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## Tracking Global Demand for Emerging Market Sovereign Debt

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## **IMF Working Paper**

Monetary and Capital Markets Department

### **Tracking Global Demand for Emerging Market Sovereign Debt<sup>1</sup>**

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Authorized for distribution by Luc Everaert

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#### **Abstract**

This paper proposes an approach to track US\$1 trillion of emerging market government debt held by foreign investors in local and hard currency, based on a similar approach that was used for advanced economies (Arslanalp and Tsuda, 2012). The estimates are constructed on a quarterly basis from 2004 to mid-2013 and are available along with the paper in an online dataset. We estimate that about half a trillion dollars of foreign flows went into emerging market government debt during 2010–12, mostly coming from foreign asset managers. Foreign central bank holdings have risen as well, but remain concentrated in a few countries: Brazil, China, Indonesia, Poland, Malaysia, Mexico, and South Africa. We also find that foreign investor flows to emerging markets were less differentiated during 2010–12 against the background of near-zero interest rates in advanced economies. The paper extends some of the indicators proposed in our earlier paper to show how the investor base data can be used to assess countries' sensitivity to external funding shocks and to track foreign investors' exposures to different markets within a global benchmark portfolio.

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## I. INTRODUCTION

**Over the last decade, emerging markets (EMs) have made significant improvements in public debt management, reducing a number of risks associated with how they issue debt (“supply-side risks”).** In particular, most EMs have extended the maturity of their debt profile, cut down issuance of floating rate debt, and reduced foreign-currency debt (Anderson et al. 2010). These improvements, along with reduced levels of public debt, have made their public sector balance sheets more resilient to shocks, including exchange rate and interest rate shocks. Partly as a result, foreign interest in EM government debt rose sharply in recent years.

**Rising foreign participation in EM government debt markets create opportunities but also new risks (“demand-side risks”).** In particular, rising foreign participation in government debt markets can help reduce borrowing costs and spread risks more broadly among investors, but it can also raise external funding risks for the government. This risk was highlighted when EM local bond markets experienced foreign outflows and bond yields rose sharply after Chairman Bernanke’s remarks in May 2013 regarding tapering of asset purchases. This “demand-side” risk, which is related to who holds the debt rather than how it is issued, is less under the control of public debt managers, as long as government debt is freely traded in secondary markets.

**These demand-side risks make it important to track the investor base for government debt, especially from an international perspective.** Having a cross-country view of the sovereign investor base is essential for understanding global demand dynamics, as changes in the country allocations of international investors affect many countries at once. Also, only internationally comparable data allow us to aggregate investor flows across countries to examine changes in the asset allocation of international investors. However, this is currently difficult to do as (i) investor base data available from national sources are not always comprehensive or comparable; (ii) flow of funds data are not usually available for emerging markets; and (iii) data from private sector vendors (e.g. survey or custodial data) cover only part of the investor base, although these data have their own merits, such as shorter reporting lags.

**This paper takes a step towards compiling comparable and standardized estimates of the investor base of EM government debt.** It follows the same approach we took for advanced economies and has the following characteristics: First, a common definition of debt is used (general government gross debt). Second, a common estimation methodology is used to ensure cross-country comparability based on harmonized international data sources. Third, all data are compiled either at face value or, in a few instances, adjusted for valuation changes. This allows for tracking investor transactions as well as holdings. Fourth, foreign investor holdings are estimated separately for the foreign official sector, foreign banks, and foreign nonbanks, in contrast to national data sources that usually classify them under one category (“rest of the world”). Finally, the dataset covers 24 countries that make up most of the investable universe of EM government debt, and, therefore, provides a comprehensive view of the global demand for sovereign debt of emerging markets.<sup>2</sup>

<sup>2</sup> The dataset is available at <http://www.imf.org/external/pubs/ft/wp/2014/Data/wp1439.zip>. The corresponding dataset for advanced economies is available at <http://www.imf.org/external/pubs/ft/wp/2012/Data/wp12284.zip>. Separately, the emerging markets dataset includes data on foreign holdings of government debt in local currency.

