_USD)
		General Government	BFPAEG_BP6_USD	IAPEG_BP6_USD
		Banks	BFPAEDC_BP6_USD	IAPEDC_BP6_USD
		Corporates	BFPAEO_BP6_USD	IAPEO_BP6_USD
	Liabilities	Central Banks	BFPLECB_BP6_USD	ILPECB_BP6_USD
		General Government	BFPLEG_BP6_USD	ILPEG_BP6_USD
		Banks	BFPLEDC_BP6_USD	ILPEDC_BP6_USD
		Corporates	BFPLEO_BP6_USD	ILPEO_BP6_USD

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Table B3 – *Continued from previous page*

Flow Type	**A/L**	**Sector**	**New BP6**	**New IIP**
Portfolio Debt	Assets	Central Banks	(BFPADCB_BP6_USD + BFPADMA_BP6_USD)	(IAPDCB_BP6_USD + IAPDMA_BP6_USD)
		General Government	BFPADG_BP6_USD	IAPDG_BP6_USD
		Banks	BFPADC_BP6_USD	IAPDDC_BP6_USD
		Corporates	BFPADO_BP6_USD	IAPDO_BP6_USD
	Liabilities	Central Banks	(BFPLDCB_BP6_USD + BFPLDMA_BP6_USD)	ILPDCB_BP6_USD
		General Government	BFPLDG_BP6_USD	ILPDG_BP6_USD
		Banks	BFPLDDC_BP6_USD	ILPDDC_BP6_USD
		Corporates	BFPLDO_BP6_USD	ILPDO_BP6_USD
Other Investment Debt	Assets	Central Banks	BFOADCB_BP6_USD	IAODCB_BP6_USD
		General Government	BFOADG_BP6_USD	IAODG_BP6_USD
		Banks	BFOADDC_BP6_USD	IAODDC_BP6_USD

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Table B3 – *Continued from previous page*

Flow Type	**A/L**	**Sector**	**New BP6**	**New IIP**
		Corporates	BFOADO_BP6_USD	IAODO_BP6_USD
	Liabilities	Central Banks	BFOLOCBFR_BP6_USD	ILOOCBFR_BP6_USD
		General Government	BFOLOGFR_BP6_USD	ILOOGFR_BP6_USD
		Banks	BFOLODC_BP6_USD	ILOODC_BP6_USD
		Corporates	BFOLOO_BP6_USD	ILOOO_BP6_USD
Financial Derivatives	Assets	Central Banks	BFFACB_BP6_USD + BFFAMA_BP6_USD	IADFCB_BP6_USD + IADFMA_BP6_USD
		General Government	BFFAG_BP6_USD	IADFG_BP6_USD
		Banks	BFFADC_BP6_USD	IADFDC_BP6_USD
		Corporates	BFFAO_BP6_USD	IADFO_BP6_USD
	Liabilities	Central Banks	BFFLCB_BP6_USD	ILFCB_BP6_USD
		General Government	BFFLG_BP6_USD	ILFG_BP6_USD

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Table B3 – *Continued from previous page*

Flow Type	**A/L**	**Sector**	**New BP6**	**New IIP**
		Banks	BFFLDC_BP6_USD	ILFDC_BP6_USD
		Corporates	BFFLO_BP6_USD	ILFO_BP6_USD
Reserves	Assets	Central Bank	BFRA_BP6_USD	IAR_BP6_USD

C BIS Data

C.1 International Debt Securities

The Bank for International Settlements (BIS) produces datasets on international bond issuance and bonds outstanding, by sector and by residence or nationality of the issuer. International debt securities (IDS) are defined as those issued in a market other than that of the country where the borrower resides (Gruić & Wooldridge, 2012). This does not necessarily imply that the securities are held by foreigners, but can be taken as an approximation for external holdings of debt securities.[60] Since the IDS data are compiled on a security-by-security basis, granular sectoral splits are easy to obtain, unlike the data on debt from international bank creditors which requires some construction to obtain the split.

The IDS data are important for our exercise. While the BOP data relies on reporting by national statistical offices (which can result in incomplete coverage of portfolio debt securities by sector), the IDS data are compiled directly on a security-by-security basis, which can result in much better coverage. The IDS data can also be presented on a residency basis or by the nationality of the issuing institution. See Avdjiev, Chui, and Shin (2014) and Shin (2013) for a more detailed discussion of this issue.

There are several options for how we allocate international debt securities to each sector. As noted earlier, bonds can be classified based on the residence of the issuer or the nationality of the issuer. Further, the BIS classifies IDS according to sector with several subsectors which can be aggregated up to our public, bank, and corporate sectors: Public banks, private banks, central banks, public other financial corporations, private other financial corporations, public non-financial corporations, private non-financial corporations, and general government sectors.

[60] While this is a reasonable assumption for most borrowing sectors and countries in the world, there are some exceptions. Most notably, the gap between the set of IDS and the set of externally-held debt securities tends to considerable in the case of government bonds issued by reserve currency countries, since these countries often issue large amounts of government debt in domestic markets, which are then traded abroad. Lately, this has also been the case for the government bonds of several large EMEs (e.g. Brazil, Mexico, and Poland), albeit to a lesser degree than for government bonds issued by reserve currency countries. For most of these cases, BOP data is available and used. Otherwise, we rely on other data sources first to avoid this issue.

We keep general government and central bank sectors as they are found. Public and private banks are allocated to the bank sector. Public and private other financial and public and private non-financial corporations are allocated to the corporate sector. This aligns the bonds up with the standard institutional sector definitions in the BOP data. However, the role of public banks and corporations can be quite important in some countries.

C.2 BIS External Bank Credit Data

The BIS compiles two sets of statistics on international banking activity. The Locational Banking Statistics (LBS) capture outstanding claims and liabilities of internationally active banks located in 44 reporting countries against counterparties residing in more than 200 countries. Banks record their positions on an unconsolidated basis, including intragroup positions between offices of the same banking group. The data are compiled based on the residency principle (as done for BOP or QEDS). The LBS capture the overwhelming majority of cross-border banking activity.[61] The historical LBS data breaks down counterparties in each country into banks (banks and central bank sectors) and non-banks (corporate and government sectors).[62] The LBS reports outstanding stocks, and based on them BIS calculates exchange rate- and break-adjusted flows.[63]

The second set of banking data is the Consolidated Banking Statistics (CBS). This differs from the LBS in that the positions of banks reporting to the BIS are aggregated by the na-

[61] Due to the fact that not all counties in the world report data to the LBS, these statistics do not capture the entire global stock of outstanding external bank credit. Most countries which host large internationally active banks have reported to the LBS for several decades (the full list of LBS reporting countries is available at: http://www.bis.org/statistics/rep_countries.htm). Nevertheless, there are a small number of notable exceptions, such as China and Russia (the LBS series for both of which starts only as recently as Q4/2015). That said, the LBS capture around 95% of all global cross-border interbank business (BIS, 2015). While there is no similar estimate for the share of cross-border bank lending to non-banks captured by the LBS, it is reasonable to assume that it is also above 90%.

[62] Data on total cross border claims by BIS reporting banks separated by bank and non-bank counterparties are available going back to 1978. The recent enhancements to the BIS LBS data have provided more granular counterparty sector splits. Most importantly in the context of our study, in the enhanced LBS data the non-bank sector has been divided into the non-bank private sector and the public sector (Avdjiev, McGuire, & Wooldridge, 2015).

[63] Breaks may arise from changes in reporting practices, methodology, population of reporting institutions, etc. Other valuation adjustments besides exchange rates are less concerning, as loans are generally not traded in secondary markets.

tionality (rather than by the residence) of the reporting bank.[64] Currently, banking groups from 31 countries report to the CBS. We use the CBS on an immediate counterparty basis (CBS/IC).[65] The CBS data does provide a borrower breakdown of the Non-Bank Sector into Public and Private. Since there is no currency breakdown available for the CBS, the BIS does not calculate adjusted flows.

C.3 Obtaining Borrowing Sector Splits for Bank Creditor Data

In this section, we describe our methodology for constructing gross capital inflows and debt outstanding from BIS sources. Our goal is to obtain the stocks and flows measured based on residency (consistent with the LBS data), but we also employ the CBS to obtain certain (non-bank) borrowing sector splits. We deviate from residency in some cases to gain a more complete picture of flows.

The bank loan data is from the LBSR. For observations prior to 2013, the LBS only provide the breakdown between bank and non-bank debtors (where non-bank captures both the non-bank private and the public sector).[66] We focus on cross-border bank lending in the LBS in the form of loans, for which we have data starting in 1996. However, our methodology described below can also be applied to total cross-border bank claims (in all instruments).[67]

Next, we describe how we use the sectoral split information contained in the CBS/IC data in order to divide the Non-Bank sector in the LBS data into Non-Bank Public sector and Non-Bank Private sector. This is described next. First, we go over our methodology for constructing the split for the outstanding stocks of LBS cross-border bank loans. Then,

[64] For example, the positions of a French bank's subsidiary located in New York - which in the LBS are included in the positions of banks in the United States - are consolidated in the CBS with those of its parent and included in the positions of French banks.

[65] The CBS are compiled in two different ways: by immediate counterparty and by ultimate risk. The immediate counterparty is the entity with whom the bank contracts to lend or borrow. Ultimate risk takes account of credit risk mitigants, such as collateral, guarantees and credit protection bought, which transfer the bank's credit exposure from one counterparty to another. (BIS, 2015)

[66] The enhanced BIS data, available from 2013 on, splits the non-bank sector into public and private sub-sectors. Note that the LBS include central banks with banks instead of public, but central banks tend to compose a very small portion of cross-border bank claims in the BIS data.

[67] Starting in 1984, we have data for total bank cross-border credit (in all instruments). We don't use this in our initial analysis in order to avoid double counting external bond flows. In practice, the difference between total bank credit and bank credit in just the loan and deposit instruments tends to be small.

we describe our methodology for constructing the split for exchange rate adjusted changes, which relies on currency composition information available in the LBS.

