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GROSS CAPITAL FLOWS BY BANKS, CORPORATES AND SOVEREIGNS

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<u>ABSTRACT</u>

We construct a new dataset of quarterly capital flows by sector and establish four facts. First, the co-movement of capital inflows and outflows is driven by banks. Second, procyclicality of capital inflows is driven by banks and corporates, whereas sovereigns' external liabilities move acyclically in advanced and countercyclically in emerging countries. Third, procyclicality of capital outflows is driven by advanced countries' banks and emerging countries' sovereigns (reserves). Fourth, capital inflows and outflows decline for banks and corporates, when global risk aversion (VIX) increases, whereas sovereigns' flows show no response. These facts are inconsistent with a large class of theoretical models.

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1 Introduction

It is widely recognized that international capital flows have nontrivial consequences for macroeconomic outcomes. The history of financial crises taught us that the vulnerability to external shocks 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. During the latest global financial crisis, 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, which culminated in a sudden stop. Yet, gross capital flows by *sector* have received no attention in the empirical literature due to lack of data for a large set of countries and long time periods at the business cycle frequency. Our paper fills this gap.

Our paper's contributions are twofold. First, we introduce a new comprehensive dataset on *gross* capital inflows and outflows at the *quarterly* frequency starting 1996 for a balanced panel of 85 countries for inflows and 31 countries for outflows, decomposing both inflows and outflows by borrowing and lending sectors. Second, using this dataset we document four new stylized facts. Our facts are as follows: First, the co-movement of capital inflows and outflows is solely driven by flows to and from banks. Second, procyclicality of capital inflows is driven by banks and corporates in all the countries, whereas sovereigns' external liabilities move acyclically in advanced countries and countercyclically in emerging markets. Third, procyclicality of capital outflows is driven by advanced countries' banks and emerging countries' sovereigns. Fourth, capital inflows and outflows decline for banks and

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corporates, when global risk aversion (VIX) increases, whereas neither advanced country nor emerging market sovereigns respond to such global shocks. These facts are inconsistent with many models that use countries' own productivity shocks as the only source of shocks and/or focus on asymmetric information and sovereign risk alone as frictions to explain co-movement of inflows and outflows together with procyclicality of capital flows.
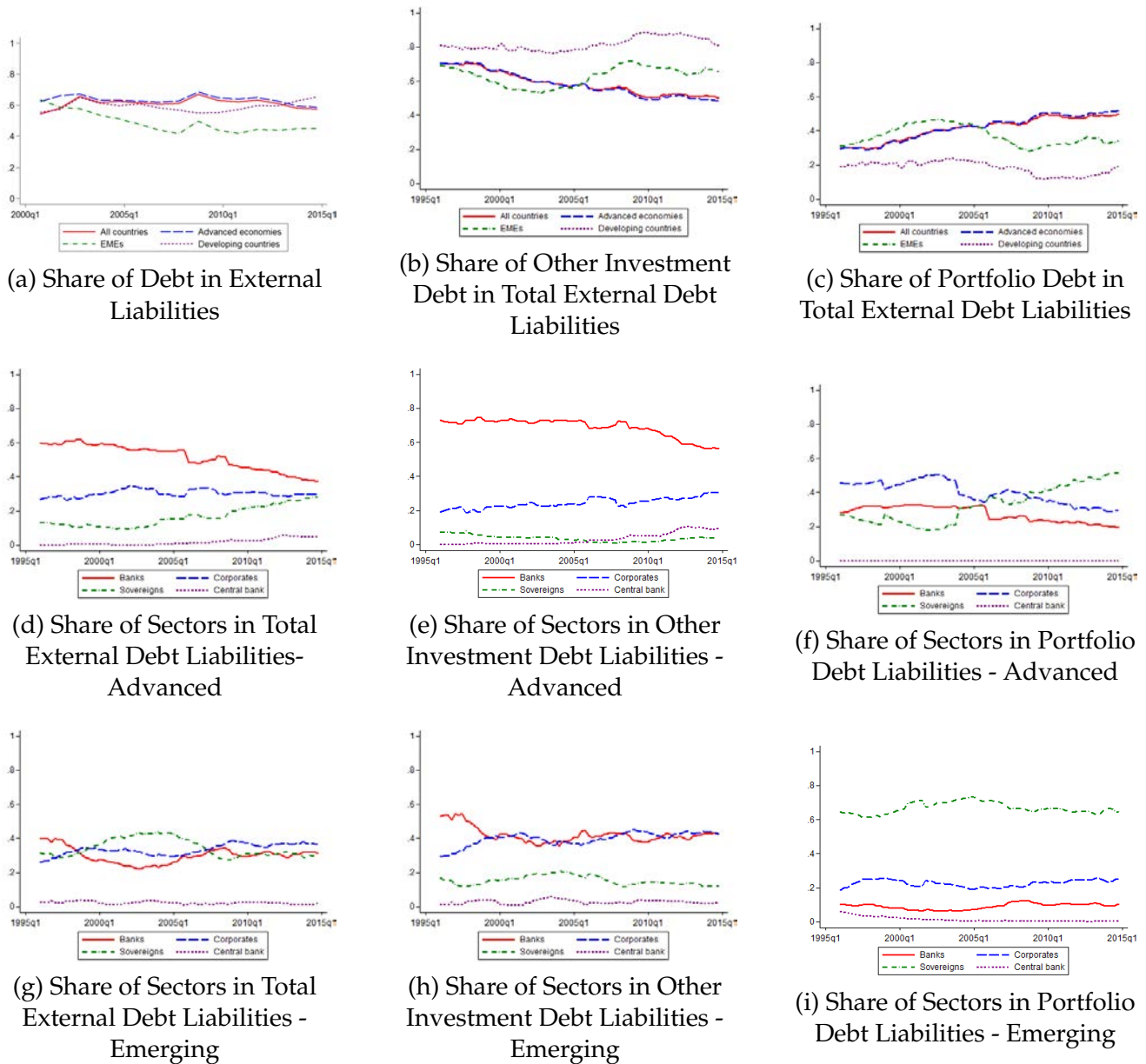
Our dataset combines data from several publicly available sources and offers a distinct advantage over existing datasets from single institutions, such as the IMF and/or World Bank. The large number of developing countries and emerging markets at the quarterly frequency, which is the preferred frequency to study the relationship between capital flows and the business cycle, is a big advantage of our capital inflows dataset relative to standard sources.[1]

Why decompose *only* debt inflows and outflows by sector? Debt flows are generally the largest component in total capital flows. Figure 1 illustrates this clearly.[2] Panel (a) shows the share of total debt in total external liabilities. Debt represents the majority of external liabilities globally and in advanced countries (AE). In emerging markets (EM), debt and non-debt liabilities are of similar magnitude. Panel (b) highlights that other investment debt (usually bank loans) is the bulk of debt stocks. 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

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[1]The set of countries in our 85 country capital inflows data includes 25 advanced, 34 emerging, and 26 developing economies from 1996q1 to 2014q4. Standard sources for such a long period will only have available data for 20 or so countries. 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 for outflows.

[2]This figure plots stocks. The flow version delivers a similar picture, though more noisy, and is plotted in Figure C1 in Appendix C.

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Figure 1: Composition of External Debt Liabilities by Debt Type and Sector

(a) Share of Debt in External Liabilities

(b) Share of Other Investment Debt in Total External Debt Liabilities

(c) Share of Portfolio Debt in Total External Debt Liabilities

(d) Share of Sectors in Total External Debt Liabilities-Advanced

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

(f) Share of Sectors in Portfolio Debt Liabilities - Advanced

(g) Share of Sectors in Total External Debt Liabilities - Emerging

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

(i) Share of Sectors in Portfolio Debt Liabilities - Emerging

Source: Raw data from IIP, QEDS, and BIS. Final data is constructed by the authors.

to consider both types of external debt.

In terms of sectoral composition of debt, employing our data, panels (d)-(i) highlight the sectoral share of external debt stocks for each flow type and country group. In AE, banks account for 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 owed by banks and most portfolio debt is owed by corporates holds for AE but not for EM. In the latter, most of the portfolio debt is attributable to sovereigns, while banks and corporates have equal shares in other investment debt.

The composition of external debt is remarkably stable over time, with few exceptions. In these figures, we use a balanced sample of countries to prevent entry/exit of countries into the sample from distorting time series patterns in the composition of debt. 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 (mostly other investment debt) declines and that of sovereign debt (mostly portfolio debt) increases following the crisis. For EM, sector shares are more stable over time, although during the pre-crisis period there is a small decline in the share of debt in total inflows.

Figure 2 shows the counterpart of Figure 1 for the composition of external asset stocks in debt instruments, including reserves.[3] Panel (a) shows the share of debt in total external assets. Debt assets represents the majority of external assets; 70 percent in EM and 60 percent in AE on average during 2000s, though the 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 accounts for the bulk of debt asset stocks in AE, whereas portfolio debt assets in panel

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[3]There are not enough developing countries in the outflows sample to include an average for the group.

(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, portfolio debt assets are not important, and the remainder consists of reserves.

Figure 2: Composition of External Assets by Asset Type and Sector
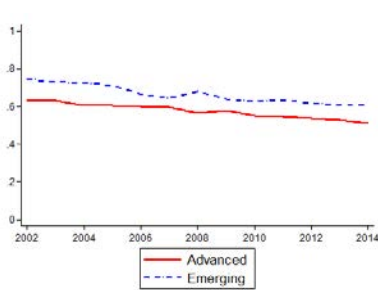
(a) Share of Debt in External Assets
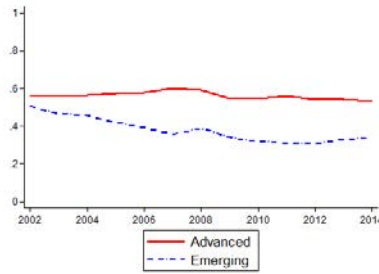
(b) Share of Other Investment Debt Assets in Total External Debt Assets
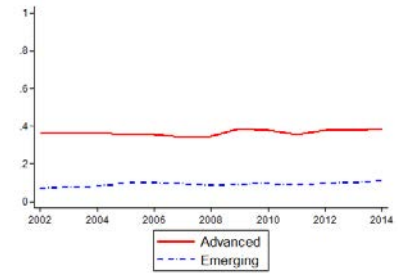
(c) Share of Portfolio Debt Assets in Total External Debt Assets
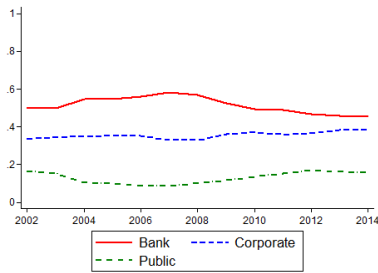
(d) Sector Shares of Total External Debt Assets - Advanced
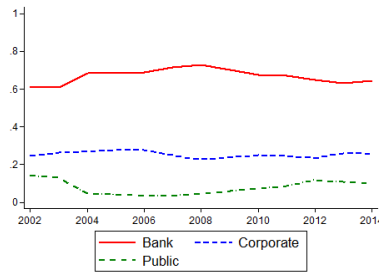
(e) Sector Shares of Other Investment Debt Assets - Advanced
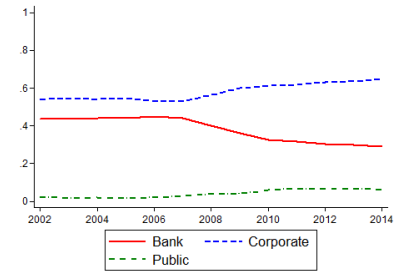
(f) Sector Shares of Portfolio Debt Assets - Advanced
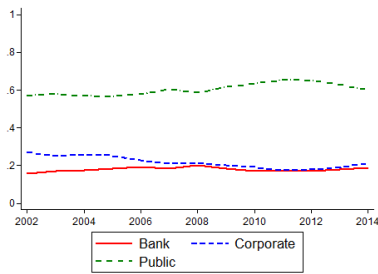
(g) Sector Shares of Total External Debt Assets - Emerging
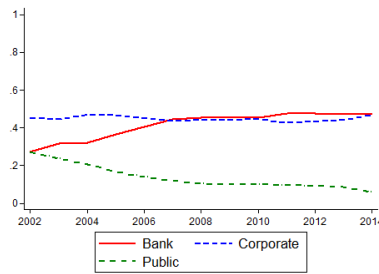
(h) Sector Shares of Other Investment Debt Assets - Emerging
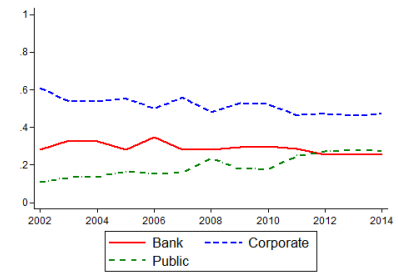
(i) Sector Shares of Portfolio Debt Assets - Emerging

Source: Raw data from IIP and BIS. Final data is constructed by the authors. Total Debt includes official reserves.