**Based on this dataset, the paper presents some stylized facts about EM sovereign debt investors.** First, we find that about half a trillion dollars of foreign flows went into EM government debt during 2010–12, mostly coming from foreign asset managers (Figure 5 and Annex Figure 3). Second, we find that foreign central banks are playing a greater role in EM debt markets, but still hold only about US\$40-80 billion of EM government debt securities as of end-2012 (out of a total of US\$1 trillion foreign holdings). Moreover, their holdings appear to be concentrated in only a few countries: Brazil, China, Indonesia, Poland, Malaysia, Mexico, and South Africa. Third, we find that foreign flows to emerging markets were less differentiated during 2010–12 against the background of near-zero interest rates in advanced economies (Figure 8).

**Finally, the paper extends some of the indicators proposed in our earlier paper to demonstrate how the investor base data can be used for further analysis.** In particular, we construct illustrative scenarios (Funding Shock Scenarios (FSS)) to assess countries' sensitivity to external funding shocks. The scenarios highlight the importance of extending the maturity of government debt, developing a local investor base, and maintaining liquidity buffers to mitigate external funding shocks. We also show through the Foreign Investor Position Index (FIPI) how to track exposures of foreign investors to different markets within a global benchmark portfolio.

**The rest of the paper is organized as follows.** Section II discusses further the motivation of the paper. Section III describes the methodology and data sources used to compile our investor base estimates. Section IV highlights the main trends we identify in the data. Section V describes the FSS, while Section IV demonstrates the use of the FIPI. The final section examines some of the policy implications of our findings.

## II. MOTIVATION

**Why does the composition of the sovereign investor base matter?** There are at least three reasons: shifts in the sovereign investor base can (i) affect governments' borrowing costs; (ii) affect governments' funding risks; and (iii) create potentially harmful sovereign-bank linkages and threaten domestic financial stability, if domestic banks become highly exposed to own government debt. The focus of the paper is on the last two issues. We also touch on the issue of investor base diversity, which could matter for market liquidity, risk sharing, and public debt liability management operations.

### *Borrowing costs*

**Shifts in the composition of the investor base can have implications for governments' borrowing costs.** In the short run, the supply of sovereign debt is set by the government and, therefore, the price (or inversely yield) of debt is set by demand. Hence, as new investors, such as foreign or institutional investors, join the investor base, demand for government debt can rise and the government's borrowing costs can decline. Moreover, financial integration, driven by a desire for portfolio diversification, can lead to a convergence in real interest rates. Indeed, several studies show that an increase in the share of foreign investors or real money investors in the investor base is typically associated with lower sovereign bond yields (Andritzky, 2012; Arslanalp and Poghosyan, 2014; Jaramillo and Zhang, 2013; Warnock and Warnock, 2009).

### *External funding risks*

**At the same time, a rising share of foreign investors in the investor base can make borrowers more sensitive to external funding conditions.** Foreign investors, in particular foreign private investors, could be a less stable source of demand in times of stress, given the broader pool of assets they can invest in. As a result, they may be less willing to roll over (or more likely to sell) their holdings during such episodes (Broner et al., 2013). Countries may also be hit by sudden stops in foreign funding simply as a result of increased global risk aversion (Calvo and Talvi, 2005). Regardless of the reason (country-specific or global), a rising share of foreign investors in the investor base can increase the exposure of a sovereign to external funding risks. This is one reason why public debt managers pay special attention to investor relations, especially relations with foreign investors (Blommenstein et al., 2011; IMF, 2011).

### *Risk to domestic financial stability*

**On the other hand, a high share of domestic banks in the investor base may jeopardize domestic financial stability.** During the euro area debt turmoil, domestic banks in a number of countries became significant buyers of government debt when foreign investors fled the market. This offset some of the pressure on bond yields. However, rising bank holdings of own government debt may pose another type of risk, that is the risk to domestic financial stability stemming from a strong two-way interdependence between the sovereign and domestic bank balance sheets (BIS, 2011; Merler and Pisani-Ferry, 2012). Specifically, market concerns about sovereign risk could undermine confidence in banks, and thus threaten domestic financial stability, if banks hold large amounts of government debt or their funding costs are closely tied to sovereign yields. In turn, domestic banks may require sovereign support, which could further elevate the sovereign-bank interdependence. Due to these negative feedback loops, a large concentration of government bond holdings in domestic banks is a potential risk to domestic financial stability.

### *Implications of a diverse investor base*

**The composition of the investor base, in particular its diversity, can have other important implications.** A more diverse investor base can facilitate greater international risk sharing (Sill, 2011; Stulz 1999; Tesar, 1995). A diverse investor base, reflecting different investor characteristics in terms of risk tolerance and trading motives, may increase the liquidity of government debt securities in the secondary market (World Bank and IMF, 2001). Markets may also better reflect sovereign credit risk with a large and diverse investor base (Ejsing et al. 2012). At the same time, a more concentrated investor base may facilitate easier liability management operations in government debt markets (Das, Papaioannou, and Trebesch, 2012).