C.3.1 Borrowing Sector Splits for Outstanding Stocks

For outstanding stocks, we use the share of international bank debt for each sector from the CBS to estimate the split of the Non-Bank LBS data into Public and Private components.[68] We calculate that as follows:

$$\widehat{XBS}_{nbp,j,t} = XBC_{nb,j,t} \frac{INTC_{nbp,j,t}}{INTC_{nbp,j,t} + INTC_{pub,j,t}} \tag{2}$$

$$\widehat{XBS}_{pub,j,t} = XBC_{nb,j,t} \frac{INTC_{pub,j,t}}{INTC_{nbp,j,t} + INTC_{pub,j,t}} \tag{3}$$

where npb indicates Non-Bank Private, nb indicates Non-Bank, pub indicates Public, j denotes the borrowing country, and t denotes the time period. $\widehat{XBS}$ is our estimated cross border bank debt, XBC denotes the cross border claims (from the LBS) of BIS reporting banks, and $INTC$ is international claims (from the CBS on immediate counterparty basis). The CBS international claims are defined as the sum of XBC and the local claims by foreign affiliates that are denominated in foreign currencies (LCFC).

This construction of the split of bank debt makes the following assumptions: First, the sectoral shares for $INTC$ are the same as the sectoral shares for XBC. This is reasonable since for most countries, LCFC tends to be small relative to XBC.[69] Second, the sectoral shares for the set of banks that report LBS data (44 countries) are the same as the sectoral shares for the set of banks that report CBS data (31 countries). The 31 CBS reporting countries account for about 90% of the XBC in the LBS, and the CBS captures the activities of the subsidiaries of banks from these 31 countries worldwide. As a result, the CBS data are sufficiently representative to make the above assumption a reasonable one. Third, data for the CBS that allows us to estimate the split of Non-Bank into Public and Private is not

[68] This estimation is also used in Arslanalp and Tsuda (2014a) and Arslanalp and Tsuda (2014b).

[69] While for most countries, LCFC tends to be small relative to XBC, there are a small number of exceptions. For example, this is not the case in dollarized economies (e.g. Ecuador) and some emerging European economies (e.g. Hungary and Poland), where lending denominated in euro and in Swiss francs has been non-negligible.

available for advanced economies before 2000, and is only available on a semiannual basis for EM for the period before 2000. We linearly extrapolate the semiannual shares to Public and Private into a quarterly series for EM. For advanced economies, we assume constant shares from 2000 backwards.[70]

Having made these assumptions and constructed the external debt to bank creditors, we can then estimate total external debt by sector by adding $\widehat{XBS}$ to IDS for each sector. This will produce a longer series of external debt estimates by sector than the Quarterly External Debt Statistics (QEDS)[71], and cover more countries.

Recently, the BIS has released its enhanced banking data, starting in 2013. This data contain more granular borrowing sector splits - Bank, Public, and Non-Bank Private. We use this short, recent series to judge the quality of our decomposition. Our methodology for estimating borrowing sector splits for the non-bank borrowing sector and the public sector generates estimates that are very close to the actual (reported) underlying figures.[72]

C.3.2 Borrowing Sector Splits for Outstanding Flows

Obtaining exchange rate-adjusted flows to all sectors and to banks is straightforward since they are reported in the LBS data. However, as discussed above, the historical LBS data do not have a split of the non-banks sector into its public and private components. Thus, in order to get estimates for exchange rate-adjusted flows to the non-bank private sector and to the public sector, we rely on the estimated stocks for those sectors obtained in the previous section.[73] We assume that the currency compositions of claims on these sectors are the same as the currency composition of claims on the non-bank sector as a whole.

Using the above assumption, we can obtain estimates of the stock of bank lending to the

[70] The assumption of constant shares for advanced economies before 2000 is not too concerning when we are only extending back 4 years.

[71] The QEDS data starts in 2004, and provides data on stocks of external debt by institutional sector for a wide range of countries.

[72] Since not all LBS reporting countries have started providing the enhanced borrowing sector splits, these comparisons are based on the set of LBS reporting countries which had started reporting enhanced LBS data as of March 2016.

[73] Note that since most bank credit is not traded in secondary markets (e.g. loans), fluctuations in market valuations should be negligible.

non-bank private Sector denominated in currency j as follows:

$$\widehat{XBS}_{i,t}^{j,nbp} = \widehat{XBS}_{i,t}^{all,nbp} \left(\frac{XBS_{i,t}^{j,nb}}{XBS_{i,t}^{all,nb}} \right) \tag{4}$$

where $\widehat{XBS}_{i,t}^{j,nbp}$ is the *estimated* stock of claims denominated in currency j on the non-bank private Sector in country i at the end of period t; $\widehat{XBS}_{i,t}^{all,nbp}$ is the *estimated* stock of claims denominated in *all* currencies on the Non-Bank Private Sector in country i at the end of period t; $XBS_{i,t}^{j,nb}$ is the *reported* stock of claims denominated in currency j on the Non-Bank Private Sector in country i at the end of period t; and $XBS_{i,t}^{all,nb}$ is the *reported* stock of claims denominated in *all* currencies on the Non-Bank Private Sector in country i at the end of period t.

We then estimate the flow of bank lending to the Non-Bank Private Sector in each currency by converting the USD values of the estimated stocks into their corresponding values in the currency in which they are denominated using the same period USD exchange rate, differencing them, and then converting back into USD using the average exchange rate:

$$\widehat{XBF}_{i,t}^{j,nbp} = \frac{\widehat{XBS}_{i,t}^{j,nbp} FX_t^{j,usd} - \widehat{XBS}_{i,t-1}^{j,nbp} FX_{t-1}^{j,usd}}{\widetilde{FX}_t^{j,usd}} \tag{5}$$

where $\widehat{XBF}_{i,t}^{j,nbp}$ is the *estimated* flow of claims denominated in currency j on the Non-Bank Private Sector in country i during period t; $FX_t^{j,usd}$ is the end-of-period t exchange rate between currency j and USD; and $\widetilde{FX}_t^{j,usd}$ is the average exchange rate during period t between currency j and USD.

Now that we have the estimated flow for each currency, we sum these individual flows to obtain the total estimated flow:

$$\widehat{XBF}_{i,t}^{all,nbp} = \sum_j \widehat{XBF}_{i,t}^{j,nbp} \tag{6}$$

where nbp denotes the Non-Bank Private Sector.

Estimates of flows to the Public Sector can be obtained in an analogous fashion:

$$\widehat{XBS}_{i,t}^{j,pub} = \widehat{XBS}_{i,t}^{all,pub} \left(\frac{XBS_{i,t}^{j,nb}}{XBS_{i,t}^{all,nb}} \right) \tag{7}$$

$$\widehat{XBF}_{i,t}^{j,pub} = \frac{\widehat{XBS}_{i,t}^{j,pub} FX_t^{j,usd} - \widehat{XBS}_{i,t-1}^{j,pub} FX_{t-1}^{j,usd}}{\widetilde{FX}_t^{j,usd}} \tag{8}$$

$$\widehat{XBF}_{i,t}^{all,pub} = \sum_j \widehat{XBF}_{i,t}^{j,pub} \tag{9}$$

where *pub* denotes the Public Sector.

D Filling Missing Data

We draw on 3 separate sources for data to construct measures of capital flows that can be used when the BOP data is missing. The first is BIS data, which is described in detail in Appendix C. We also draw on the International Investment Position (IIP) data that accompanies the BOP data, and the Quarterly External Debt Statistics (QEDS) data which is produced jointly by the World Bank and IMF. Both of these are stock measures, and have the same sector and capital flow type classifications as the BOP data. The QEDS data is quarterly, the IIP data comes either quarterly or annually.

The dataset with the most broad coverage by sector and capital flow type is derived from BIS data. While this data in many cases captures much of the international financial flows we are trying to measure, it is not always an appropriate fill. Specifically, bond inflows are measured in the BIS data as net issuance of debt securities in international markets. While this measure is appropriate for many countries, countries that have many foreigners buying domestically issued bonds or domestics buying international issued bonds will introduce error. An important example of this is government debt issued by advanced economies. The US has a substantial amount of sovereign debt that is traded abroad, but nearly all of the debt is issued domestically, making the BIS measure an inappropriate way to fill the missing series.[74] Thus to increase the accuracy of our filling process, we turn to the IIP and

[74]The only national data that we include is for the United States, which has subtantial capital flows that won't be captured by the BIS data, but also a gap between the availability of QEDS and IIP data and the coverage of the

QEDS data. To approximate flows, we first difference the stocks with a simple correction for exchange rate valuation effects.[75] When both IIP and QEDS data are available, we use the IIP measures for consistency with the BOP data. We use these stock measures to fill both portfolio debt and other investment debt for the government and central bank sectors. We also use these measures to fill Corporate portfolio debt in AE.

For the remaining missing data, we use our BIS constructed measures. Table D1 summarizes the process of constructing matching series using the BIS data.

Table D1: BIS Data Alignment with BOP

Capital Flow Type		Sector			
		Banks	Corporates	Government	Central Bank
Bonds	BOP	PD to DC	PD to OS	PD to GG	PD to CB
	BIS	NI by Banks	NI by Corporates	NI by Government	NI by Central Bank
Loans	BOP	CD to DC	LN to OS	LN to GG	CD to CB
	BIS	Loans to Banks	Loans to Corporates	Loans to Government + IMF Credit to GG (BOP)	Loans to CB + IMF Credit to CB (BOP)
Other Investment Debt	BOP	OID to DC	OID to OS	OID to GG	OID to CB
	BIS	BIS Filled Loans plus any other non-missing other investment debt instruments from BOP, by sector			

DC = Depository Corproations, except the Central Bank; OS = Other Sectors; GG = General Government; CB = Central Bank; CD = Currency & Deposits; LN = Loans; PD = portfolio debt; OID = other investment debt; NI = Net Issues in International Markets by Residency

For the BIS data, we construct our measure of portfolio debt flows from the BIS IDS data. It captures net issuance of debt securities (bonds) in a market other than that of the country where the borrower resides (Gruić & Wooldridge, 2012). This does not necessarily imply that the securities are held by foreigners, but can be taken as an approximation for external

BOP data. Specifically, we fill in the stock IIP measure of government portfolio debt for the US using the TIC data from the US Treasury, Securities data (B) Tables A.2.d and A.2.a, for the period 1999q1-2003q2, and then take the first difference.