In terms of sectoral composition, employing our data, panels (d)-(i) highlight the sectoral share of external debt asset stocks for each flow type and country group. In EM the public

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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. In AE, as is the case for borrowing, banks do the lion's share of external lending in loans, while corporates also have a big share of AE lending in portfolio debt assets. 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 data patterns highlight the importance of separating external debt liabilities and debt assets by sector for a more complete understanding of the drivers of capital flows and lead us to a re-evaluation of conventional stylized facts on capital flows.

Most of the literature focuses on net capital flows defined as the purchase of domestic assets by foreign agents minus purchase of foreign assets by domestic agents. There have been recent papers, such as Forbes and Warnock (2012), Broner, Didier, Erce, and Schmukler (2013), and Davis and van Wincoop (2017), that focus on gross inflows and outflows separately—that is capital inflows by foreign agents and capital outflows by domestic agents—but no paper separated these gross inflows by foreigners and gross outflows by domestics into borrowing and lending sectors.[4] These papers show a high degree of correlation between capital inflows and outflows and an increase in this correlation over time. Some of these works show that both capital inflows and outflows are procyclical. Our conjecture is that depending on which foreign agent and which domestic agent are involved in external borrowing and lending, there will be further differences in the response of capital

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[4]There is also a literature that studies the long-term movements in gross capital flows that culminates into long-term external asset and liability positions such as Gourinchas and Rey (2007); Lane and Milesi-Ferretti (2001); Obstfeld (2012). We focus on capital flow dynamics at the quarterly business cycle frequency.

flows to countries' own business cycles and global shocks.

We document that the positive correlation between capital inflows and outflows is driven mainly by the borrowing and lending patterns of advanced country banks. This results holds both for unconditional correlations and correlations conditional on global risk factor, proxied by VIX, and countries' own GDP growth. Regressing inflows on outflows also delivers similar results.

In order to investigate procyclicality of capital inflows and outflows, we run separate quarterly panel regressions of capital inflows and outflows on lagged global risk appetite (VIX) and countries' own lagged GDP growth. These regressions include country fixed effects, which means we identify from within variation, that is from changes in VIX, GDP growth and capital flows. These regressions allow us to ask whether during expansions foreign agents increase their purchase of domestic assets and domestic agents increase their purchase of foreign assets. And during contractions, do we observe the opposite? The same regressions will also allow us to evaluate the response of inflows and outflows to global shocks, proxied by changes in VIX.

We find that, during domestic economic downturns, capital inflows to domestic banks and corporates decline in all countries and vice versa during expansions. Capital *inflow* procyclicality is due to procyclicality of the private sector capital inflows since advanced country sovereigns' inflows are acyclical and emerging market sovereigns' inflows behave countercyclically.[5]

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[5]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 that on 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.This can also be the case for a particular asset class (capital flow type) rather than a 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

For capital outflows, the case is quite different. Capital *outflows* are procyclical *only* for the advanced country banks and emerging markets sovereigns, where the rest of sectors' outflows are acyclical. Hence during expansions advanced country banks invest more abroad, whereas during contractions they retrench. In a similar fashion, EM sovereigns' outflows behave procyclically, where they run down reserves during downturns and accumulate reserves during booms. This is an important result since it means that during a downturn/crisis in a given emerging market, domestic private agents do not bring their investment back (retrench) to their own country, as argued by other researchers. During those bad times when foreigners flee from the emerging market, sovereigns provide the much needed risk sharing. In a similar vein, during a downturn in AE, banks bring the money back helping to smooth out the bust.

The results on procyclicality of inflows and outflows supports our earlier finding on the co-movement of inflows and outflows being driven by advanced country banks since the only sector that is procyclical both in terms of capital inflows and capital outflows is the banking sector in advanced countries, as banking and corporate sector outflows in emerging markets is acyclical and sovereign and corporate sector outflows in advanced countries is also acyclical. Emerging market sovereign sector capital outflows is procyclical but the same sovereign sector's capital inflows is countercyclical and hence cannot create a positive comovement between capital inflows and outflows in emerging markets.[6]

What about global shocks? Capital inflow and outflow responses to global shocks differ

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two-way capital flows.

[6]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 inflows are positively correlated with GDP growth and portfolio debt inflows are negatively correlated or not robustly correlated with GDP growth.

from their responses to their own business cycles. In response to adverse global shocks, such as an increase in the VIX, inflows to banks and corporates decline, while domestic banks and corporates invest less abroad, decreasing their outflows. Sovereigns do not respond to such global shocks on average.[7] Several papers document that gross flows respond systematically to changes in global conditions.[8] Our results are consistent with these works and explain that another potential source responsible for the co-movement of capital inflows and outflows might be the response of both banking and corporate sector inflows and outflows to global shocks in all countries.

These four facts stand in contrast to standard international macroeconomic models, which treat domestic and foreign investors symmetrically. The evidence we provide helps to discriminate among several classes of models. As we explain in section 5, our findings are consistent with models with financial shocks and financial frictions and not with models with only productivity shocks and/or asymmetric information and sovereign risk as the sole sources of friction.

The rest of the paper is organized as follows: Section 2 describes the construction and coverage of our data; Section 3 illustrates descriptive patterns; Section 4 presents the results from our empirical analysis; Section 5 discusses the theoretical implications and Section 6 concludes.

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[7]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.

[8]See Forbes and Warnock (2012), Milesi-Ferretti and Tille (2011), Cerutti, Claessens, and Puy (2015), Broner et al. (2013), J. Caballero (2016), Obstfeld (2012), Catão and Milesi-Ferretti (2014), Borio and Disyatat (2011), Lane (2013), Cerutti, Claessens, and Rose (2018).

2 A New Dataset for Capital Flows Research

2.1 Data Construction

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, which is based on residency principle, 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.

The focus of this paper is on the differentiation of capital flows by source or destination sector in the domestic economy.[9] 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").[10]

To build our dataset, we combine and harmonize several publicly available sources: Balance of Payments (BOP) and International Investment Position (IIP) statistics of the Interna-

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[9]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 all the components of debt, that is the flow of portfolio debt and other investment debt by sector over a much longer time horizon in quarterly data. Cerutti and Hong (2018) use internal vintages of the BOP dataset in order to split portfolio equity flows by sector. They follow our work for decomposition of debt flows by sector, replicating some of our results, but use only data from BOP. Hence their sample is limited to 2003 onwards and 43 countries. 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 but only for the sovereign starting 2005, where we consider all three sectors since 1996: banks, corporates and the sovereigns.

[10]It should be noted that the BOP category "other sectors" is broader than what is captured by 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.

tional Monetary Fund (IMF), Locational Bank Statistics (LBS) and Consolidated Bank Statistics (CBS) from Bank for International Settlements (BIS), International Debt Securities (IDS) Statistics from BIS, Quarterly External Debt Statistics (QEDS) of IMF and World Bank (WB), and Debt Reporting System (DRS) data of WB.[11]

The cornerstone of our dataset is the Balance of Payments (BOP) data produced by the IMF, which is the most comprehensive source of international capital flow data across countries. The BOP data, which is reported to the IMF by country statistical offices, captures capital flows into and out of a given 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 (inflows - outflows). We focus on the financial account portion of the data and the latest (6th) version of the balance of payments manual (BPM6). More details on the BOP data, along with its different presentations and versions, are given in Appendix A.2.[12]

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

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[11]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).

[12]See the 6th Edition Balance of Payments Manual (BPM6) Appendix 8 for more details on the differences between the previous edition (BPM5) and BPM6.

Figure A1 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.[13] 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[14]) and then by sector.

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.[15] We similarly construct our dataset for outflows, and incorporate data from the BIS to complement coverage for portfolio debt and other investment debt outflows.

We undertake a "filling" exercise to complete the missing sectoral data on debt inflows in the BOP. 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.[16] 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.[17]

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[13]The remaining categories include reserves (asset flows from the central bank) and financial derivatives (small and sparsely reported, previously a part of portfolio investment).

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

[15]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 only at a semiannual frequency; more importantly, the CPIS does not have data on other investment debt flows.

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

[17]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 investment debt flows are important since the vast majority of external bank flows are in this category.[18] Crucially, this category also includes some cross-border loans to corporates and loans to sovereigns, such as IMF credit.[19] 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.[20]

In order to get a larger, longer, and balanced panel of countries with debt flows split by sector, we proceed with the following methodology for our data filling exercise. When the BOP data contains the total for the category and for three out of the four sectors, we take the total and subtract the 3 reported sectors in order to obtain the fourth sector. For the remaining observations where the sector data is still missing, we construct measures of portfolio debt and other investment debt inflows by sector from several alternative datasets.[21] One such dataset is the data from BIS on debt securities issued in international markets, which we use to fill in the portfolio debt flows series. Another one is the BIS dataset on cross-border

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.In reality, other investment equity (which is usually very small) is the only category within other investment that is not split by borrowing sector. We thank Gian-Maria Milesi-Ferretti and IMF Statistics for helping us uncover this.

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

[19]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, Duttagupta, Guajardo, and Topalova (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 reserves, IMF credit, and most government-related components included under the other investment debt category from total flows.

[20]Figure C1 in Appendix C shows that this is the case during the global financial crisis.

[21]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 a discussion. See also Claessens and Naudé (1993).

bank flows, which we use to fill the missing data under other investment debt.[22] Here, we only use loan lending by BIS reporting banks, so as not to capture direct investment flows or debt securities holdings.[23,24] 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.[25,26]

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.[27] 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 flow data and allow us to be more accurate as we fill missing data.

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[22]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. Polish banks lending to Nigeria, etc.).

[23]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 the bank has at least a 10% ownership stake. In practice, we expect this to be small.

[24]A small number AEs exhibit some discrepancies between the BOP data and the BIS Bank data (e.g. Japan, Switzerland, and the US). These are isolated cases that have already been well documented. As a rule, we use BOP data, which is generally well reported for these cases, and other data sources first to avoid these issues.

[25]It is almost always the case that when the total is missing, the underlying instruments are also missing, except for, in some instances, IMF credit.

[26]In some cases, the flows of other investment debt, by sector or in total, are reported as coming from just one instrument (usually loans) even though in reality they reflect flows from other instruments as well (e.g. trade credit). So, summing these instruments can capture the proper total in such cases (this is 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.

[27]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 exclusively bonds that are issued in international markets.

We deflate GDP and all capital flows to 1996 USD and express them in billions.[28] 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.

A detailed description of the datasets and our construction of the estimates to fill missing data can be found in Appendix A.3. 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 were 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 A4 and A5 in Appendix A.3 report these plots for both other investment debt flows and portfolio debt flows for each sector. The match is pretty close and speaks to the quality of our constructed estimates to fill missing data over the entire sample. The correlation between the two series for total debt inflows is over 86 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 dataset.

There are few important details to note. 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

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

IMF Credit.[29]

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 (depending on the instrument type). 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 corporate sector. We include direct investment debt in total debt in our regression analysis of inflows. More details on the contribution of direct investment debt are given in Appendix C.1.