## III. SOVEREIGN INVESTOR BASE ESTIMATES

### A. Overview

**This section explains the methodology and data sources used to compile our investor base estimates for emerging markets, as an extension of Arslanalp and Tsuda (2012).** The estimates are compiled on a quarterly basis and cover the period from 2004 to mid-2013 for 24 emerging markets. As of end-2012, the sample covers US\$ 9 trillion of government debt and

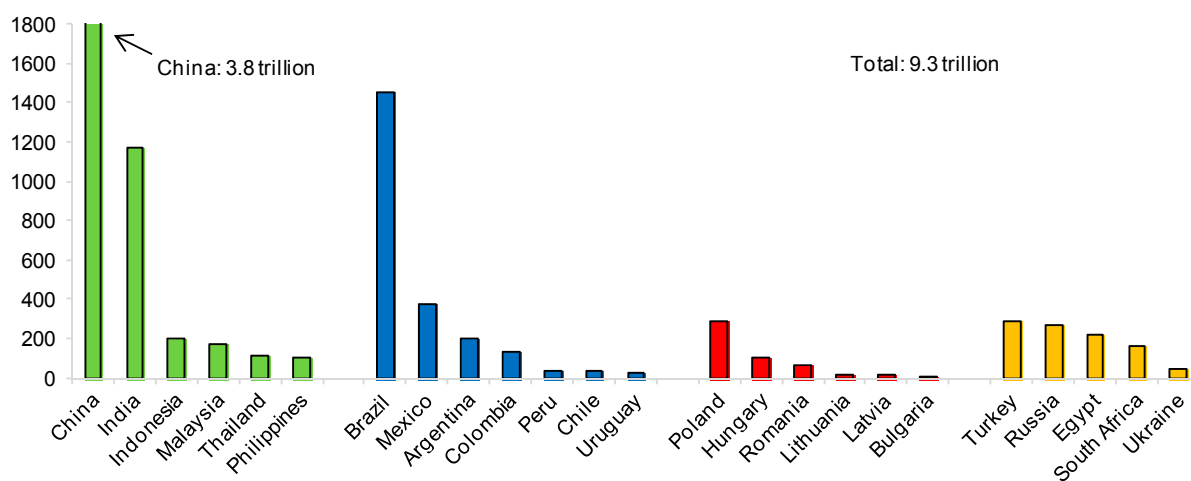
US\$ 1 trillion of debt securities held by foreigners.<sup>3</sup> It captures 14 of the 15 countries included in JPMorgan's local-currency emerging market government bond index (JPMorgan GBI-EM) and 23 countries included in the foreign-currency bond index (JPMorgan EMBI). Together, these countries account for 99 percent of the JPMorgan GBI-EM Global index by country weights and nearly 80 percent of the JPMorgan EMBI Global index, as of end-2012. Table 1 provides the full list of countries in our dataset. Table 2 provides a summary of the data sources used in the compilation of our estimates. Figure 1 provides a breakdown of government debt outstanding by country and region. Figure 2 provides an overview of our estimation approach. Figure 3 gives a breakdown of the estimated holdings of the debt as of end-2012. Annex Figure 1 provides the full picture of investor holdings since 2004.

**Table 1. Sample of Countries**

Asia	Latin America	EMEA-EU	EMEA-Non EU
China	Argentina	Bulgaria	Egypt
India	Brazil	Hungary	Russia
Indonesia	Chile	Latvia	South Africa
Malaysia	Colombia	Lithuania	Turkey
Philippines	Mexico	Poland	Ukraine
Thailand	Peru	Romania	
	Uruguay		

Note: EMEA stands for Europe, Middle East, and Africa.