[75] Data on currency composition of external debt, split by capital flow type and sector, is scarce. We assume the external debt is denominated in domestic currency. While this is not always the case, changing the assumption to denominated in USD does not appreciably change our filling accuracy.

financing flows through debt securities.[76] Since the IDS data are compiled on a security-by-security basis, granular sectoral splits are easy to obtain; we thus construct these net issuances by sector using the same sector definitions as the BOP data.

For other investment debt, we construct our series from our BIS estimates as follows: First, we examine the underlying components of other investment debt. The primary instruments are loans (for corporates and governments) and currency and deposits (for banks and central banks). If loans are missing for corporates or government, or currency and deposits is missing for banks or central banks, we rely on the BIS Locational Banking Statistics (LBS) to fill in the data.[77] The BIS data captures cross-border lending from banks in BIS reporting countries.[78,79] This lending can be broken by instrument into loans, debt securities holdings, and other instruments. We use just the loan instrument in our measure, and so avoid capturing any bond holdings or equity investment made by banks. Since the BIS data will not capture official lending, we add IMF Credit to these series to capture that component of loans.[80] The Locational Banking Statistics by Residence (LBSR) historically only break the counterparty sector for Bank lending into banks and non-banks, though recent data includes additional sector splits. We employ the BIS Consolidated Banking Statistics (CBS) and the Locational Banking Statistics by Nationality (LBSN), both of which have further counterparty breakdowns, in order to construct estimates for Bank lending flows for all 4 sectors for the entire period, as described in Appendix C.

After augmenting the Loans (or Currency and Deposits) with the BIS data, we sum them with any remaining non-missing instruments within other investment debt. This sum be-

[76] As discussed above, the assumption does not hold well for sovereign debt, particularly in advanced economies, but is otherwise appropriate for many economies.

[77] Interbank loan flows are automatically classified as deposits in the BOP data. Thus, all loans from BIS reporting banks to bank counterparties, including the central bank, would be captured in the currency and deposits instrument in the BOP.

[78] This captures about 95% of all cross-border interbank business (BIS, 2015).

[79] There have been some discrepancies noted in the past between the BOP ad BIS data due for a few specific cases, such as trustee accounts in Japan and custodial accounts in Switzerland. We give priority to the BOP data, which is well reported for these series.

[80] IMF Credit is a subcomponent of the Loans instrument in other investment debt for general government and central banks. This figure is known by the IMF even if the actual loans by sector are not reported by the country. For central banks, since we fill the currency and deposits instrument with BIS loans, we add IMF Credit to the central bank back in only if the Loans instrument is missing.

comes our estimate for other investment debt from BIS data.[81]

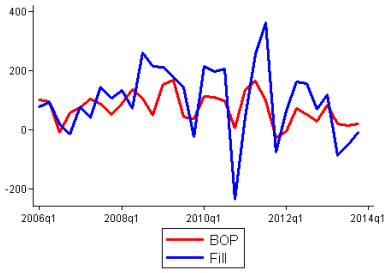
Our corresponding stock measures are similarly constructed. We rely first on IIP data, with an internal fill. We next fill any missing data with QEDS measures. And finally any remaining missing observations are filled with our BIS stock estimates derived above.

D.1 Comparison with BOP data

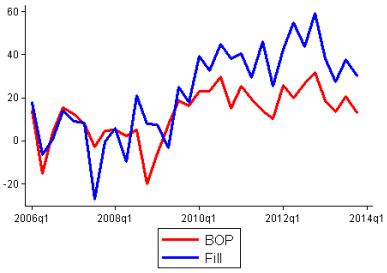
Having thus constructed our filling series, we compare the result with the available BOP data. Figures D1 and D2 illustrates this match by plotting the aggregate flows for each series by sector, capital flow type, and country group. For each sector and capital flow type, we keep only countries that had non-missing BOP data over 2006q1-2013q4.

[81] In general, when other investment debt is missing, most data on the underlying instruments are also missing. A few countries are exceptions to this, and only for a very few periods: Eritrea and Equatorial Guinea in the annual data, and Eritrea and Kosovo in the quarterly data. None of these countries are included in our analysis with this data.

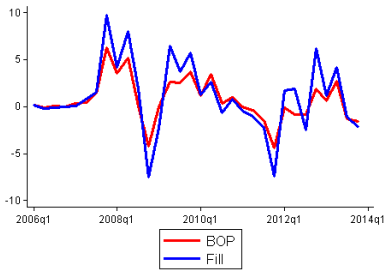
Figure D1: Aggregate Portfolio Debt, Billions USD



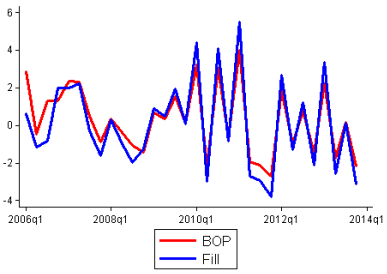
(a) Advanced Government



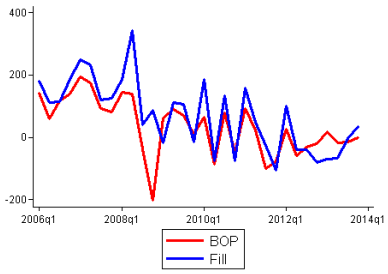
(b) Emerging Government



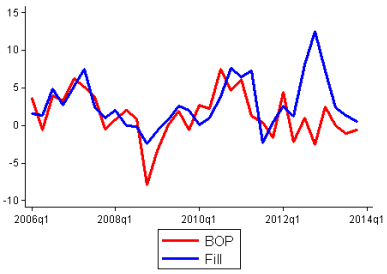
(c) Advanced Central Bank



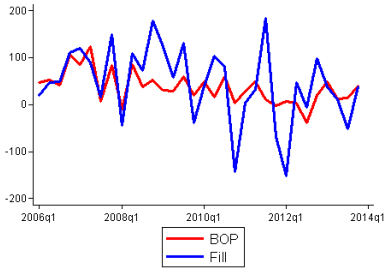
(d) Emerging Central Bank



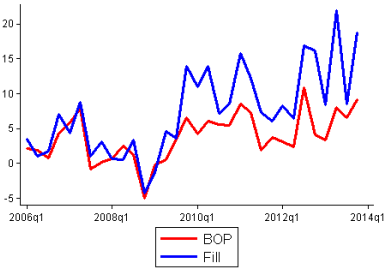
(e) Advanced Banks



(f) Emerging Banks

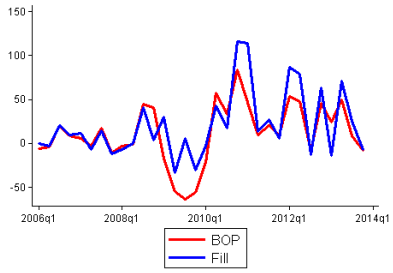


(g) Advanced Corporates

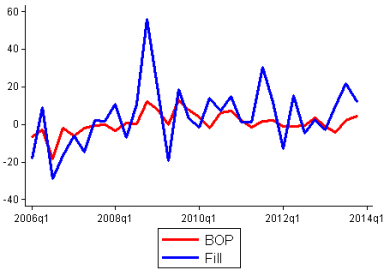


(h) Emerging Corporates

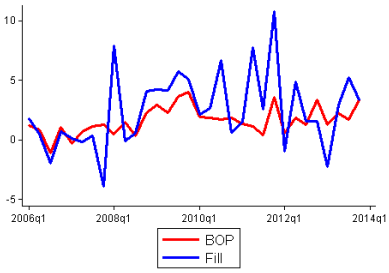
Figure D2: Aggregate Other Investment Debt , Billions USD



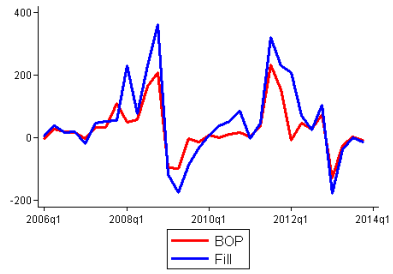
(a) Advanced Government



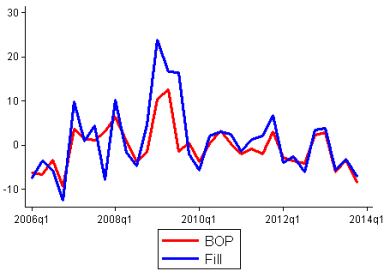
(b) Emerging Government



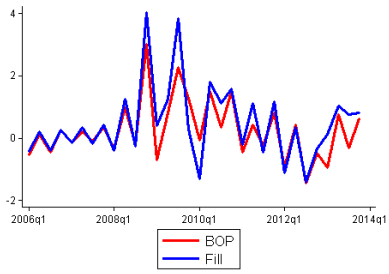
(c) Developing Government



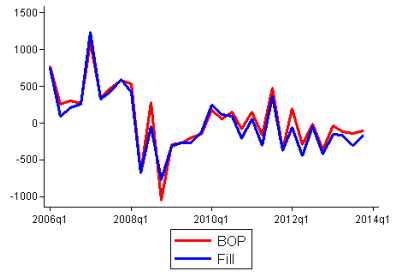
(d) Advanced Central Bank



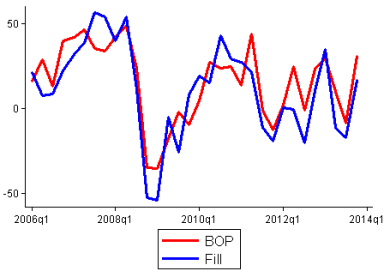
(e) Emerging Central Bank



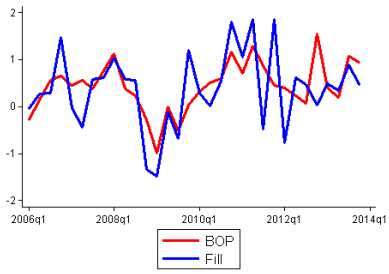
(f) Developing Central Bank



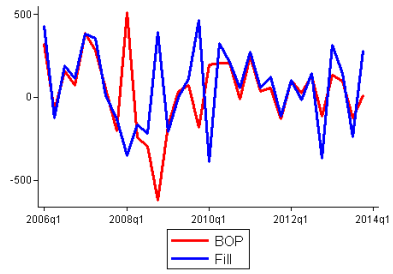
(g) Advanced Banks



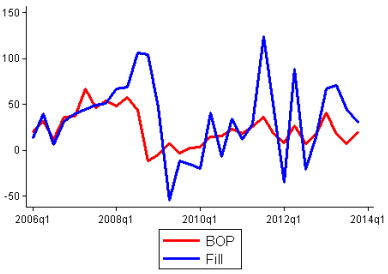
(h) Emerging Banks



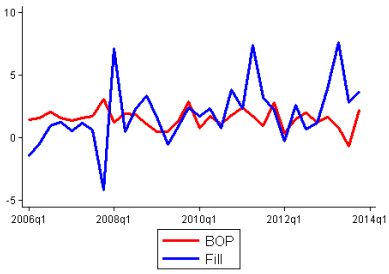
(i) Developing Banks



(j) Advanced Corporates



(k) Emerging Corporates



(l) Developing Corporates

E Samples

E.1 Inflow Figures

There are 89 countries in our annual data sample of capital inflows:[82]