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 in the case of inflows, we do an internal fill on missing sectors if the remaining two sectors and the total are non-missing.[30] The one external fill that we do is for the banking sector. We fill in portfolio debt asset flows and other investment debt asset flows using the BIS LBS by

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

[30]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.

residency, which has data on bank cross-border claims in each instrument. This data only covers banks resident in BIS reporting countries, and so is more limited in terms of coverage than the BIS data used for inflows.

2.2 Coverage of the New Dataset

We divide the countries into three groups by level of development: Advanced, Emerging, and Developing.[31] In our sample of annual capital inflows, we have 89 countries (25 advanced, 34 emerging, 30 developing). We exclude financial centers (e.g. Panama, Hong Kong, Bermuda) to avoid distorting the patterns in the data. At the quarterly frequency, our inflow 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. The outflow sample consists of 31 countries (15 advanced, 16 emerging) at a quarterly frequency spanning 2004q1-2014q4. For the annual data, we have 31 countries (13 advanced and 18 emerging) spanning 2002-2014. Details on the samples are in Appendix A.4. We are unable to make the outflow sample as large as the inflow sample because data on liabilities owed is more widely reported than data on assets owned, so we do not have many comparable filling series to replace missing outflows values in the BOP. Thus, while our efforts do improve our coverage of outflows, we focus on the contribution to inflow coverage in this section.

Table A5 illustrates the impact of our data filling exercise on sample coverage for in-

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[31]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 guide the definition of our EM group.

flows. 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 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 it fills 25-40 percent of observations for EM and 75-90 percent of observations for developing countries that were missing under portfolio debt. 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 sizable 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 inflow 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

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consequential.[32]

Figure A2 compares aggregate inflows as measured by our filled data and from the BOP alone, for total external debt of 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 the subsequent contraction are 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 debt inflows for China.

Figure A3 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). EM governments and AE 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 EM 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 EM central banks is driven by China.

Our dataset captures a large volume of capital inflows by sector that would 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.

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[32]Note that our inflow sample and outflow sample are not the same, but both samples are balanced panels.

3 Descriptive Patterns

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.

Figure 3: Aggregate External Debt Inflows, Billions 1996 USD
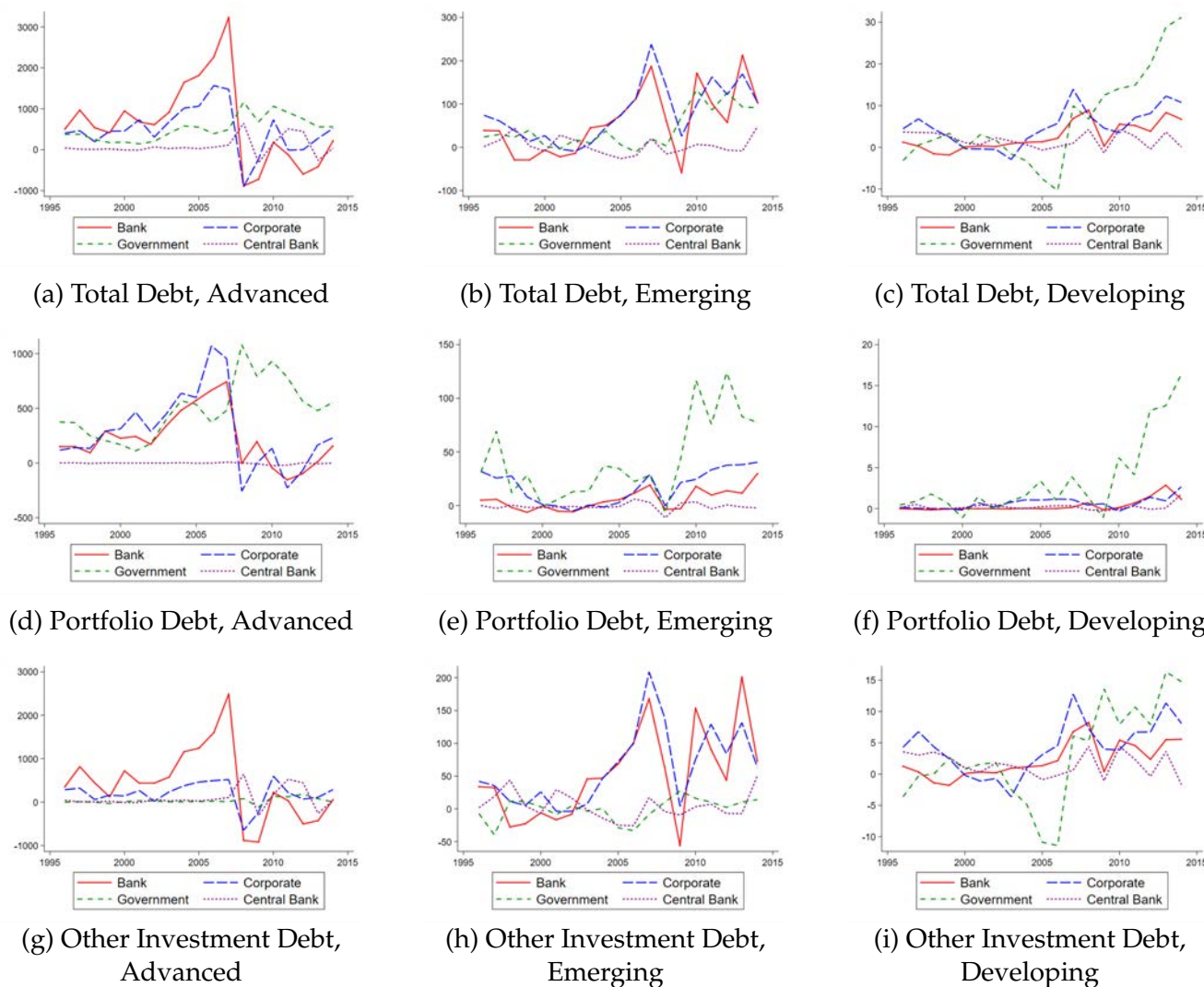
(a) Total Debt, Advanced

(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 3 (a)-(c) plots the aggregate debt inflows by sector for each country group. The buildup and collapse surrounding the 2008 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 flows to advanced economies 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. They reveal that the increase in inflows for governments comes primarily in the form of bonds, with the exception of developing country governments, which also see an increase in other investment debt funding (i.e. loans). Advanced economy corporates also have a significant share of their inflows coming in the form of 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. However, 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 4. China has poor sector coverage in the BOP data, so much of the measured effect is derived from our data filling series. Both bank and corporate inflows increase substantially, but bank in-

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Figure 4: Emerging Market External Debt Inflows, Billions 1996 USD
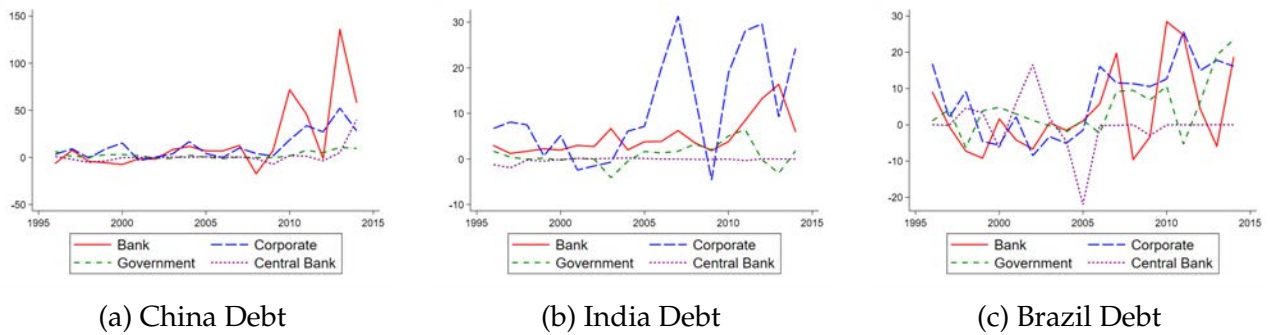
(a) China Debt   (b) India Debt   (c) Brazil Debt

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

flows to China have been much larger. In India, the corporate sector has been the dominant recipient of debt flows, though bank flows increased considerably after 2010. Brazil saw a sustained increase in corporate debt inflows, and volatile increases in bank and government flows.

The result that public sector gross inflows increase when private gross inflows are falling at the business cycle frequency as a response to shocks, is an important finding that complements existing work on long-term movements in public vs private net flows (Aguiar & Amador, 2011; Alfaro, Kalemli-Özcan, & Volosovych, 2014; Gourinchas & Jeanne, 2013). 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.[33]

Turning to outflows, Figure 5 plots the debt asset flows for a subset of 31 countries over 2002-2014. The public sector is the sum of central banks and general government sectors,

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[33]Thus far our figures have plotted aggregate flows, but figures showing the dynamic patterns of average flows to GDP are shown in Appendix C. Figure C3 illustrates the impact of the public sector for an average 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, with the VIX shown in red (right axis), for reference. For both sets of countries, but especially for EM, the drops in private inflows are larger than the corresponding drops in total inflows, reflecting the potential role of the sovereign to smooth out sudden stops.

and total debt asset flows for the public sector include the flow of reserves.

Figure 5: Aggregate Asset Outflows, Billions USD
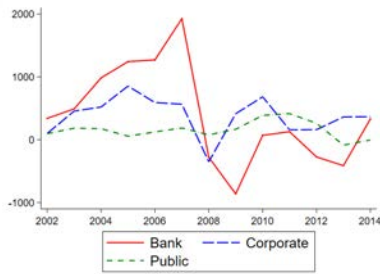
| (a) Total Debt Asset Flows, Advanced | (b) Portfolio Debt Asset Flows, Advanced | (c) Other Investment Debt Asset Flows, Advanced |

| (d) Total Debt Asset Flows, Emerging | (e) Portfolio Debt Asset Flows, Emerging | (f) Other Investment Debt Asset Flows, Emerging |
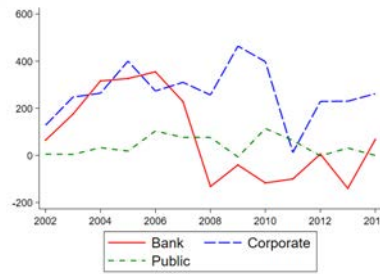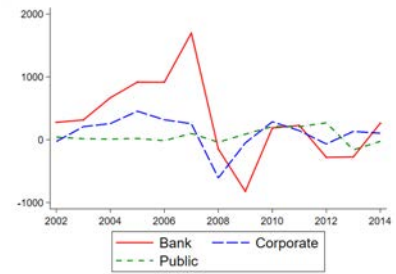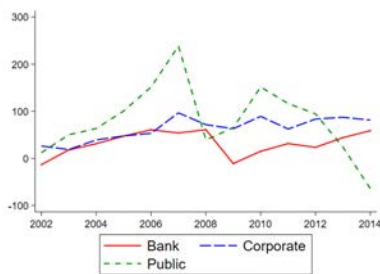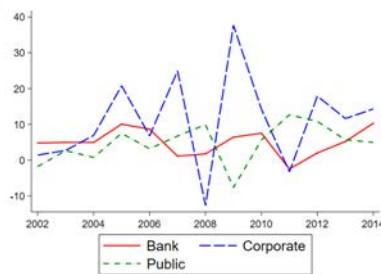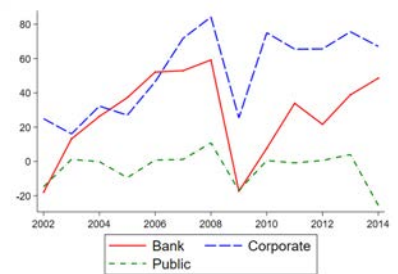
Source: BOP and BIS, authors' calculations.

For advanced countries, we see the same pattern for total and other investment debt as we see with inflows. More concretely, the landscape of flows is 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. Nevertheless, there is actually an increase in external portfolio debt investment by the corporate sector, followed by a brief contraction coinciding 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 (d), with a large buildup and collapse mirroring the private sector inflow and outflows pattern.