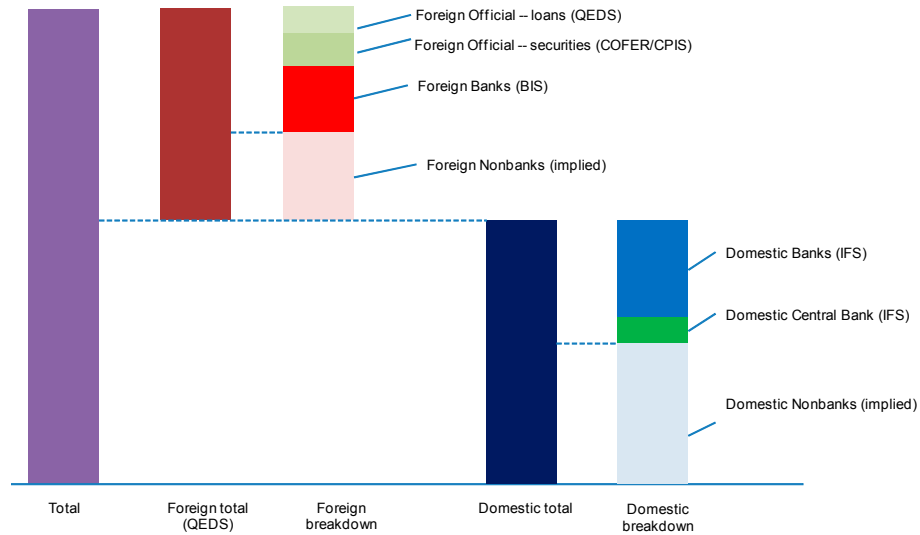
**Figure 1. Emerging Market Government Debt Universe, end-2012**  
(billion U.S. dollars)



Source: Authors' calculations.

Note: Government debt indicates general government gross debt.

<sup>3</sup> In comparison, Emerging Markets Portfolio Research (EPFR) tracks about US\$ 300 billion of emerging market bonds, inclusive of corporate bonds. EPFR Global also tracks individual country bond holdings, but these are smaller due to the difficulty of identifying country allocations within each mutual and exchange traded fund (ETF).

**Figure 2. Summary of Methodology**

Source: Based on Arslanalp and Tsuda (2012).  
 Note: Dotted lines lead to calculation of implied values.