Advanced (25): Australia, Austria, Belgium, Canada, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Korea, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States

Emerging (34): Argentina, Brazil, Bulgaria, Chile, China, Colombia, Croatia, Czech Republic, Egypt, Estonia, Hungary, India, Indonesia, Jordan, Kazakhstan, Latvia, Lebanon, Lithuania, Macedonia, Malaysia, Mexico, Peru, Philippines, Poland, Romania, Russian Federation, Slovak Republic, Slovenia, South Africa, Thailand, Turkey, Ukraine, Uruguay, Venezuela

Developing (30): Albania, Angola, Bangladesh, Belarus, Bolivia, Costa Rica, Cote d'Ivoire, Dominican Republic, Ecuador, El Salvador, Gabon, Ghana, Guatemala, Jamaica, Kenya, Liberia, Mongolia, Montenegro, Morocco, Namibia, Nigeria, Pakistan, Papua New Guinea, Paraguay, Serbia, Sri Lanka, Sudan, Trinidad and Tobago, Tunisia, Vietnam

Countries dropped for the Direct Investment figures (22): Angola, Austria, Belgium, Cote d'Ivoire, El Salvador, Gabon, Greece, India, Ireland, Jamaica, Jordan, Lebanon, Liberia, Malaysia, Montenegro, Morocco, New Zealand, Serbia, Trinidad and Tobago, Ukraine, Venezuela, Vietnam

E.2 Inflow Regressions

Sample was selected from countries that had data for debt flows for all 4 sectors and for GDP over 2001q3-2014q4.

Advanced (23): Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Korea, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States

[82] If we use quarterly data for these figures our sample drops to 85, leaving off El Salvador, Mongolia, Montenegro, and Serbia.

Emerging (28): Argentina, Brazil, Bulgaria, Chile, China, Colombia, Croatia, Czech Republic, Egypt, Estonia, Hungary, India, Indonesia, Kazakhstan, Latvia, Lithuania, Malaysia, Mexico, Peru, Philippines, Poland, Romania, Russian Federation, Slovak Republic, Slovenia, South Africa, Thailand, Turkey

Developing (4): Bolivia, Costa Rica, Ecuador, Guatemala

Note that we drop Cyprus and Iceland due to their large debt flows relative to individual GDP.[83]

E.3 Outflow Sample

Advanced (15): Australia, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Israel, Italy, Japan, Korea, Netherlands, Norway, United Kingdom

Emerging (16): Brazil, Bulgaria, Chile, Colombia, Croatia, Czech Republic, Estonia, Hungary, Kazakhstan, Lithuania, Mexico, Philippines, Russian Federation, South Africa, Thailand, Turkey

For the outflow figures using the annual data, we extend the sample back to 2002 by dropping Korea and Netherlands from the advanced group, though we are able to add Poland and Uruguay to the EM group. The trends in the figures are the same if we use our main sample and start in 2004.

E.4 DRS Debt Data

The DRS data is annual and does not cover advanced economies. It does, however, extend much further back for many of the countries. Our sample consists of 74 countries over 1981-2014 is as follows:

Emerging (14): Brazil, Bulgaria, China, Colombia, Egypt, India, Indonesia, Jordan, Malaysia,

[83] Samples by region (for appendix correlation tables): **NorthAmerica (2):** Canada, United States; **Latin America (10):** Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Guatemala, Mexico, Peru; **Central and Eastern Europe (13):** Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russian Federation, Slovak Republic, Slovenia, Turkey; **Western Europe (16):** Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom; **Emerging Asia (7):** China, India, Indonesia, Kazakhstan, Malaysia, Philippines, Thailand; **Asia (4):** Australia, Japan, Korea, New Zealand; **Middle East and Africa (7):** Egypt, Israel, South Africa

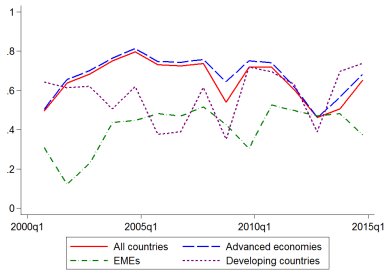
Mexico, Peru, Philippines, Thailand, Turkey

Developing (60): Algeria, Bangladesh, Belize, Benin, Bhutan, Bolivia, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Republic of Congo, Costa Rica, Cote d'Ivoire, Dominica, Dominican Republic, Ecuador, El Salvador, Ethipia, Fiji, Gabon, Ghana, Grenada, Guatemala, Guinea-Bissau, Guyana, Honduras, Jamaica, Kenya, Lesotho, Liberia, Madagascar, Malawi, Maldives, Mali, Mauritania, Morocco, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Papua New Guinea, Paraguay, Rwanda, Senegal, Sierra Leone, Solomon Islands, Sri Lanka, Sudan, Swaziland, Togo, Tunisia, Uganda, Vanuatu, Zambia, Zimbabwe

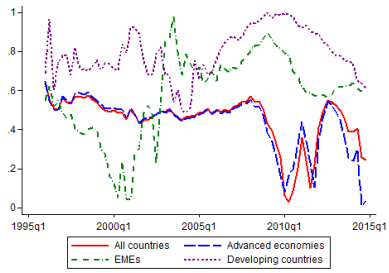
F Additional Results

F.1 Flow Shares by Sector

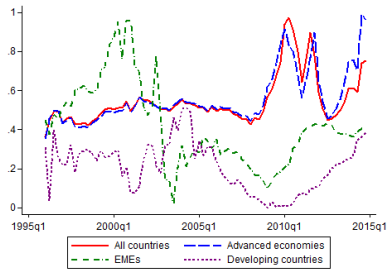
Figure F1: Composition of External Debt Flows - Share by Sector



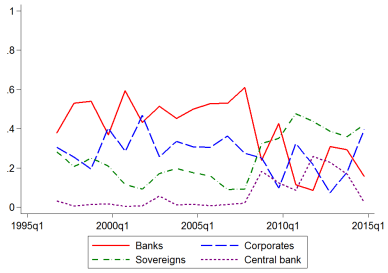
(a) Share of Debt in Total Stocks



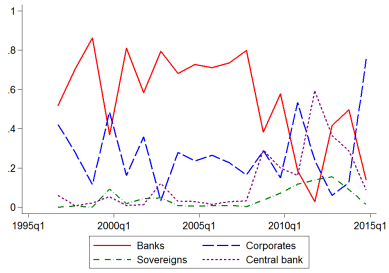
(b) Share of Other Investment in Total Debt Stocks



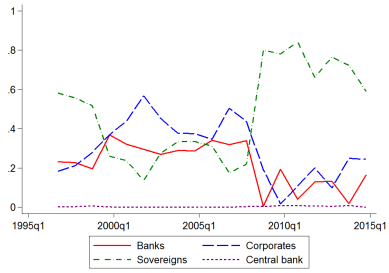
(c) Share of Portfolio Debt in Total Debt Stocks



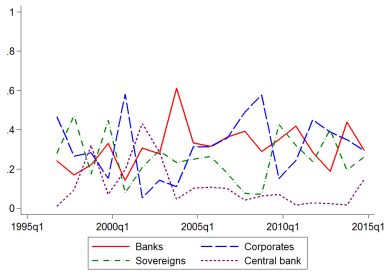
(d) Share of Sectors in Total Debt - Advanced



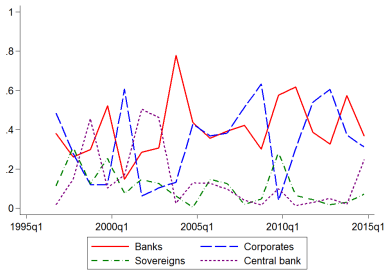
(e) Share of Sectors in Other Investment Debt - Advanced



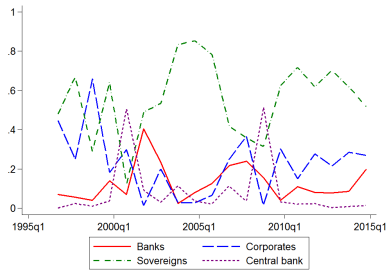
(f) Share of Sectors in Portfolio Debt - Advanced



(g) Share of Sectors in Total Debt - Emerging



(h) Share of Sectors in Other Investment Debt - Emerging



(i) Share of Sectors in Portfolio Debt - Emerging

Source: BOP, IIP, QEDS, and BIS, authors' calculations. Panel (a) uses annual data after 2001 in order to get a balanced sample.

F.2 Average Debt Flows to GDP

Figure F2: Average External Debt Inflows, Percent of GDP

(a) Total Debt, Advanced (b) Total Debt, Emerging (c) Total Debt, Developing

(d) Portfolio Debt, Advanced (e) Portfolio Debt, Emerging (f) Portfolio Debt, Developing

(g) Other Investment Debt, Advanced (h) Other Investment Debt, Emerging (i) Other Investment Debt, Developing

Source: BOP, IIP, QEDS, and BIS, authors' calculations. Total debt is portfolio debt + other investment debt.