4   Empirical Analysis

4.1   Comovement of Capital Inflows and Outflows

So far, we have have analyzed the patterns in the raw data. These dynamic patterns in the raw data can be due to inflows and outflows by sector responding to domestic and external shocks differentially. In this section, we will analyze how these responses work in detail.

Table 1 presents correlations of inflows and outflows across sectors. These are partial correlations of debt flows/country GDP, conditional on country fixed effects, lagged log of VIX, and lagged GDP growth.[34] The sample is our asset flow sample detailed in Appendix A.4, 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 debt and other investment debt, and also reserves in the case of public sector outflows.

The strength of the inflow-outflow correlation within the bank sector is striking. In fact, the only positive correlation that is more than 50 percent for inflows and outflows is the correlation between banking inflows and outflows. Conditioning on countries' own GDP growth and the VIX, both of which can drive capital flow behavior as we show below, is

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[34]The patterns hold in unconditional aggregate correlations.

important in terms of getting at the true co-movement between inflows and outflows and we

see that there is a high degree of correlation between bank inflows and bank outflows. This

is clearly the case in AEs; furthermore, banks still have the strongest positive inflow-outflow

correlation in EMs, though with lower magnitude. As a result, the key to understanding the

inflow-outflow comovement is the banking sector. All of the negative correlations in this

table involve the public sector, reinforcing the point that the public sector often behaves

differently than the private sector.

Table 1: 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	0.50	-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 A.4. N=1408, 660, and 704 respectively for each panel. Correlations are conditional on country fixed effects, lagged log VIX, and lagged GDP growth.
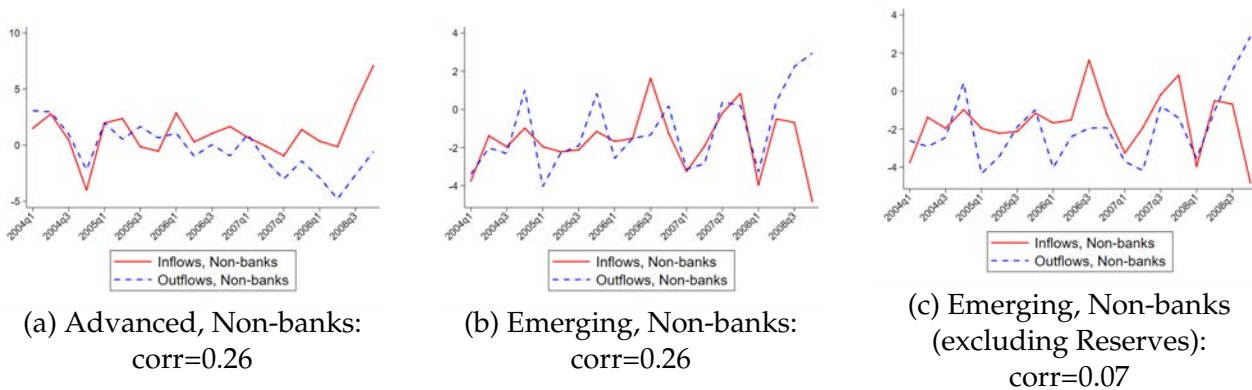
Table 2: Correlation of Inflows and Outflows, by Instrument

Advanced economies		Inflows						Outflows						
		Public		Bank		Corp		Public			Bank		Corp	
		PD	OID	PD	OID	PD	OID	PD	OID	Res.	PD	OID	PD	OID
Inflows	Public PD													
	Public OID													
	Bank PD													
	Bank OID													
	Corp PD													
	Corp OID													
Outflows	Public PD													
	Public OID													
	Public Res.													
	Bank PD													
	Bank OID													
	Corp PD													
	Corp OID													

Emerging Markets		Inflows						Outflows						
		Public		Bank		Corp		Public			Bank		Corp	
		PD	OID	PD	OID	PD	OID	PD	OID	Res.	PD	OID	PD	OID
Inflows	Public PD													
	Public OID													
	Bank PD													
	Bank OID													
	Corp PD													
	Corp OID													
Outflows	Public PD													
	Public OID													
	Public Res.													
	Bank PD													
	Bank OID													
	Corp PD													
	Corp OID													

Sample consists of 31 countries (15 advanced, 16 emerging) over 2004q1-2014q4, and is described in Appendix A.4. 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.

To see visually that banking flows are the key to capital inflow and outflow co-movement, we plot in Figure 6 inflows and outflows, after demeaning them from the common time effects, over time stopping before the global financial crisis. It is clear that for the non-bank flows correlations are very low (the corresponding bank inflow-outflow correlations for Figure 6 are 0.85, 0.91, 0.89 respectively).

Figure 6: Non-Bank Capital Inflows and Outflows, % Trend GDP, Group Average

(a) Advanced, Non-banks: corr=0.26

(b) Emerging, Non-banks: corr=0.26

(c) Emerging, Non-banks (excluding Reserves): corr=0.07

Source: Quarterly AHKS data over 2004q1-2008q4, author's calculations. Total debt inflows and outflows consist of portfolio debt flows, other investment debt flows, reserve asset flows (except where indicated). Flows are normalized by trend GDP, common shocks are removed by regressing all countries on quarter fixed effects and taking the residuals, and the plot displays the average of those residuals within each country group. Non-bank sector consists of all sectors except for banks.

Table 2 plots the 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 that the strongest comovement at this disaggregation is among AE banks, particularly within other investment debt flows. AE banks are in general global banks and these banks' borrowing and lending patterns within their internal capital markets combined with hedging-related trades produce a strong correlation between capital inflows and outflows, especially for AE. In AE, corporates' other in-

vestment debt inflows and outflows also appear to be highly correlated, presumably due to financial arms of large corporates in such countries, while public sector inflows are broadly negatively correlated with other inflows.

EMs do not display correlations as strong as those of AEs at this level of 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 in either portfolio debt or other investment debt. 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 public sector, particularly when it comes to EM capital flows.

4.2 Panel Regressions: Capital Inflows by Sector

We next examine the response of sectoral capital inflows to global risk appetite, measured by the VIX (push factor), and to the domestic business cycle, measured by countries' own GDP growth (pull factor), in a panel regression setup with our quarterly data. We focus on a very simple specification to illustrate our results:

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

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. GDP_{it} is quarterly GDP from Datastream and national sources. The dependent variables are capital flows expressed as a percent of GDP. α_i is a country fixed effect.

VIX_{t-1} is the option-implied volatility of the S&P 500 index, 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 to EM. $GDPGrowth_{it-1}$ is real year-on-year GDP growth for country i in the previous period, which is a standard pull factor driving 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. We use a balanced sample (detailed in Appendix A.4) of 55 countries (23 advanced, 28 emerging, 4 developing) over 2002q4-2014q4.

Table 3 shows our regressions. Columns (1) reports the results with total debt inflows, column (2) shows results on sovereign inflows, column (3) and (4) show results for bank and corporate sectors inflows using data from portfolio debt and other investment debt, while columns (5)-(6) add direct investment debt to total debt and corporate debt inflows, respectively.[35] We take direct investment debt (DID) and add it to corporate and total debt, respectively, to obtain a more complete measure of debt inflows.[36]

For the full set of countries in Panel A, total debt inflows respond negatively to increases in the VIX. This response is driven by the private sector (banks and corporates), and holds (with an even larger magnitude) when DID is included in columns (5) and (6). The public sector flows' response to the VIX is positive but not significant. On the business cycle front, the total and private sector flows respond positively to a domestic boom, while the public sector flows are countercyclical, but not significant. This pattern is largely the same for the

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

[36]As discussed above, 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.

Table 3: Quarterly Drivers of Total Debt Inflows by Sector, 2002–2014)

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: All Countries						
					Total	Corp.
	Total	Public	Banks	Corp.	w/DI Debt	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	Corp.
	Total	Public	Banks	Corp.	w/DI Debt	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	Corp.
	Total	Public	Banks	Corp.	w/DI Debt	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 A.4. 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

AE countries (Panel B), but with larger coefficients, with the exception that in AE, corporates do not respond to VIX shocks, once we consider DID, which is the internal market debt of corporates in AE. DID seems to play a smoothing role.

Inflows for EM countries in Panel C also follow a similar pattern, with the exception of sovereign sector. As the VIX rises or as GDP falls, total and private inflows fall. This is in contrast to total debt flows to the public sector, which run counter-cyclical to domestic growth.[37] These results are the gross inflows analog to the results found in Alfaro, Kalemli-Özcan, and Volosovych (2014) for net debt flows, who show, using the *annual* DRS data explored in Appendix C, 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 in addition to net flows, at the *quarterly* frequency.

The global financial crisis (GFC) has generated a lot of discussion about how the nature of capital flows may have changed in its wake.[38] Tables C1 and C2 in Appendix C 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 the VIX before the GFC with the expected negative sign, but after the crisis they are more strongly driven procyclically by GDP growth.[39] EM flows

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[37]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 C3 and C4 in Appendix C. Results on the VIX are robust to the inclusion of a time trend and the TED spread, but significance declines 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 C5 and C6.

[38]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.

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

similarly have a stronger correlation with the VIX prior to the GFC and stronger correlation with GDP growth after it, with the expected signs. Banking flows to EM move opposite to the VIX during both the pre- and post-GFC periods.

In Tables 4-5, we focus on separate asset classes and show regressions by sector for other investment debt and portfolio debt. In Table 4, we see a negative relationship with the VIX and a positive relationship with GDP growth for total other investment debt inflows, as also shown by other researchers. As panel B and C show, these effects are driven by AE and EM banks and corporates. Panel C also shows that in EM total other investment debt flows do not respond to VIX, as also shown by other researchers, but the rest of the Panel C explains why this is the case: the response of banks and corporates to VIX shocks is negative but the response of EM sovereigns is positive. Note that while other investment debt is usually not the primary form of financing for the public sector, it can account for a non-trivial share at times, including IMF credit and other official flows and such flows are exactly the ones to be used in times of global stress by EM when private foreign investors were fleeing. Thus, the response of public sector flows to a global risk shock goes in the opposite direction to that of private sector flows in EM, which makes it hard to find a response in total flows as debated in the literature.

Table 5 examines portfolio debt inflows. For all countries and for advanced economies (in Panels A and B, respectively), there is not much in terms of significant relationships. Total and corporate portfolio debt inflows exhibit a significantly negative relationship with the VIX for the full set of countries, but as shown in Panel C, this is driven by EM corporates. As also shown in Panel C for EM, for GDP growth, we find a negative and significant rela-

Table 4: Quarterly Drivers of Other Investment Debt Inflows by Sector, 2002–2014

	Panel A: All Countries			
	(1) Total	(2) Public	(3) Banks	(4) Corp.
$\log(\text{VIX}_{t-1})$	-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.
$\log(\text{VIX}_{t-1})$	-7.365***	0.287	-6.073***	-1.579**
	(2.380)	(1.269)	(1.817)	(0.672)
GDP Growth$_{it-1}$	0.360***	0.0304	0.294***	0.0353**
	(0.120)	(0.0490)	(0.0938)	(0.0159)
Observations	1127	1127	1127	1127
R^2	0.044	0.001	0.048	0.012
CountryFE	Yes	Yes	Yes	Yes
	Panel C: EM			
	(1) Total	(2) Public	(3) Banks	(4) Corp.
$\log(\text{VIX}_{t-1})$	-1.511	1.500**	-2.130***	-0.880***
	(0.875)	(0.704)	(0.719)	(0.213)
GDP Growth$_{it-1}$	0.140***	-0.0167	0.113***	0.0440***
	(0.0360)	(0.00855)	(0.0330)	(0.00917)
Observations	1372	1372	1372	1372
R^2	0.087	0.018	0.113	0.090
CountryFE	Yes	Yes	Yes	Yes

Sample is from 2002q4-2014q4, countries as listed in Appendix A.4. 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 5: Quarterly Drivers of Portfolio Debt Inflows by Sector, 2002–2014

	(1) Total	(2) Public	(3) Banks	(4) Corp.
Panel A: All Countries				
$\log(\text{VIX}_{t-1})$	-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				
$\log(\text{VIX}_{t-1})$	-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				
$\log(\text{VIX}_{t-1})$	-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 A.4. 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. ** $p < 0.05$, *** $p < 0.01$

tionship for public and corporate sectors, but not for banks or for total flows. So public and corporate sectors borrow less in terms of international bond issuance during good times, creating this countercyclical pattern and the procyclical pattern that we have shown before in EM is driven by private sectors borrowing in terms of loans, that is other investment debt.[40] One remark from the results on inflows, as EM and AE responses differ in several respects, is that researchers using a mixed sample of developing and advanced countries, employing the standard data sources, may have their results will be driven by advanced countries since those sources' coverage of developing and EM countries are much lower than our dataset.