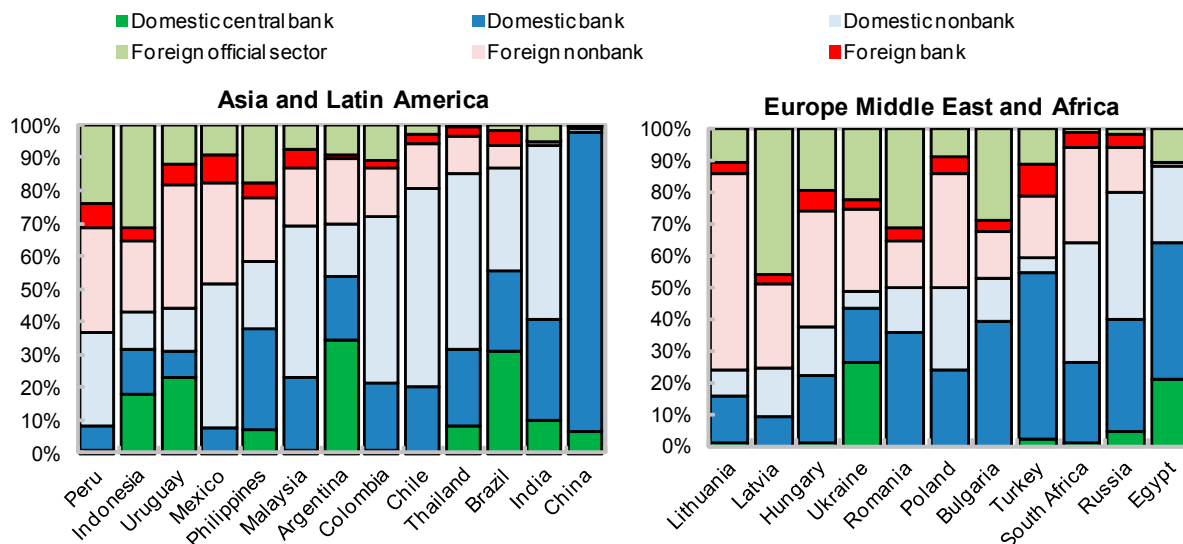
**Table 2. Summary of Data Sources**

	Data Source	Coverage, by sector	Coverage, by instrument <sup>1/</sup>	Valuation of debt securities
<b>Total debt</b>	Eurostat, Quarterly Public Sector Debt Statistics (QPSD), Government Financial Statistics (GFS), and national sources	General Government	Loans and Securities	Face value
<b>Foreign Holders</b>	IMF/World Bank Quarterly External Debt Statistics (QEDS), and national sources	General Government	Loans and Securities	Face value, with a few exceptions (see Table 4)
<b>Foreign Banks</b>	BIS, International Banking Statistics	General Government	Loans and Securities	Book value
<b>Foreign Official: Foreign Central Banks</b>	IMF, Currency Composition of Official Foreign Exchange Reserves (COFER); IMF, Coordinated Portfolio Investment Survey (CPIS)	General Government	Securities	Market value
<b>Foreign Official: Official Loans</b>	IMF/World Bank, Quarterly External Debt Statistics (QEDS)	General Government	Loans	...
<b>Domestic Banks</b>	IMF, International Financial Statistics (IFS)	General Government	Loans and Securities	Book value
<b>Domestic Central Bank</b>	IMF, International Financial Statistics (IFS)	General Government	Loans and Securities	Book value

<sup>1/</sup> For EU countries, an additional category is "currency and deposits." These mainly represent savings certificates and retail bonds that can be redeemed before maturity, and are generally a relatively small share of total debt.



**Figure 3. Emerging Markets: Holders of Government Debt, end-2012**  
(percent of total)



Source: Authors' calculations.

Note: Government debt indicates general government gross debt. Domestic banks are depository corporations residing in the country (IFS definition). Foreign banks are BIS reporting banks and bank branches residing outside the country. Foreign official sector includes foreign official loans and foreign central bank holdings as reserve assets. Foreign nonbanks and domestic nonbanks are imputed from external and total debt.

**Our estimates derive primarily from cross-comparable international data sources** (Table 2). To the extent possible, we use international data sources because they allow us to have a more harmonized view of debt and investor holdings.<sup>4</sup> In particular, these data sources have the same coverage of government debt (general government securities and loans), are based on the same definition of foreign investors (the “residency principle”), and use similar definitions of banks and other investors (e.g. the IFS and BIS definitions of banks as “depository corporations”). Moreover, valuations of debt securities in these data sources are usually comparable, except for a few cases, as discussed later. Finally a guiding principle in our estimates is that investor holdings represent outright ownership. Government debt pledged or accepted as collateral does not constitute a transfer of ownership in our approach.

**Throughout the exercise, we use a common definition of government debt—general government gross debt.** General government gross debt covers the debt of the central government, state and local governments, and, if any, social security funds. For most countries in the sample, general government debt consists predominantly of central government debt. The definition of debt includes securities and loans (in local and foreign currency). It does not include arrears, financial derivatives, guaranteed debt or other contingent liabilities. All debt figures are compiled on a gross basis.<sup>5</sup> We adopt this definition of debt for better comparability

<sup>4</sup> National data submitted to international data sources need to be consistent with a number of statistical guidelines for data compilation, bringing an additional level of cross-comparability. These include the *BIS Guide to the International Banking Statistics*; *IMF Coordinated Portfolio Investment Survey Guide*; *IMF External Debt Statistics: Guide for Compilers and Users*; and *IMF Monetary and Financial Statistics: Compilation Guide*.

<sup>5</sup> Although some countries may use the “net debt” concept by subtracting various types of financial assets from gross debt, there is no internationally recognized common definition of net debt.

and to facilitate use of international data sources. This approach also makes our investor base estimates comparable with those constructed earlier for advanced economies.

**For most countries, general government gross debt statistics are reported directly by the authorities.** For EU countries, relevant data are readily available from Eurostat’s Quarterly Government Finance Statistics (“Maastricht debt”). For Indonesia, Mexico, Peru, and Russia, they are available from the IMF/World Bank Quarterly Public Sector Debt Statistics (QPSD) database. For Brazil, Egypt, India, Philippines, Turkey, and Uruguay, they are reported by national authorities either directly or through IMF’s Government Finance Statistics (GFS).<sup>6</sup>

**For the remaining countries, general government gross debt is estimated from various sources.** For China, we use the “augmented” government debt estimates constructed by Zhang (2014) and reported in IMF’s 2013 Article IV consultation report with China (IMF Country Report 13/211). These figures capture (i) central government debt, and (ii) borrowing by local government financing vehicles (LGFVs) through market financing channels. For other countries, we follow a similar approach and compile general government debt as the sum of (i) central government gross debt, as reported by national authorities, and (ii) local government gross debt, if any (Table 3). Data on the latter are available from national sources for Colombia and South Africa. For others, they are estimated from IMF’s International Financial Statistics (“depository corporations’ claims on local governments”) based on the assumption that local governments borrow mainly from domestic banks in these economies.