Since aggregate figures can be driven by some of the large players in each group, we normalize flows by GDP and examine the evolution of the average. Figure F2 (a)-(c) plots this for each country group by sector. For both advanced and emerging economies, we see a collective sudden stop in banking inflows at the time of the 2008 crisis. Unlike the aggregate figures, we do not see the dramatic increase in debt inflows to emerging market banks and corporates following the GFC for the average country. Emerging market corporate borrowing similarly dropped at the time of the crisis, but the drop was not as large as for banks. The

pattern of government debt inflows surging at the crisis survives for the average emerging market country.

Splitting debt again into portfolio and other investment debt in panels (d)-(f) and (g)-(i), we can see the magnitude of the collapse and the ensuing sustained decrease in other investment debt flows to banks relative to GDP for the average advanced economy. For emerging market corporates, the factor that mitigates the collapse in other investment debt flows is the sustained increase in bond inflows relative to GDP. Bond inflows to governments still tend to be quite large relative to other sectors, particularly after the GFC and generally for EM.

F.3 Direct Investment Debt

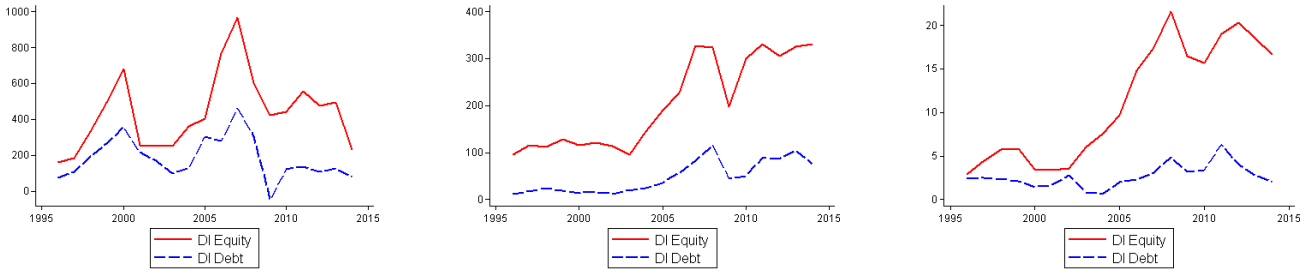
The direct investment debt (DID) component of the data is not as extensively reported as our augmented data for portfolio debt and other investment inflows, so we limit our sample for this analysis.[84] The balanced DID sample is a subsample of 67 countries, of which there are 20 advanced, 28 emerging, and 19 developing. Details of the 22 countries that are dropped can be found in Appendix E.

Direct investment debt is an important part of direct investment flows, as shown in Figure F3 where we plot it against direct investment equity, in aggregate terms. The figure shows that they share the same pattern over time. However, with the rise in offshore issuance much of direct investment debt may really be more like portfolio debt flows and hence less stable than its equity counterpart (Avdjiev et al., 2014). Direct investment debt makes up a larger share of direct investment for AE, but less so for EM and especially developing countries. It is interesting to note that, for both debt and equity, direct investment has decreased substantially in advanced economies following the global financial crisis, but has leveled off somewhat in emerging and developing economies. Thus, while direct investment debt plays a larger role in the advanced world prior to the crisis, its influence will

[84] When DID is missing, we fill it by subtracting direct investment equity (DIE) from total direct investment, as with our other data series.

be felt relatively more in other economies.

Figure F3: Aggregate Direct Investment Inflows, Billions 1996 USD

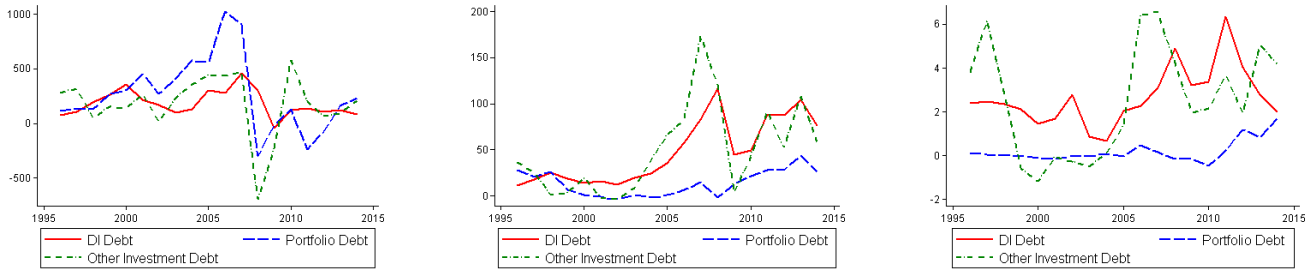


(a) Advanced (b) Emerging (c) Developing

Source: BOP data and authors' calculations.

Direct investment debt is only recorded in the BOP if one of the (related) counterparties involved is a non-financial entity. Debt flows between related financial enterprises (including banks) are captured in either portfolio debt or other investment debt. We make the assumption that direct investment debt flows from offshore non-financial firms to onshore financial firms (or banks) are negligible. With this assumption, we can allocate direct investment debt to the corporate sector. We compare direct investment debt, portfolio debt, and other investment debt for the corporate sector in Figure F4.[85]

Figure F4: Aggregate Corporate Debt Inflows, Billions 1996 USD



(a) Advanced (b) Emerging (c) Developing

Source: BOP data and authors' calculations.

[85]When comparing direct investment with our other series that have been filled using BIS data, we need to assume that direct investment debt flows from banks to non-financial firms are negligible (else they would be double counted). This assumption applies to less than 3% of observations in our direct investment debt sample, as most observations with non-zero direct investment debt are not mising the other investment debt for coprorates series in the BOP.

We see that direct investment debt can be significant in size, relative to other capital flow types. It tends to follow the same trends as other forms of debt in the aggregate, but can have some influence on the evolution of total debt. In fact, it is larger than the other debt components in some periods.

F.4 PPG vs PNG Debt Inflows

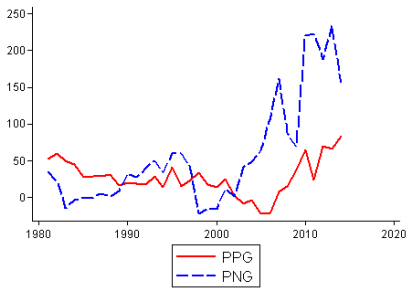
We have focused on the sectoral split of inflows by government, central bank, banks, and corporates, and found important differences between public and private flows. Another way to examine the roles of the public and private sector is to split the data by Public and Publicly-Guaranteed Debt (PPG) vs Private Non-Guaranteed Debt (PNG). This allows us to capture flows nominally allocated to the private sector which should actually be considered liabilities of the public sector, such as borrowing by public and quasi-public corporations common in many EM.[86] We can do this for EM and developing economies using the World Bank's Debtor Reporting System (DRS) data found within the World Bank International Debt Statistics (WB-IDS). This data is annual going back to 1970 for many countries, but we use a balanced sample of 14 EM and 60 developing countries over 1981-2014.[87]

Figure F5 (a)-(b) plots aggregate debt inflows from the DRS data, with flows split by PPG and PNG debt. Panels (c)-(d) plot the average of PPG and PNG debt to GDP ratio for each group of countries. According to these measures, PNG debt in EM soared leading up to the GFC, as most measures of debt inflows did. Following a brief collapse, PNG debt rebounded significantly in the aggregate, but this rebound is muted if we examine flows relative to GDP for the average country. This is consistent with what we see in Figures 6 and

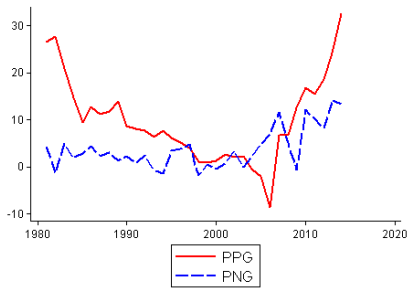
[86] The usual definitions allocate flows to the sector of the immediate borrower, not the sector who is ultimately owes the debt, which may result in effectively misattributing the debt to the wrong sector. Also, note that all of our measures are based on the residency principle, however the recent increase in offshore bond issuance can also be a source of mismeasurement of capital flows. Offshore bond issuance has received significant recent attention in Shin (2013), Avdjiev et al. (2014), Avdjiev, McCauley, and Shin (2016), and others, so we refer the interested reader to those sources for a more complete discussion of the issue.

[87] See Section E in the appendix for details on the sample. The DRS data is first split into short term, long term, and IMF credits. The long term data can be further subdivided by PNG debt and PPG debt. The PPG debt can further be split by creditor. We assume that the portion of PPG debt that is short term is negligible, and so attribute all Short Term Debt to PNG. We further combine IMF credit into PPG debt to get our split of total external debt into public and private components. This is analgous to the decomposition done in Alfaro, Kalemli-Özcan, and Volosovych (2014), who do their analysis in the context of net flows.

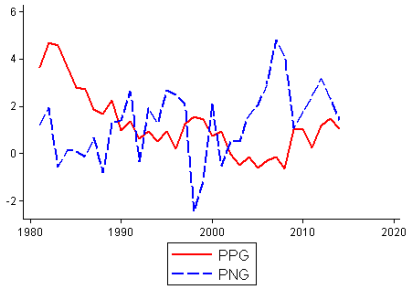
Figure F5: PPG vs. PNG Debt Inflows



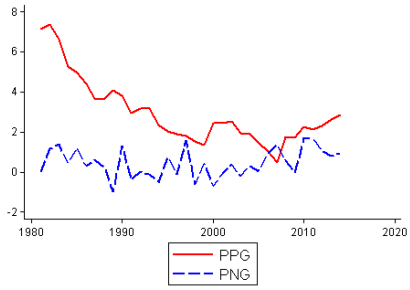
(a) Aggregate, Billions 1996 USD, Emerging



(b) Aggregate, Billions 1996 USD, Developing



(c) Average, Percent GDP, Emerging



(d) Average, Percent GDP, Developing

Source: World Bank DRS data and authors' calculations.

F2, where much of the post-2008 increase in aggregate flows is driven by large and quickly growing EM such as China.[88]

In both emerging and developing economies, and in both the aggregate and average GDP figures, we see a steady decline in PPG debt until the GFC, after which it rebounds, and significantly so in the case of developing economies. This is similar to what we observe in Figures 6 and F2, but in those figures the decrease leading up to 2008 is not as pronounced as when you take the longer time horizon.