4.3   Panel Regressions: Capital Outflows by Sector

For debt outflows, we use the same regression setup as the one for inflow regressions. The sample for outflows is smaller and shorter, covering 31 countries (15 advanced, 16 emerging) over 2004q1-2014q4, with the sample detailed in Appendix A.4. We also include flows of official reserves in this analysis.

Table 6 shows our regressions for total debt outflows. Columns (1)-(4) decompose sum of portfolio debt and other investment debt into sectors, while columns (5) and (6) add reserve flows to total and public flows, respectively. Debt outflows respond negatively to the VIX, reflecting domestic agents scaling back their external investments when global risk appetite is low (VIX is high). In terms of business cycle response, when the domestic economy is growing faster, total debt outflows increases but this is solely driven by the banking sector outflows. Thus, domestic banks invest more abroad when the domestic economy is stronger.

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[40]This decomposition of results by sector helps highlight a possible reason why Blanchard et al. (2015) find an insignificant result on bond inflows.

Table 6: Quarterly Drivers of Total Debt Outflows by Sector, 2004–2014

	(1)	(2)	(3)	(4)	(5) Total + Reserves	(6) Public + Reserves
	Total	Public	Banks	Corp.		
Panel A: All Countries						
$\log(\text{VIX}_{t-1})$	-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)	(2)	(3)	(4)	(5) Total + Reserves	(6) Public + Reserves
	Total	Public	Banks	Corp.		
$\log(\text{VIX}_{t-1})$	-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)	(2)	(3)	(4)	(5) Total + Reserves	(6) Public + Reserves
	Total	Public	Banks	Corp.		
$\log(\text{VIX}_{t-1})$	-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 A.4. 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. ** $p < 0.05$, *** $p < 0.01$

Panel B shows that, these patterns are driven by advance countries. EM in Panel C have the same responses to the VIX, however, the cyclical behavior of capital flows in EM is very different. Only reserve outflows responds procyclically to GDP growth and all else is acyclical.

Table 7: Quarterly Drivers of Other Investment Debt Outflows by Sector, 2004–2014

	Panel A: All Countries			
	(1) Total	(2) Public	(3) Banks	(4) Corp.
$\log(\text{VIX}_{t-1})$	-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.
$\log(\text{VIX}_{t-1})$	-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.
$\log(\text{VIX}_{t-1})$	-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 A.4. 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. ** $p < 0.05$, *** $p < 0.01$

Tables 7 and 8 show the relationships for other investment debt and portfolio debt out-flows separately, with reserve flows included in Table 8. Panels A and B of Table 7 reflect the same patterns as total debt outflows. For EM, the responses are again similar to those in Table 6, with the exception that the total and the corporate sector flows' responses to GDP growth in columns (1) and (4) are significant with a positive coefficient.

Table 8 shows the response of portfolio debt outflows by sector, separately without reserves and including reserves. Unlike the other tables, here the results for the full set of countries (in Panel A) reflects more the behavior of the EM than the advanced economies. EM countries 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 procyclical for EM. This confirms the relationship observed in Table 6 (Panel C columns (5) and (6)), that reserve accumulation is an important procyclical capital outflow for EM.

5   Theoretical Implications

Previous research has shown that capital inflows and outflows are positively correlated with each other and procyclical. Standard international real business cycle models with a single asset cannot account for these patterns. In these models, the only shock is a shock to productivity in a single country, so capital inflows go in one direction only and hence procyclicality and co-movement cannot be accounted for. Researchers have argued that only a few models can account for these patterns, including McGrattan and Prescott (2010) and Bianchi, Boz, and Mendoza (2012).[41] In the former model, a positive productivity shock generates both

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[41]See Bai (2013)

Table 8: Quarterly Drivers of Portfolio Debt Outflows by Sector, 2004–2014

	Panel A: All Countries				
	(1)	(2)	(3)	(4)	(5)
					Reserves
	Total	Public	Banks	Corp.	Only
$\log(\text{VIX}_{t-1})$	-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)	(2)	(3)	(4)	(5)
					Reserves
	Total	Public	Banks	Corp.	Only
$\log(\text{VIX}_{t-1})$	-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)	(2)	(3)	(4)	(5)
					Reserves
	Total	Public	Banks	Corp.	Only
$\log(\text{VIX}_{t-1})$	-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 A.4. Portfolio Debt out-flow 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. ** $p < 0.05$, *** $p < 0.01$

capital inflows and outflows. The country with the positive productivity shock receives inflows from multinationals. At the same time, it also experiences outflows as affiliates of multinationals invest in other countries given their increased productivity. These patterns can also create procyclicality.

However, our findings point to procyclical outflows only by banks in advanced countries and sovereigns in emerging markets, which means that a model based on investment by multinational companies cannot account for our findings. We can also rule out explanations based on asymmetric information, unless there is a specific reason why only the banking sector in advanced countries and the sovereign sector in emerging markets are subject to asymmetric information, while other sectors are not.

The model by Bianchi et al. (2012) can match the comovement of total capital inflows and outflows, but not its source. In that model, sovereigns borrow and accumulate reserves. When a sudden stop occurs, capital outflows decline along with inflows since reserves are used to smooth consumption. This model would be able to account for capital inflow-outflow comovement in EM if the comovement were driven by sovereigns, but as we show it is not. Sovereign inflows are countercyclical - in bad times, the sovereign sector borrows, increasing inflows, and runs down reserves, decreasing outflows.

We argue that, in the absence of frictions, only models with financial shocks, as in Kalemli-Özcan, Papaioannou, and Perri (2013), can generate the positive correlation of banking inflows and outflows found in the data. Models in which domestic financial frictions tighten for certain sectors during bad times, can also match our findings. For example, R. Caballero and Simsek (2018) assumes that, during crisis times, financial frictions bind for domestic

banks but not for foreign banks. Their model can provide a rationale for our findings. These authors argue that models featuring only portfolio investors ignore the important role of banks in intermediating capital flows. In their model both banks and sovereigns play a role in EM, consistent with our data.

6 Conclusion

We construct a new data set for gross capital flows during 1996–2014 for a large set of countries at a quarterly frequency. We decompose debt inflows and outflows by borrower and lender type: banks, corporates and sovereigns. We use the standard BOP data from IMF (BMP6) as the starting source. 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 use other publicly available data from IMF, WB, and BIS. Our data captures fairly accurately 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 – the correlation between the the two series for the total debt inflows is over 86 percent. At the sector level, our external filling procedure makes a large difference. Some 25-40 percent of observations for EM and 75-90 percent of observations for developing countries that are missing in the BOP inflow data are filled. A sizable number of observations for advanced

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economies – around 15-30 percent, depending on the debt flow type – are filled by external data.

We establish four facts with the new data. First, the co-movement of capital inflows and outflows is driven by banking flows. Second, procyclicality of capital inflows is driven by banks and corporates everywhere, whereas sovereigns' external liabilities move acyclically in advanced and countercyclically in emerging countries. Third, procyclicality of capital outflows is driven by advanced countries' banks and emerging countries' sovereigns (reserves). Fourth, capital inflows and outflows decline for banks and corporates, when global risk aversion (VIX) increases, whereas sovereigns do not respond to such shocks.

These facts are inconsistent with a large class of models that assume only productivity shocks and default risk as the sole friction. Our findings can be produced by models with financial shocks and/or financial frictions. The results highlight the importance of separating capital flows by borrower and lender sector to understand better their effects, as well as the systemic risks that they may pose for the borrowing country and the lending country. They also show the difficulty of establishing robust stylized facts about the business cycle properties of capital flows and their relationship with global push factors in a sample that combines EM and AE countries. Our new dataset will be useful for future research on capital flows.

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Appendix: For Online Publication

A Dataset Construction

This appendix describes the construction of the dataset used in this paper, as well as the relevant background information for capital flow data generally and the underlying data sources specifically. The purpose of this dataset is to split capital inflows and outflows by capital flow type and by sector of the domestic economy, focusing primarily on debt flows. We base our dataset on the Balance of Payments (BOP) dataset, which includes capital flow data with breakdowns by flow type and sector, but also has some missing data. We fill in gaps in the data using some external datasets, such as the Quarterly External Debt Statistics (QEDS) and banking and bond data from the Bank for International Settlements (BIS).

We describe first the basics of capital flow data, the structure and coverage of the BOP data. We then explain the filling exercise and the external datasets that are used. We present comparisons to illustrate the quality of the fit of our external data and the contribution of our filling exercise. Lastly, we summarize the samples and coverage of our completed dataset. In Appendix B, we give more detail on the BIS datasets and how those series are constructed.

A.1 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.1.1 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.1.2 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").[42] There are other ways to define the sectors of the economy, but this breakdown is the most common in the data.[43] For much of our analysis, and all analysis using asset flows, we combine the central bank and general government sectors into a single sector called "public sector".

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. Non-publicly

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[42]It should be noted that the BOP category "other sectors" is broader than what is captured by 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.

[43]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.

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 consider PPG vs. PNG debt in Appendix C.2.

A.1.3 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.

A.2 Balance of Payments Data

The IMF's Balance of Payments (BOP) data is the most comprehensive dataset available on international capital flows and the basis for our dataset. It comprises two main accounts – the Current Account and the Financial Account.[44] The current account records transactions from the real side, capturing imports and exports, factor income, and transfer payments.

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[44]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)).

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.[45] The standard presentation disaggregates the data by flow type and instrument. Figure A1 illustrates this structure, with the available breakdowns by sector. 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.[46] The analytic presentation can be useful to separate some public flows from 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.[47] 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.

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

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

[47]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.

Figure A1: BOP Data Structure

General diagram structure:

by flow type[a]
- Direct Investment
  - Equity
  - Debt
- Portfolio Equity
- Portfolio Debt
  - **by sector[b]**
    - General Government
    - Central Banks
    - Banks
    - Other Sectors
- Financial Derivatives
- Other Investment Debt
  - **by instrument**
    - Currency & Deposits
    - Loans
    - Trade Credit & Advances
    - Accounts Payable/Recievable
      - **by sector[b]**
        - General Government
        - Central Banks
        - Banks
        - Other Sectors
- Other Investment Equity
- Reserves[a]

[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.

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.

A.2.1 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.[48] We focus on the debt portions of capital flows (portfolio debt, other investment debt, reserves, and sometimes direct investment debt) in our dataset, but we describe all components of capital flows here.

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

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[48]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.

(consistent with other BOP flows).[49] Direct investment does not have a split in the BOP by sector, but the debt portion of direct investment inflows can be allocated with some assumptions. Direct investment debt inflows 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.[50] 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.[51]

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.[52] 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

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

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

[51]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.

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

previous categories. It is first broken into other investment equity[53] 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,[54]trade credit and advances, other accounts payable/receivable, and SDR allocations.[55]

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.

While in principle the structure of the BOP data contains all the ingredients required to compute each type of flow for each sector, with the exception of direct investment, in practice there are some countries which do not exhaustively provide these breakdowns, especially for earlier years.[56] Table A1 highlights the coverage by flow type and sector in the quarterly BOP data.[57] For each component, the table displays the number of countries

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[53]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.

[54]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.

[55]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.

[56]Table A3 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.

[57]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,

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

Table A2 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.).[58]

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and other sectors, respectively.