These figures also highlight how private and public capital flows can move opposite each other, consistent with our previous results. This is particularly noticeable for EM around the 2008 crisis, where we see PNG flows fall dramatically while PPG flows rise, thus smoothing out the total debt inflows.

[88]These figures will not be exactly comparable in terms of magnitude with our previous dataset in Figure 6, as the underlying sample of countries is somewhat different.

F.5 Correlations with the VIX

Recent work by Rey (2013), Bruno and Shin (2015), and others highlights how capital flows tend to move together and correlate strongly with the VIX, a common proxy for global liquidity or global risk aversion. We use our dataset to perform this analysis while distinguishing flows by sector. We use the quarterly version of our dataset and restrict our sample to countries where we have quarterly GDP data for the period, 2001q3-2014q4.[89] This reduces our sample to 23 advanced, 28 emerging, and 4 developing countries, 55 in total. The sample is detailed in Appendix E. We split our countries into groups, aggregate their flows, and normalize those flows by their aggregate GDP. Negative correlations are displayed in red.

Table F1: Correlation of Aggregate Inflows with VIX, by Capital Flow Type

Regions	DI	PE	PD	OID	DID	DIE
World	-0.17	-0.52	-0.46	-0.47	-0.16	-0.12
N. America	-0.19	-0.12	-0.38	-0.43	-0.47	0.06
Lat. America	0.01	-0.34	-0.43	-0.20	-0.15	0.11
Cent./East. Europe	0.01	-0.39	-0.51	-0.32	-0.01	0.02
West. Europe	-0.12	-0.44	-0.27	-0.42	-0.02	-0.44
Em. Asia	-0.24	-0.50	-0.51	-0.52	-0.24	-0.22
Adv. Asia	0.07	-0.40	-0.41	-0.07	0.04	0.05
ME/Africa	-0.25	-0.37	-0.46	-0.35	-0.27	-0.09

Sample consists of 55 countries over 2001q3-2014q4, and is described in Appendix E. DI = direct investment; PE = portfolio equity; PD = portfolio debt; OID = other investment debt; DID = direct investment debt; DIE = direct investment equity. We allow portfolio equity and direct investment to be zero if missing when computing the aggregate figures, but correlations are comparable if we restrict to a balanced sample where equity flows are non-missing. Flows are aggregated by group and normalized by group aggregate GDP.

Table F1 is akin to correlations in Rey (2013), with flows split by capital flow type and borrower region. In addition to the 4 main components of flows, we display correlations for the debt and equity portions of direct investment separately. Like her results, we see the familiar pattern of capital flows that are negatively correlated with the VIX across all capital flow types. The exception to this is direct investment flows, which Rey finds to be always positively correlated with the VIX. Our results show negative correlations instead, in-

[89] Availability of quarterly GDP data constrains the size and length of our sample.

cluding at the world level, although strictly speaking they are not statistically significant.[90] This is driven by the sample window: Rey's window is 1990q1-2012q4, but direct investment begins to move more opposite of the VIX in more recent years (our sample window is 2001q3-2014q4).

Table F2: Correlation of Aggregate Debt Inflows with VIX, by Geography and Sector

Regions	Gov	CB	Bank	Corp	All
World	0.24	0.31	-0.52	-0.59	-0.52
N. America	0.34	0.04	-0.11	-0.62	-0.48
Lat. America	-0.27	0.42	-0.47	-0.38	-0.38
Cent./East. Europe	-0.10	0.27	-0.56	-0.37	-0.47
West. Europe	0.11	0.30	-0.49	-0.36	-0.44
Em. Asia	-0.25	-0.13	-0.46	-0.52	-0.57
Adv. Asia	-0.15	0.15	-0.06	-0.37	-0.30
ME/Africa	-0.19	-0.20	-0.25	-0.45	-0.52

Sample consists of 55 countries over 2001q3-2014q4, and is described in Appendix E. Debt flows are inflows of portfolio and other investment debt. Flows are aggregated by group and normalized by group aggregate GDP.

Table F3: Correlation of Aggregate Portfolio Debt Inflows with VIX, by Geography and Sector

Region	Gov	CB	Bank	Corp	All
World	0.23	-0.25	-0.54	-0.50	-0.46
N. America	0.32	-0.02	-0.59	-0.52	-0.38
Lat. America	-0.36	-0.38	-0.45	-0.30	-0.43
Cent./East. Europe	-0.4	-0.02	-0.63	-0.43	-0.51
West. Europe	0.16	-0.09	-0.46	-0.21	-0.27
Em. Asia	-0.34	-0.24	-0.42	-0.38	-0.51
Adv. Asia	-0.22	-0.11	-0.47	-0.41	-0.41
ME/Africa	-0.33	-0.14	-0.13	-0.29	-0.46

Sample consists of 55 countries over 2001q3-2014q4, and is described in Appendix E. Flows are aggregated by group and normalized by group aggregate GDP.

Analysis by capital flow type may obscure important trends and relationships in flows by sector (see Alfaro, Kalemli-Özcan, and Volosovych (2014) for an emphasis on this point for the case of net flows). In Table F2, we take the debt inflows (portfolio debt + other investment debt) and split them by sector and then examine the correlation with the VIX. The last column is the total flow of all 4 sectors combined. The most striking feature of

[90] The approximate standard error of each correlation in the table is 0.13.

Table F4: Correlation of Aggregate Other Investment Debt Inflows with VIX, by Geography and Sector

Region	Gov	CB	Bank	Corp	All
World	0.11	0.31	-0.49	-0.52	-0.46
N. America	0.28	0.04	0.00	-0.58	-0.43
Lat. America	0.17	0.44	-0.42	-0.29	-0.20
Cent./East. Europe	0.26	0.28	-0.52	-0.33	-0.32
West. Europe	-0.11	0.30	-0.47	-0.30	-0.42
Em. Asia	-0.04	-0.03	-0.42	-0.51	-0.52
Adv. Asia	0.16	0.15	0.10	-0.31	-0.07
ME/Africa	0.23	-0.14	-0.24	-0.39	-0.35

Sample consists of 55 countries over 2001q3-2014q4, and is described in Appendix E. Flows are aggregated by group and normalized by group aggregate GDP.

Table F2 is that inflows to the banks and corporates (the private sectors) are all negatively correlated with the VIX as usual, but inflows to governments and central banks (the public sectors) are often positively correlated, particularly for more developed regions like North America and Western Europe. The positive correlation of government debt with the VIX at the World level is driven by these large, AE. Tables F3 and F4 in Appendix F present these correlations by region with debt split into portfolio debt and other investment debt.

Table F5: Correlation of Aggregate Debt Inflows with VIX, by Development, Sector, and Capital Flow Type

	Portfolio Debt				Other Investment Debt			
Group	Gov	CB	Bank	Corp	Gov	CB	Bank	Corp
Advanced	0.28	-0.16	-0.53	-0.49	0.02	0.29	-0.44	-0.48
Emerging	-0.49	-0.26	-0.65	-0.48	0.30	0.33	-0.61	-0.51
Developing	-0.19	-0.07	-0.11	-0.14	0.10	0.24	-0.29	-0.15

Sample consists of 55 countries over 2001q3-2014q4, and is described in Appendix E. Flows are aggregated by group and normalized by group aggregate GDP.

Table F5 shows the correlations, but with debt split into portfolio debt and other investment debt and countries grouped by development. Here we see clearly the delineation between public and private sectors. Advanced economy government portfolio debt correlates positively with the VIX. This is consistent with a flight to safe assets during crisis times, or may reflect advanced economy governments borrowing more in response to a crisis. Emerging market sovereigns face the same fate as their private sector, with portfolio

debt inflows falling as the VIX rises. Other investment debt to the public sectors is positively correlated across each group, though the correlation is strongest for EM and for advanced central banks. Thus, while emerging market sovereigns may not be able to obtain bond financing from international financial markets during a global crisis, they are able to obtain other forms of credit, perhaps from public sector lenders such as the IMF. Other developing nations have quantitatively the weakest connection of their flows to the VIX, but follow the same qualitative patterns as emerging market countries.

F.6 Correlations Between Flows

We also examine the correlation of capital flows across sectors and flow types. Rey (2013) shows that capital flows tend to move together across asset classes and regions. We explore this relationship by sectors in stages. Table F6 presents these correlations over the whole sample. Consistent with our previous results, public and private flows tend to move in opposite directions.

Table F6: Correlation of Aggregate Inflows by Sector

	GG DB	CB DB	DC DB	OS DB
GG DB	1.00			
CB DB	0.21	1.00		
DC DB	-0.12	-0.20	1.00	
OS DB	-0.20	-0.30	0.80	1.00

Sample consists of 55 countries over 2001q3-2014q4, and is described in Appendix E. Aggregate flows are normalized by aggregate GDP. GG = Government; CB = Central Bank; DC = Banks; OS = Corporates; DB = Debt, which is the sum of portfolio debt and other investment debt.

We disaggregate the flows by type in Table F7. Here, we see a bit more contrast. Some public flows do not move together, such as central bank portfolio debt, which moves opposite that of central bank and government other investment debt, but co-moves with bank and corporate portfolio debt. Also, government portfolio debt has a weakly positive correlation with corporate other investment debt. Corporate and bank other investment debt tend to move together, and equally strong is the correlation between corporate and bank portfo-

lio debt. The cross correlations of these also tend to be large, with the correlation between other and portfolio debt for corporates being the lowest.

Table F7: Correlation of Aggregate Flows by Sector and Capital Flow Type

	GG PD	CB PD	DC PD	OS PD	GG OID	CB OID	DC OID	OS OID
GG PD	1.00							
CB PD	-0.05	1.00						
DC PD	-0.13	0.54	1.00					
OS PD	-0.28	0.43	0.77	1.00				
GG OID	0.05	-0.33	-0.48	-0.34	1.00			
CB OID	0.08	-0.32	-0.45	-0.33	0.46	1.00		
DC OID	-0.01	0.36	0.70	0.55	-0.20	-0.14	1.00	
OS OID	0.01	0.38	0.62	0.46	-0.18	-0.23	0.71	1.00

Sample consists of 55 countries over 2001q3-2014q4, and is described in Appendix E. Aggregate flows are normalized by aggregate GDP. GG = Government; CB = Central Bank; DC = Banks; OS = Corporates; PD = portfolio debt; OID = other investment debt

Table F8 in shows the correlation of flows by sector, capital flow type, and country group for advanced and emerging countries. Similar patterns remain, but additional detail on these relationships is uncovered. For instance, while advanced economy government debt tends to move opposite that of their banks, emerging market government portfolio debt inflows tend to move with either advanced or emerging bank inflows.