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

Table A1: 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%)

Table A1 – *Continued from previous page*

Flow Type	A/L	Sector	Country	Quarter	Country-Quarter	Panel
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%)
		Banks	91 (48%)	143 (99%)	4037 (15%)	13 (7%)
		Corporates	93 (49%)	143 (99%)	5217 (19%)	19 (10%)

Table A1 – *Continued from previous page*

Flow Type	A/L	Sector	Country	Quarter	Country-Quarter	Panel
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%)

Flow Type	A/L	Sector	Country	Quarter	Country-Quarter	Panel
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%)
		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 download, most 2015q4 variables have not yet been reported. Data for Other Equity is extremely sparse, and so is not reported in this table.

Table A2: 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%)

Table A2 – *Continued from previous page*

Instrument	A/L	Sector	Country	Quarter	Country-Quarter	Panel
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%)

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%)

Instrument	A/L	Sector	Country	Quarter	Country-Quarter	Panel
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%)

Table A2 – *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 A3: 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

Table A3 – *Continued from previous page*

Flow Type	A/L	Sector	New BP6	New IIP
Portfolio Equity	Assets	Central Banks	(BFPAECB_BP6_USD + BF-PAEMA_BP6_USD)	(IAPECB_BP6_USD + IA-PEMA_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

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

Flow Type	A/L	Sector	New BP6	New IIP
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
		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

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

A.3 Filling Missing Data

We proceed in two steps to fill the gaps in the BOP data. The first step is an internal fill. When the BOP data reports the total for a flow type and reports 3 out of the 4 sectors, we fill the fourth sector by subtracting the three reported sectors from the total, the residual being allocated to the missing sector. In the case of capital outflows (asset flows), we combine general government and central bank into a single public sector. So, when one or both of general government or central bank are missing data, we fill the public sector with the residual of the total minus banks and corporate sectors. After performing our internal filling exercise, we use external data to fill the remaining gaps.

We draw on 3 separate sources for data to construct measures of capital inflows that can be used when the BOP data is missing. The first is banking and bond data from the BIS, which is described in detail in Appendix B. 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 and is compiled from a combination of data reported to the IMF via their Special Data Dissemination Standard (SDDS) and their General Data Dissemination System (GDDS), thus sometimes giving it better coverage than the reported IIP stock data. The IIP data comes either quarterly or annually.

The dataset with the broadest coverage by sector and capital flow type, and thus fills the most observations, is derived from the BIS data. The BIS produces a database on international bond issuances and databases on international banking flows (e.g. loans), which are

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described in more detail below and in Appendix B. While the BIS data in many cases captures much of the international financial flows we are trying to measure, it is not always an appropriate fill and so we do not want to use just a single data source for our external filling exercise. 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 that missing series.[59] Thus to increase the accuracy of our filling process, we turn first to the IIP and QEDS data. To approximate flows, we first difference the stocks with a simple correction for exchange rate valuation effects.[60] 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 A4 summarizes the process of constructing matching series for inflows using the BIS data.[61]

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[59] The only national data that we include is for the United States, which has substantial 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 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.

[60] 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.

[61] Recall that other investment debt can be decomposed into loans, currency and deposits, trade credit and advances, other accounts payable/receivable, and pension and insurance.

Table A4: 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 Corporations, 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 International Debt Securities (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 financing flows through debt securities.[62] 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.[63] The BIS data captures cross-border lending from banks in BIS reporting countries.[64,65] 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 com-

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

[63]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.

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

[65]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.

ponent of loans.[66] 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 B.

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 becomes our estimate for other investment debt from BIS data.[67]

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.[68]

Table A5 shows the percentage of observations for inflows that are filled by each step of our filling exercise for each sector-instrument category for each country group. For outflows (asset flows), there are few external datasets to do comparable filling. Thus, we rely primarily on our internal filling strategy and end up with a much smaller sample of countries. In one case, we can and do fill using external data. The BIS banking data has data for cross border lending of banks in countries that report to the BIS, separated into loans and bonds.

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[66] 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.

[67] 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.

[68] Even though the sector data may be missing in the BOP, the total for portfolio debt or other investment debt inflows often is not. We do not constrain our filled series by sector to match the total of the flow type as reported in the BOP. However, the two series correlate highly (.86 for total debt inflows) and exhibit similar patterns.

Thus, we use this data to fill for the banking sector when missing, but given that most BIS member reporting countries are advanced, this does not fill many observations.

Figure A2 compares aggregate inflows as measured by our filled data and from the BOP alone, for total external debt of 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 the subsequent contraction are 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 debt inflows for China.

Figure A3 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). EM governments and AE 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 EM 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 EM central banks is driven by China.

To illustrate the quality of our inflow filling series, we compare it with the available BOP data. Figures A4 and A5 illustrates this match by plotting the aggregate inflows for each series by sector, capital flow type, and country group. For each sector and capital flow type,

Table A5: 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.

Figure A2: Aggregate External Debt Inflows for Banks and Corporates, Billions 1996 USD
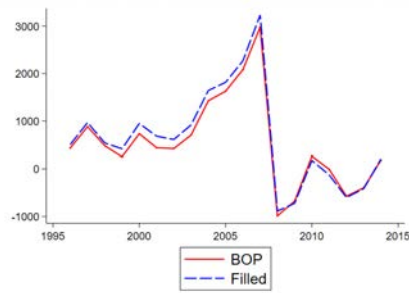
(a) Advanced Bank
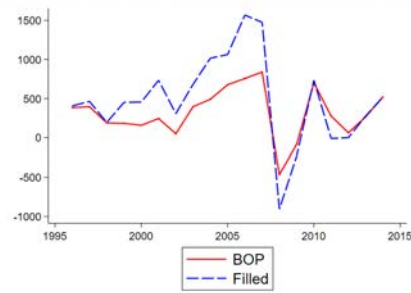
(b) Advanced Corporate
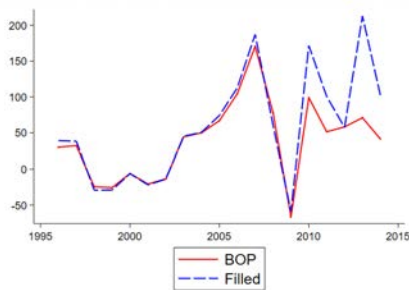
(c) Emerging Bank
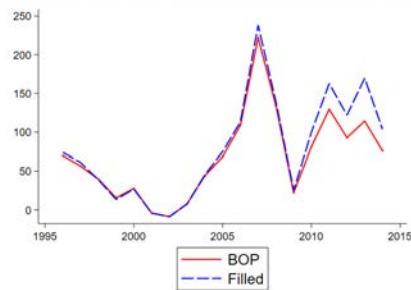
(d) Emerging Corporate

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.

we keep only countries that had non-missing BOP data over 2006q1-2013q4.

Figure A3: Aggregate External Debt Inflows for Governments and Central Banks, Billions 1996 USD
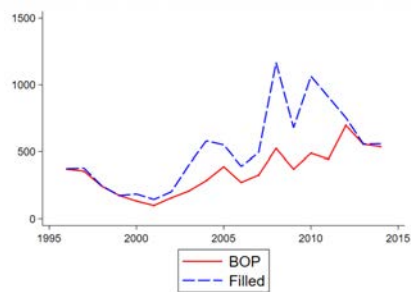
(a) Advanced Government
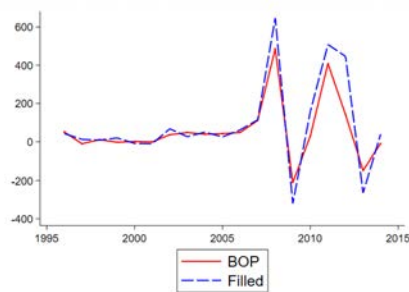
(b) Advanced Central Bank
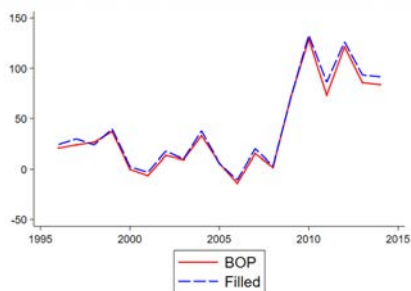
(c) Emerging Government
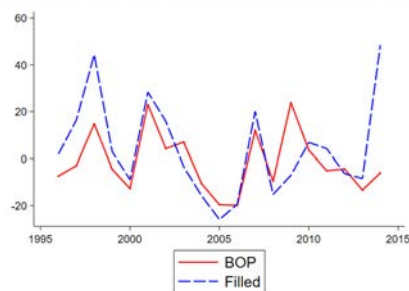
(d) Emerging Central Bank

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.

Figure A4: Aggregate Portfolio Debt, Billions USD
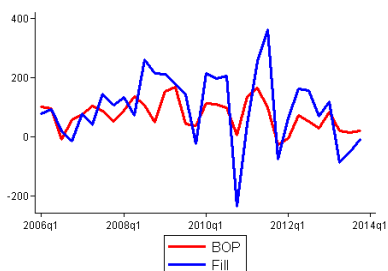
(a) Advanced Government
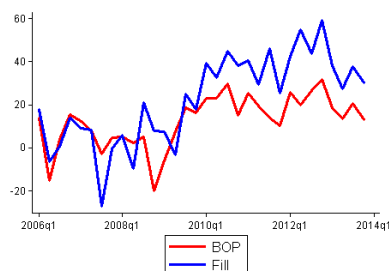
(b) Emerging Government
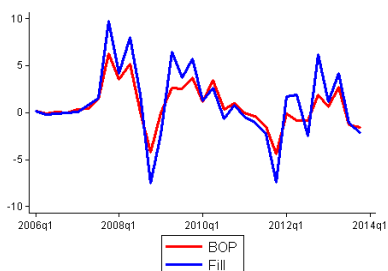
(c) Advanced Central Bank
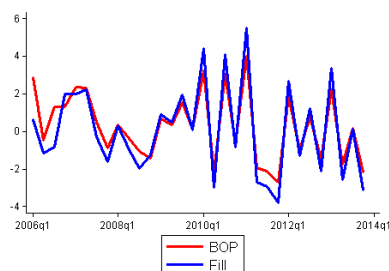
(d) Emerging Central Bank
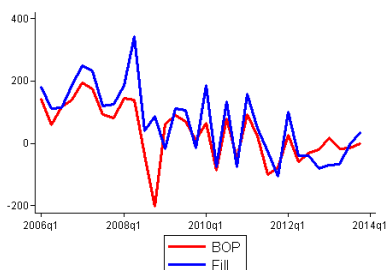
(e) Advanced Banks
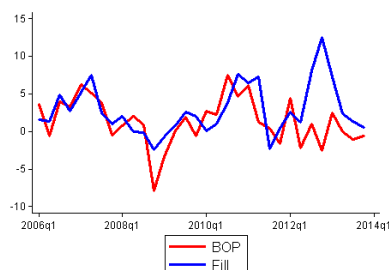
(f) Emerging Banks
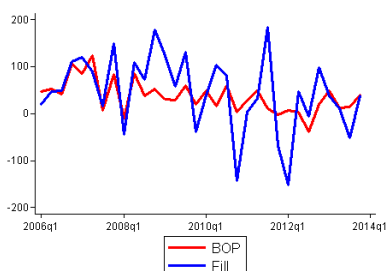
(g) Advanced Corporates
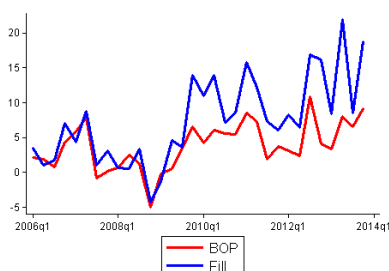
(h) Emerging Corporates