When flows are split by sector, the common finding that most flows tend to move together no longer holds. Rather, there is an interesting interplay between flows to the public and private sectors of the economy, and the relationship seems to be different for advanced than for emerging economies.

Table F8: Correlation of Flows

	Advanced								Emerging							
	Gov.		Cent. Bank		Bank		Corp.		Gov.		Cent. Bank		Bank		Corp.	
Variables	PD	OID	PD	OID	PD	OID	PD	OID	PD	OID	PD	OID	PD	OID	PD	OID
AE GG PD	1.00															
AE GG OID	0.02	1.00														
AE CB PD	-0.08	-0.23	1.00													
AE CB OID	0.11	0.45	-0.23	1.00												
AE DC PD	-0.21	-0.39	0.43	-0.46	1.00											
AE DC OID	-0.08	-0.11	0.24	-0.11	0.67	1.00										
AE OS PD	-0.32	-0.25	0.29	-0.32	0.76	0.53	1.00									
AE OS OID	-0.06	-0.10	0.09	-0.24	0.58	0.67	0.43	1.00								
EM GG PD	0.10	0.01	-0.02	-0.17	0.23	0.29	0.09	0.55	1.00							
EM GG OID	0.18	-0.09	-0.13	0.03	-0.42	-0.42	-0.43	-0.32	0.08	1.00						
EM CB PD	-0.07	-0.21	0.15	-0.30	0.42	0.33	0.43	0.61	0.37	-0.10	1.00					
EM CB OID	-0.04	0.03	0.08	-0.00	-0.15	-0.12	-0.19	-0.06	-0.25	-0.05	-0.01	1.00				
EM DC PD	-0.01	0.06	0.06	-0.16	0.37	0.38	0.33	0.53	0.53	-0.10	0.35	-0.12	1.00			
EM DC OID	0.02	0.16	0.05	-0.15	0.49	0.49	0.35	0.56	0.37	-0.25	0.27	-0.24	0.47	1.00		
EM OS PD	0.05	-0.02	-0.09	-0.13	0.15	0.15	0.12	0.33	0.61	0.18	0.35	-0.22	0.62	0.39	1.00	
EM OS OID	0.00	0.09	0.17	0.09	0.44	0.38	0.38	0.28	0.11	-0.25	0.19	-0.24	0.46	0.71	0.35	1.00

Sample consists of 55 countries over 2001q3-2014q4, and is described in Appendix E. Flows are aggregated by group and normalized by group aggregate GDP. AE = Advanced Economies; EM = EM; GG = Government; CB = Central Bank; DC = Banks; OS = Corporates; PD = portfolio debt; OID = other investment debt

F.7 Inflow Regressions

Before getting to the sector decomposition, we use the BOP data as is, filling missing data with zero, as typically done in the literature. Table F9 presents regressions by capital flow type. As expected, we see that capital inflows are negatively associated with the VIX across all capital flow types, with high significance on total flows and other investment debt flows. GDP growth is likewise positively associated with capital inflows, with high significance for total and other investment flows. Portfolio equity is negatively correlated with GDP growth, though this relationship is not significant.

Panel B restricts the sample to just advanced economies. The same results hold generally, but with larger coefficients. Portfolio debt inflows are not significantly related to the VIX, however, and the (insignificant) coefficient on direct investment flows is negative.

Examining the results for EM reveals important differences. Panel C shows these regressions. We similarly see that total flows and other investment debt are negatively related to the VIX and positively related to GDP growth. However, we see that both portfolio debt as well as direct investment are significantly related to the VIX. Direct investment also has a significant positive coefficient on GDP growth.

The fact that the VIX has a negative and statistically significant impact also on FDI in EMs is important because it is a flow category that is generally thought of as less volatile. The negative response is consistent with what has been found in Lane and Milesi-Ferretti (2016), who argue that FDI flows capture a lot of investment flows by financial entities and booking at financial and offshore centers, and Blanchard and Acalin (2016), who find that FDI inflows and outflows at the quarterly frequency are highly correlated, and emerging market FDI flows respond to the US monetary policy rate. These papers suggest that a lot of measured FDI is in fact transitional flows between financial centers.[91]

[91] See Kalemli-Özcan, Sorensen, Volosovych, and Villegas-Sanchez (2016) who decomposes FDI between European countries into industrial and financial FDI separating direct and ultimate investors using micro data on foreign ownership. They find that FDI based on ultimate investment is much lower, less volatile and in fact mostly done by US ultimate investors, but transitions through European financial centers as captured by direct foreign ownership.

Table F9: Drivers of Capital Inflows, by Instrument (Quarterly BOP data, missing filled with Zero)

Panel A: All Countries					
	(1)	(2)	(3)	(4)	(5)
	Total	Direct Investment	Portfolio Equity	Portfolio Debt	Other Investment Debt
$\log(VIX_{t-1})$	-7.986***	-1.166	-1.087	-1.252	-4.481***
	(2.654)	(0.626)	(0.809)	(0.670)	(1.347)
GDP Growth$_{it-1}$	0.218***	0.0366	-0.0245	0.0104	0.196***
	(0.0472)	(0.0199)	(0.0178)	(0.0190)	(0.0473)
Observations	2695	2695	2695	2695	2695
R^2	0.041	0.008	0.006	0.005	0.037
CountryFE	Yes	Yes	Yes	Yes	Yes
Panel B: Advanced Economies					
	(1)	(2)	(3)	(4)	(5)
	Total	Direct Investment	Portfolio Equity	Portfolio Debt	Other Investment Debt
$\log(VIX_{t-1})$	-14.87**	-1.801	-2.286	-1.961	-8.823***
	(5.998)	(1.444)	(1.874)	(1.575)	(2.897)
GDP Growth$_{it-1}$	0.370***	-0.00381	-0.0651	0.0883	0.350**
	(0.100)	(0.0342)	(0.0500)	(0.0501)	(0.128)
Observations	1127	1127	1127	1127	1127
R^2	0.055	0.005	0.012	0.015	0.049
CountryFE	Yes	Yes	Yes	Yes	Yes
Panel C: EM					
	(1)	(2)	(3)	(4)	(5)
	Total	Direct Investment	Portfolio Equity	Portfolio Debt	Other Investment Debt
$\log(VIX_{t-1})$	-3.344***	-0.788***	-0.204	-0.734***	-1.618**
	(0.831)	(0.251)	(0.115)	(0.238)	(0.787)
GDP Growth$_{it-1}$	0.165***	0.0552**	-0.00324	-0.0246	0.138***
	(0.0518)	(0.0239)	(0.00233)	(0.0120)	(0.0365)
Observations	1372	1372	1372	1372	1372
R^2	0.074	0.020	0.003	0.010	0.094
CountryFE	Yes	Yes	Yes	Yes	Yes

Sample is from 2002q4-2014q4, samples as listed in Appendix E. Capital inflow data is from Balance of Payments, with any missing data replaced with zeros. Dependent variables are expressed as a percentage of GDP. VIX is the implied volatility of S&P 500 index options. GDP growth is calculated as a year-on-year percentage growth. Errors are clustered at the country level. ** $p < 0.05$, *** $p < 0.01$

Interestingly, portfolio debt has a negative coefficient on GDP growth (significant at the 10% level), which is at odds with the majority of flows.

Table F10: Drivers of Total Debt Inflows Before and After the Global Financial Crisis, by Sector - Advanced Economies (Quarterly AHKS data, missing filled from Public Sources)

	Pre-GFC: 2002q4-2007q4				Post-GFC: 2008q1-2014q4			
	(1) Total	(2) Public	(3) Banks	(4) Corp.	(5) Total	(6) Public	(7) Banks	(8) Corp.
$\log(VIX_{t-1})$	-10.47***	-0.405	-7.224***	-2.843**	1.879	2.081	-0.255	0.0529
	(2.308)	(0.817)	(1.805)	(1.143)	(3.714)	(2.351)	(1.938)	(0.647)
GDP Growth$_{it-1}$	0.00662	0.0293	0.00464	-0.0273	0.441***	0.153***	0.196**	0.0919
	(0.0741)	(0.0309)	(0.0576)	(0.0429)	(0.145)	(0.0462)	(0.0830)	(0.0478)
Observations	483	483	483	483	644	644	644	644
R^2	0.042	0.001	0.025	0.039	0.030	0.008	0.011	0.013
CountryFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Sample is from 2002q4-2014q4, countries as listed in Appendix E. Total Debt is the sum of Portfolio Debt and Other Investment Debt inflow data, constructed by AHKS as described in Section 2. Public inflows are defined as the sum of General Government and Central Bank inflows. Dependent variables are expressed as a percentage of GDP. VIX is the implied volatility of S&P 500 index options. GDP growth is calculated as a year-on-year percentage growth. Errors are clustered at the country level. ** $p < 0.05$, *** $p < 0.01$

Table F11: Drivers of Total Debt Inflows Before and After the Global Financial Crisis, by Sector - Emerging Markets (Quarterly AHKS data, missing filled from Public Sources)

	Pre-GFC: 2002q4-2007q4				Post-GFC: 2008q1-2014q4			
	(1) Total	(2) Public	(3) Banks	(4) Corp.	(5) Total	(6) Public	(7) Banks	(8) Corp.
$\log(VIX_{t-1})$	-3.269***	0.271	-1.595**	-1.945***	-0.927	1.465	-2.047**	-0.345
	(0.813)	(0.430)	(0.586)	(0.380)	(1.022)	(1.132)	(0.780)	(0.282)
GDP Growth_{it-1}	0.00421	-0.00331	0.0152	-0.00764	0.0717***	-0.0377***	0.0747***	0.0348***
	(0.0171)	(0.00843)	(0.0148)	(0.00885)	(0.0197)	(0.0135)	(0.0173)	(0.00876)
Observations	588	588	588	588	784	784	784	784
R^2	0.037	0.001	0.018	0.073	0.025	0.018	0.072	0.045
CountryFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Sample is from 2002q4-2014q4, countries as listed in Appendix E. Total Debt is the sum of Portfolio Debt and Other Investment Debt inflow data, constructed by AHKS as described in Section 2. Dependent variables are expressed as a percentage of GDP. VIX is the implied volatility of S&P 500 index options. GDP growth is calculated as a year-on-year percentage growth. Errors are clustered at the country level. ** $p < 0.05$, *** $p < 0.01$

Table F12: Robustness on Controls: Drivers of Total Debt Inflows, All Sectors - Advanced Economies (Quarterly AHKS data, missing filled from Public Sources)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\log(VIX_{t-1})$	-9.101***	-4.154	-3.733	-11.27***	-11.45***	-2.690	-5.111
	(2.676)	(2.294)	(2.260)	(3.134)	(3.138)	(1.592)	(2.618)
$GDP\ Growth_{it-1}$	0.506***	0.402**	0.539***	0.526**	0.275**	0.285	0.276**
	(0.179)	(0.150)	(0.185)	(0.189)	(0.122)	(0.138)	(0.133)
FFR_{t-1}		3.199***				5.404***	3.397***
		(0.871)				(1.266)	(0.977)
$Yield\ Curve_{t-1}$			-3.892***			3.016**	1.101
			(1.109)			(1.087)	(1.337)
$TED\ Spread_{t-1}$				4.422		-4.517	-2.554
				(2.988)		(2.428)	(2.639)
Observations	1127	1127	1127	1127	1127	1127	1127
R^2	0.065	0.105	0.086	0.069	0.100	0.112	0.114
CountryFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
TimeTrend					Yes		Yes

Sample is from 2002q4-2014q4, countries as listed in Appendix E. Total Debt is the sum of Portfolio Debt and Other Investment Debt inflow data, constructed by AHKS as described in Section 2. Dependent variables are expressed as a percentage of GDP. VIX is the implied volatility of S&P 500 index options. GDP growth is calculated as a year-on-year percentage growth. FFR is the effective US Federal Funds Rate, lagged one quarter. Yield Curve is the difference between 10 year US Treasury constant maturity rate and 3 month US Treasury constant maturity rate, lagged one quarter. TED Spread is the difference between the 3 month US dollar LIBOR rate and the 3 month US Treasury rate, lagged one quarter. FFR is the effective US Federal Funds Rate, lagged one quarter. Yield Curve is the difference between 10 year US Treasury constant maturity rate and 3 month US Treasury constant maturity rate, lagged one quarter. TED Spread is the difference between the 3 month US dollar LIBOR rate and the 3 month US Treasury rate, lagged one quarter. Errors are clustered at the country level. ** $p < 0.05$, *** $p < 0.01$

Table F13: Robustness on Controls: Drivers of Total Debt Inflows, All Sectors - Emerging Markets (Quarterly AHKS data, missing filled from Public Sources)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\log(VIX_{t-1})$	-2.261**	-1.197	-0.824	-2.539***	-2.637***	0.0743	0.554
	(0.829)	(0.745)	(0.681)	(0.858)	(0.948)	(0.622)	(0.840)
GDP $Growth_{it-1}$	0.116***	0.0828***	0.108***	0.114***	0.0946***	0.0826***	0.0836***
	(0.0347)	(0.0252)	(0.0317)	(0.0342)	(0.0254)	(0.0234)	(0.0234)
FFR_{t-1}		0.796***				0.900	1.297***
		(0.282)				(0.485)	(0.449)
Yield $Curve_{t-1}$			-1.107***			-0.209	0.173
			(0.313)			(0.463)	(0.407)
TED $Spread_{t-1}$				0.524		-1.624	-2.018
				(0.727)		(0.892)	(1.000)
Observations	1372	1372	1372	1372	1372	1372	1372
R^2	0.071	0.100	0.093	0.071	0.079	0.105	0.106
CountryFE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
TimeTrend					Yes		Yes

Sample is from 2002q4-2014q4, countries as listed in Appendix E. Total Debt is the sum of Portfolio Debt and Other Investment Debt inflow data, constructed by AHKS as described in Section 2. Dependent variables are expressed as a percentage of GDP. VIX is the implied volatility of S&P 500 index options. GDP growth is calculated as a year-on-year percentage growth. FFR is the effective US Federal Funds Rate, lagged one quarter. Yield Curve is the difference between 10 year US Treasury constant maturity rate and 3 month US Treasury constant maturity rate, lagged one quarter. TED Spread is the difference between the 3 month US dollar LIBOR rate and the 3 month US Treasury rate, lagged one quarter. FFR is the effective US Federal Funds Rate, lagged one quarter. Yield Curve is the difference between 10 year US Treasury constant maturity rate and 3 month US Treasury constant maturity rate, lagged one quarter. TED Spread is the difference between the 3 month US dollar LIBOR rate and the 3 month US Treasury rate, lagged one quarter. Errors are clustered at the country level. ** $p < 0.05$, *** $p < 0.01$

Table F14: Robustness on GDP Growth: Drivers of Total Debt Inflows, by Sector - Advanced Economies (Quarterly AHKS data, missing filled from Public Sources)

	(1) Total	(2) Public	(3) Banks	(4) Corp.
$\log(VIX_{t-1})$	-10.48***	0.614	-8.600***	-2.495**
	(2.986)	(1.418)	(2.301)	(1.064)
$GDP\ Growth_{it-1}$	0.566**	0.00402	0.446**	0.116
	(0.241)	(0.0688)	(0.211)	(0.0737)
Observations	1127	1127	1127	1127
R^2	0.047	0.000	0.046	0.025
CountryFE	Yes	Yes	Yes	Yes

Sample is from 2002q4-2014q4, countries as listed in Appendix E. Total Debt is the sum of Portfolio Debt and Other Investment Debt inflow data, constructed by AHKS as described in Section 2. Dependent variables are expressed as a percentage of GDP. VIX is the implied volatility of S&P 500 index options. GDP growth is calculated as country year-on-year percentage GDP growth minus aggregate advanced economy year-on-year GDP growth. Errors are clustered at the country level. ** $p < 0.05$, *** $p < 0.01$

Table F15: Robustness on GDP Growth: Drivers of Total Debt Inflows, by Sector - Emerging Markets (Quarterly AHKS data, missing filled from Public Sources)

	(1) Total	(2) Public	(3) Banks	(4) Corp.
$\log(VIX_{t-1})$	-2.505***	1.188	-2.562***	-1.132***
	(0.862)	(0.677)	(0.747)	(0.253)
$GDP\ Growth_{it-1}$	0.133***	-0.0390***	0.124***	0.0478***
	(0.0440)	(0.0136)	(0.0430)	(0.0112)
Observations	1372	1372	1372	1372
R^2	0.066	0.017	0.099	0.078
CountryFE	Yes	Yes	Yes	Yes

Sample is from 2002q4-2014q4, countries as listed in Appendix E. Total Debt is the sum of Portfolio Debt and Other Investment Debt inflow data, constructed by AHKS as described in Section 2. Dependent variables are expressed as a percentage of GDP. VIX is the implied volatility of S&P 500 index options. GDP growth is calculated as country year-on-year percentage GDP growth minus aggregate advanced economy year-on-year GDP growth. Errors are clustered at the country level. ** $p < 0.05$, *** $p < 0.01$

F.8 Outflow Regressions

Table F16: Drivers of Capital Outflows, by Instrument (Quarterly BOP data, missing filled with Zero)

Panel A: All Countries						
	(1)	(2)	(3)	(4)	(5)	(6)
	Total	Direct Investment	Portfolio Equity	Portfolio Debt	Other Investment Debt	Reserves
$\log(VIX_{t-1})$	-7.173***	-0.0898	-0.409	-1.469***	-5.321***	0.115
	(2.166)	(0.884)	(0.522)	(0.503)	(1.909)	(0.485)
GDP $Growth_{it-1}$	0.196***	0.0515	-0.0142	0.00391	0.126***	0.0280***
	(0.0604)	(0.0338)	(0.00930)	(0.0159)	(0.0411)	(0.0100)
Observations	1408	1408	1408	1408	1408	1408
R^2	0.048	0.006	0.005	0.011	0.041	0.007
CountryFE	Yes	Yes	Yes	Yes	Yes	Yes
Panel B: Advanced Economies						
	(1)	(2)	(3)	(4)	(5)	(6)
	Total	Direct Investment	Portfolio Equity	Portfolio Debt	Other Investment Debt	Reserves
$\log(VIX_{t-1})$	-11.89***	-0.492	-0.743	-2.232**	-9.375**	0.951
	(3.869)	(1.862)	(1.102)	(0.958)	(3.614)	(0.583)
GDP $Growth_{it-1}$	0.392**	0.0824	-0.0271	0.0329	0.306**	-0.00203
	(0.146)	(0.0424)	(0.0224)	(0.0467)	(0.111)	(0.00951)
Observations	660	660	660	660	660	660
R^2	0.075	0.009	0.009	0.018	0.071	0.021
CountryFE	Yes	Yes	Yes	Yes	Yes	Yes
Panel C: EM						
	(1)	(2)	(3)	(4)	(5)	(6)
	Total	Direct Investment	Portfolio Equity	Portfolio Debt	Other Investment Debt	Reserves
$\log(VIX_{t-1})$	-2.678**	0.370	-0.142	-0.775**	-1.447***	-0.683
	(1.226)	(0.407)	(0.296)	(0.351)	(0.461)	(0.774)
GDP $Growth_{it-1}$	0.105	0.0384	-0.00761	-0.00891	0.0477**	0.0358**
	(0.0523)	(0.0470)	(0.00721)	(0.00879)	(0.0187)	(0.0129)
Observations	704	704	704	704	704	704
R^2	0.037	0.004	0.005	0.014	0.040	0.017
CountryFE	Yes	Yes	Yes	Yes	Yes	Yes

Sample is from 2004q1-2014q4, countries as listed in Appendix E. Capital outflow data is from Balance of Payments, with any missing data replaced with zeros. Dependent variables are expressed as a percentage of GDP. VIX is the implied volatility of S&P 500 index options. GDP growth is calculated as a year-on-year percentage growth. Errors are clustered at the country level. ** $p < 0.05$, *** $p < 0.01$