Figure A5: Aggregate Other Investment Debt , Billions USD
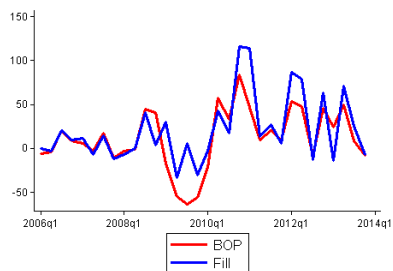
(a) Advanced Government
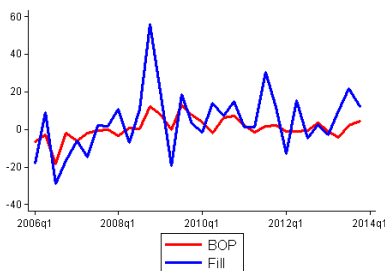
(b) Emerging Government
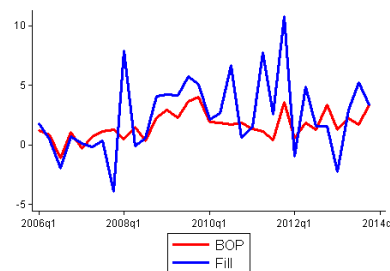
(c) Developing Government
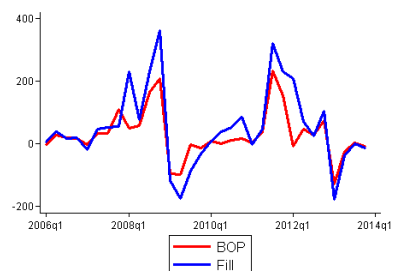
(d) Advanced Central Bank
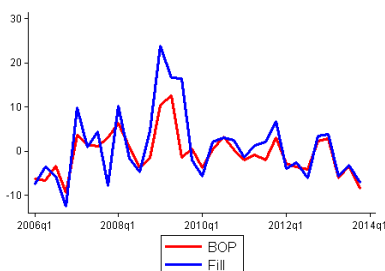
(e) Emerging Central Bank
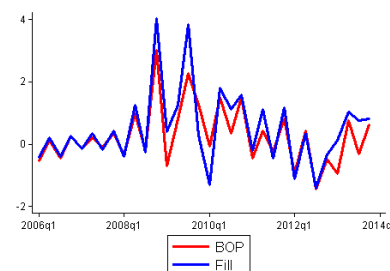
(f) Developing Central Bank
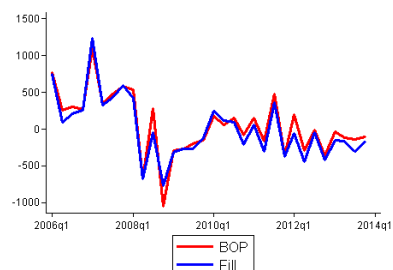
(g) Advanced Banks
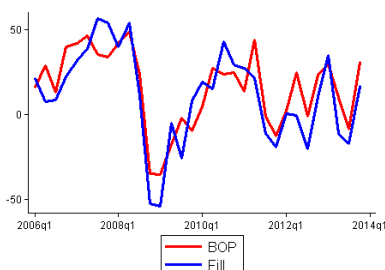
(h) Emerging Banks
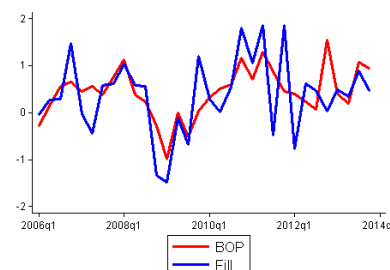
(i) Developing Banks
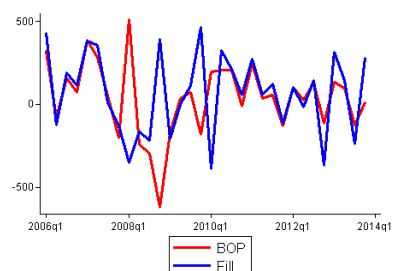
(j) Advanced Corporates
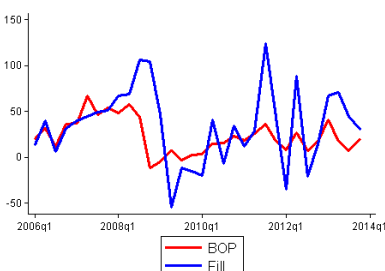
(k) Emerging Corporates
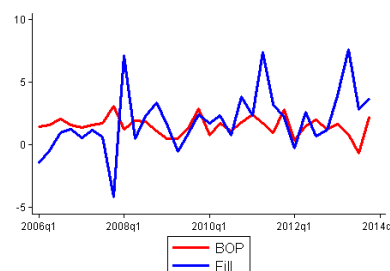
(l) Developing Corporates

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A.4 Samples

A.4.1 Inflow Figures

There are 89 countries in our annual data sample of capital inflows:[69]

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

A.4.2 Inflow Regressions

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

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

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

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.

A.4.3 Outflow Sample

Our outflow sample consists of 31 countries:[70]

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

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[70]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.

B BIS Data

B.1 International Debt Securities

The Bank for International Settlements (BIS) produces datasets on international bond is-
suance and bonds outstanding, by sector and by residence or nationality of the issuer. In-
ternational 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 neces-
sarily imply that the securities are held by foreigners, but can be taken as an approximation
for external holdings of debt securities.[71] 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 secu-
rities 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 nation-
ality of the issuer. Further, the BIS classifies IDS according to sector with several subsectors

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[71]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 be
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.

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.

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.

B.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.[72] The historical LBS data breaks down counterparties in each country into banks (banks and central bank sectors) and non-banks (corporate and

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[72]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%.

government sectors).[73] The LBS reports outstanding stocks, and based on them BIS calculates exchange rate- and break-adjusted flows.[74]

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 nationality (rather than by the residence) of the reporting bank.[75] Currently, banking groups from 31 countries report to the CBS. We use the CBS on an immediate counterparty basis (CBS/IC).[76] 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.

B.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 LBS by residency (LBSR). For observations prior to 2013,

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[73]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).

[74]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.

[75]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.

[76]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)

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).[77] 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).[78]

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

B.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.[79] We calculate that as follows:

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

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

---

[77]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.

[78]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.

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

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.[80] 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 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.[81]

Having made these assumptions and constructed the external debt to bank creditors, we

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[80] 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.

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

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)[82], 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.[83]

B.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.[84] 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 non-bank private Sector denominated in currency j as follows:

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

[83]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.

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

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

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:

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

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:

$$\widehat{XBS}_{i,t}^{j,pub} = \widehat{XBS}_{i,t}^{all,pub} \left(\frac{XBS_{i,t}^{j,nb}}{XBS_{i,t}^{all,nb}} \right) \tag{7}$$
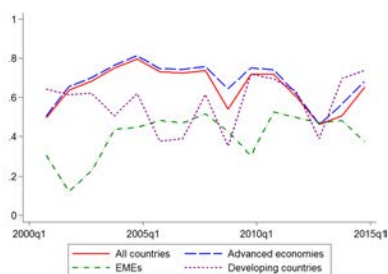
$$\widehat{XBF}_{i,t}^{j,pub} = \frac{\widehat{XBS}_{i,t}^{j,pub} FX_t^{j,usd} - \widehat{XBS}_{i,t-1}^{j,pub} FX_{t-1}^{j,usd}}{\widetilde{FX}_t^{j,usd}} \tag{8}$$

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

where pub denotes the Public Sector.

C Additional Results

Figure C1: Composition of External Debt Inflows by Debt Type and Sector

(a) Share of Debt in Total
Stocks
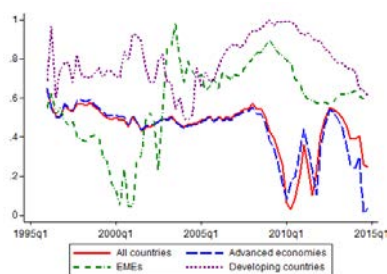
(b) Share of Other Investment
in Total Debt Stocks
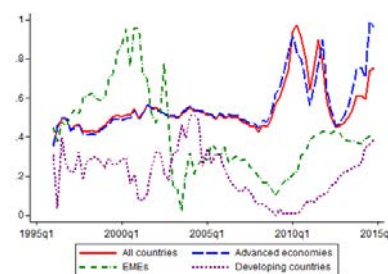
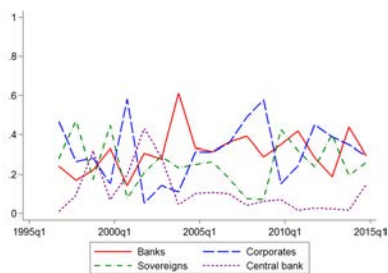(c) Share of Portfolio Debt in
Total Debt Stocks
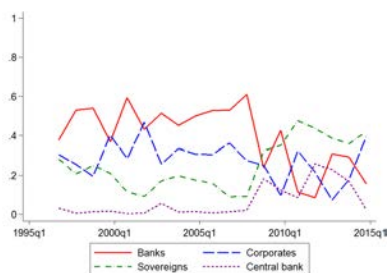
(d) Share of Sectors in Total
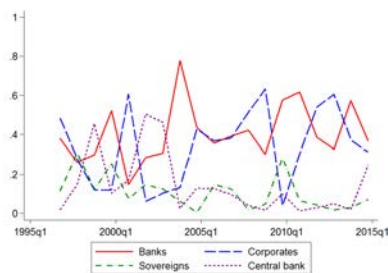Debt - Advanced
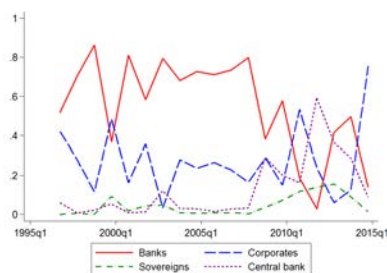
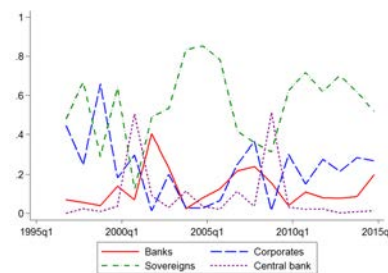(e) Share of Sectors in Other
Investment Debt - Advanced
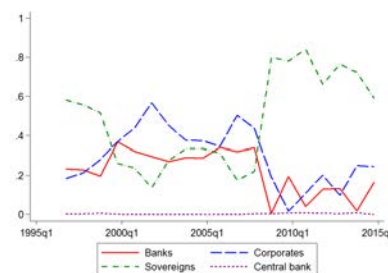
(f) Share of Sectors in Portfolio
Debt - Advanced

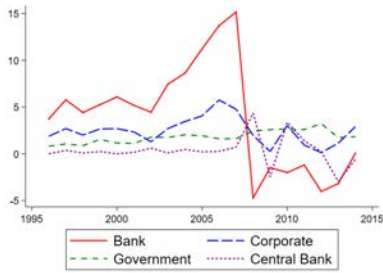(g) Share of Sectors in Total
Debt - Emerging

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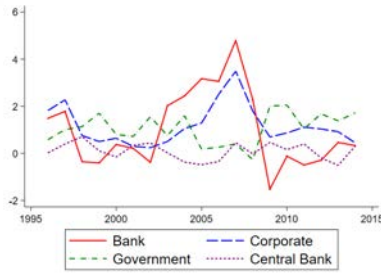Investment Debt - Emerging

(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
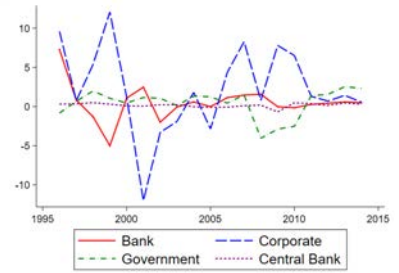balanced sample.

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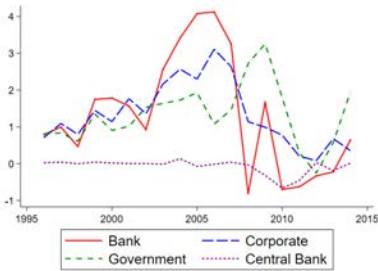Figure C2: Average External Debt Inflows, Percent of GDP
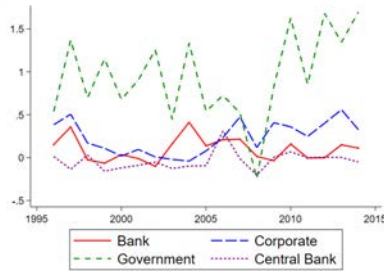

(a) Total Debt, Advanced

(b) Total Debt, Emerging

(c) Total Debt, Developing

(d) Portfolio Debt, Advanced

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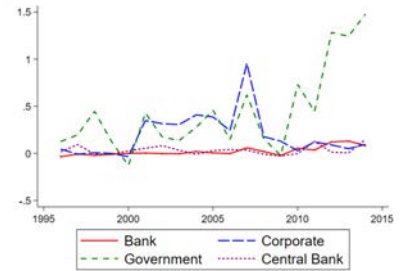
(f) Portfolio Debt, Developing
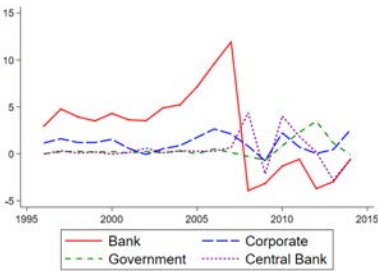
(g) Other Investment Debt,
Advanced
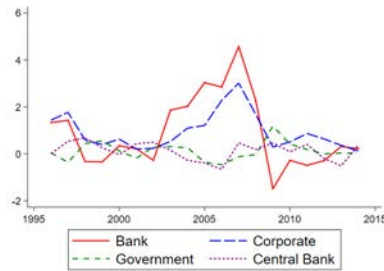
(h) Other Investment Debt,
Emerging
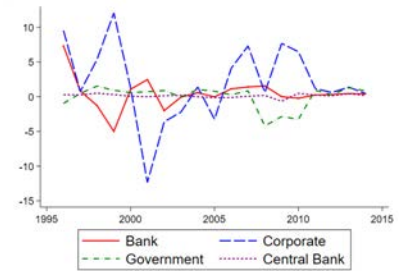
(i) Other Investment Debt,
Developing

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

Figure C3: Total vs Private Average Debt Inflows, Percent of GDP

(a) Advanced

(b) Emerging

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

Table C1: Drivers of Total Debt Inflows Before and After the Global Financial Crisis, by Sector - Advanced Economies (Quarterly AHKS data, missing filled from Public Sources)

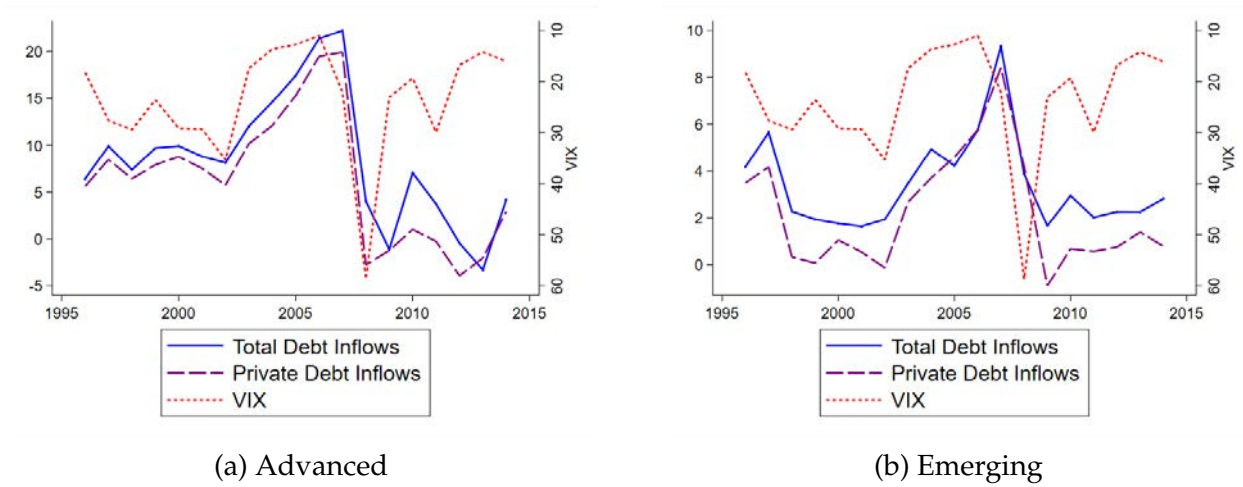|	Pre-GFC: 2002q4-2007q4				Post-GFC: 2008q1-2014q4			
	(1) Total	(2) Public	(3) Banks	(4) Corp.	(5) Total	(6) Public	(7) Banks	(8) Corp.
$\log(\text{VIX}_{t-1})$	-10.47***	-0.405	-7.224***	-2.843**	1.879	2.081	-0.255	0.0529
	(2.308)	(0.817)	(1.805)	(1.143)	(3.714)	(2.351)	(1.938)	(0.647)
GDP Growth$_{it-1}$	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 A.4. 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 C2: 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.
$\log(\text{VIX}_{t-1})$	-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 A.4. 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 C3: 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)
$\log(\text{VIX}_{t-1})$	-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 A.4. 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 C4: 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)
$\log(\text{VIX}_{t-1})$	-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 A.4. 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 C5: 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.
$\log(\text{VIX}_{t-1})$	-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 A.4. 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 C6: 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.
$\log(\text{VIX}_{t-1})$	-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 A.4. 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. ** $p < 0.05$, *** $p < 0.01$
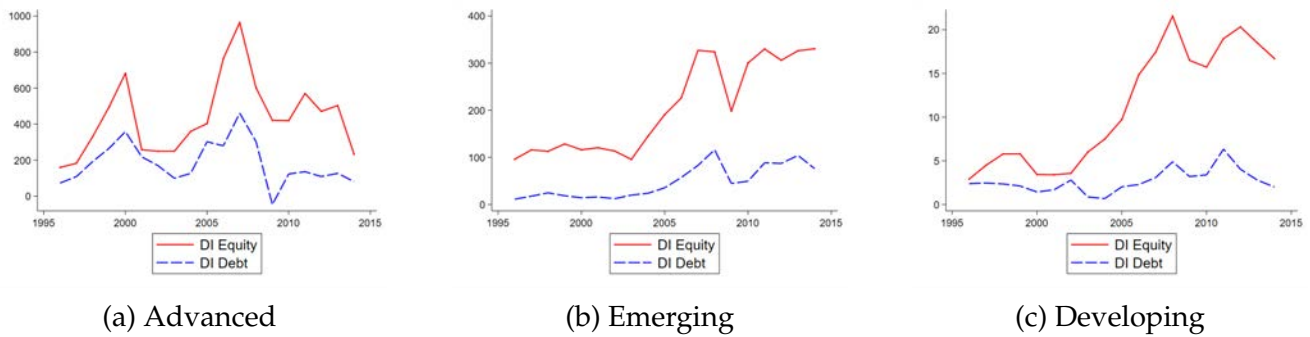
C.1 Direct Investment Debt

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.[85] 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 A.4.

Direct investment debt is an important part of direct investment flows, as shown in Figure C4 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 be felt relatively more in other economies.

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

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

Figure C4: Aggregate Direct Investment Inflows, Billions 1996 USD

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

Source: BOP data and authors' calculations.

financial firms (or banks) are negligible. With this assumption, we can allocate direct invest-ment debt to the corporate sector. We compare direct investment debt, portfolio debt, and other investment debt for the corporate sector in Figure C5.[86]

Figure C5: Aggregate Corporate Debt Inflows, Billions 1996 USD

(a) Advanced   (b) Emerging   (c) Developing
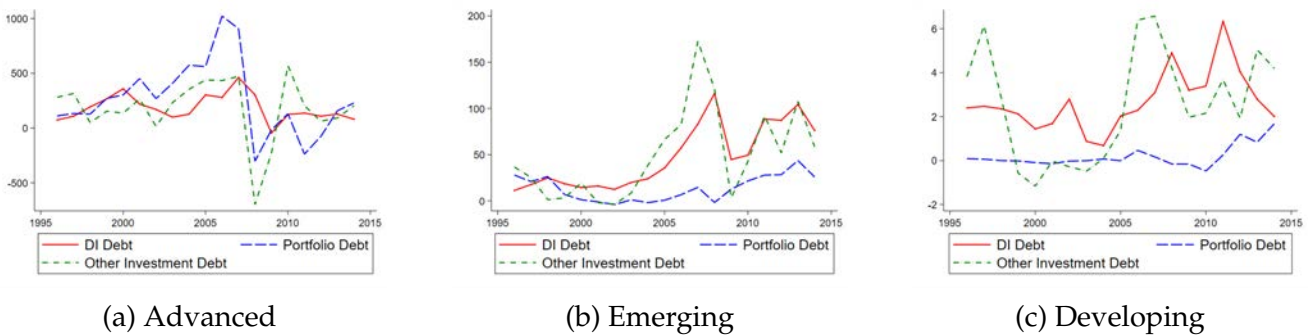
Source: BOP data and authors' calculations.

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.

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[86]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 missing the other investment debt for corporates series in the BOP.

C.2 PPG vs PNG Debt Inflows

We have focused in this paper 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.[87] We can do this for emerging 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:[88]

Emerging (14): Brazil, Bulgaria, China, Colombia, Egypt, India, Indonesia, Jordan, Malaysia, Mexico, Peru, Philippines, Thailand, Turkey
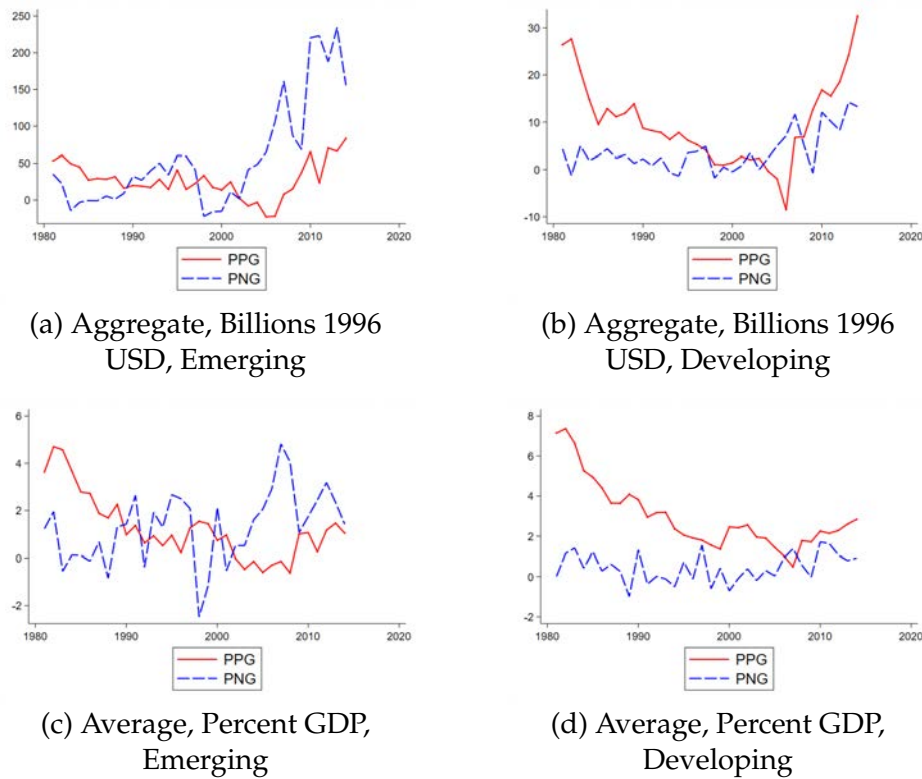
Developing (60): Algeria, Bangladesh, Belize, Benin, Bhutan, Bolivia, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Republic of Congo, Costa Rica, Cote d'Ivoire, Dominica, Dominican Republic, Ecuador, El Salvador,

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[87]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.

[88]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 analogous to the decomposition done in Alfaro, Kalemli-Özcan, and Volosovych (2014), who do their analysis in the context of net flows.

Ethiopia, 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

Figure C6: 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.

Figure C6 (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 3 and C2, where much of the post-2008 increase in aggregate flows is driven by large and quickly growing EM such as China.[89]

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 3 and C2, 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.

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[89]These figures will not be exactly comparable in terms of magnitude with our previous dataset in Figure 3, as the underlying sample of countries is somewhat different.