**Finally, we compile estimates of central government debt securities outstanding by currency.** Data on the currency composition of government debt, are needed to construct (exchange-rate adjusted) investor flows, as explained in Section III.D of the paper. The relevant data come from national data sources and are included in our online dataset.

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<sup>6</sup> Data for Philippines and Uruguay are available on an annual basis. We interpolate intra-year values based on quarterly changes in central government debt, as local government debt is limited in these countries. Gross debt for Brazil is based on the official method used until 2007, inclusive of central bank holdings of government debt.

**Table 3. Selected Emerging Markets: Construction of General Government Gross Debt, end-2012**

	Central Government	State and Local Government	Total
(in billions of local currency)			
Argentina 1/	941	31	972
Chile 2/	15,518	0	15,518
Colombia 3/	213,924	16,285	230,209
Malaysia 4/	512	2	513
South Africa 5/	1,334	14	1,348
Thailand 6/	3,517	22	3,539
Ukraine 7/	384	11	395

Sources: National authorities and authors' calculations.

1/ Ministerio de Economía y Producción (central government debt refers to debt excluding arrears and untendered debt) and International Financial Statistics (IFS).

2/ Ministerio de Hacienda and International Financial Statistics (IFS).

3/ Banco de la República.

4/ Bank Negara Malaysia and International Financial Statistics (IFS).

5/ South African Reserve Bank.

6/ Bank of Thailand and International Financial Statistics (IFS).

7/ Ministry of Finance, State Committee of Statistics (central government debt refers to debt excluding guaranteed debt and special drawing rights) and International Financial Statistics (IFS).

**All debt security holdings are reported at face value, except for a few cases where valuations adjustments are made** (Table 4). In most international data sources, such as the BIS International Banking Statistics, the International Financial Statistics (IFS), and the Quarterly External Debt Statistics (QEDS), it is recommended that, in principle, tradable securities be valued at market prices. However metadata available in these data sources show that, in practice, many countries in our sample report these statistics at face/book value. The exceptions are the QEDS data reported by Latvia, Lithuania, Hungary, Poland, South Africa and Thailand. For these, we convert foreign holdings of government debt securities reported QEDS to face value as follows:

- For Latvia, Lithuania, Hungary, and Poland, market and face values of government debt (and foreign holdings, in some cases) are provided separately through national data sources. We use the ratio between these values to convert QEDS data to face value.
- For South Africa and Thailand, a similar approach is used to convert QEDS data to face value, using data from the National Treasury and Bank of Thailand, respectively.

**Table 4. Valuation of Debt Securities in Quarterly External Debt Statistics (QEDS)**

<b>Countries</b>	<b>Valuation of debt securities</b>	<b>Countries</b>	<b>Valuation of debt securities</b>
Argentina	Face value	Malaysia	Face value
Brazil	Face value	Mexico	Face value
Bulgaria	Face value	Peru	Face value
Chile	Face value	Philippines	Face value
China	Face value	Poland	Market value
Colombia	Face value	Romania	Face value
Egypt	Face value	Russia	Face value
Hungary 1/	Market/Face value	South Africa 1/	Market/Face value
India	Face value	Thailand 1/	Market/Face value
Indonesia	Face value	Turkey	Face value
Latvia	Market value	Ukraine	Face value
Lithuania	Market value	Uruguay	Face value

Sources: IMF Dissemination Standards Bulletin Board; and national authorities.

1/ In QEDS, Hungary's reported foreign holdings of government debt securities are at face value before 2008 and market value afterwards. South Africa reports foreign holdings of local-currency debt in market value and foreign-currency debt in face value. Thailand reports foreign holdings of foreign-currency debt at market value.

## **B. Estimation Methodology for Each Investor Type**

**This section provides further discussion on the data and estimation methods used to estimate holdings by each investor.** The investor base for each country's general government debt is decomposed along six investor classes, as in Arslanalp and Tsuda (2012)—domestic banks; domestic nonbanks; the domestic central bank; foreign banks; foreign nonbanks; and the foreign official sector. Banks include depository institutions other than central banks. Nonbanks include other investors, including insurance companies, pension funds, and investment funds. Investment funds could be mutual funds, exchange-traded funds (ETFs), or sovereign wealth funds (SWFs). The foreign official sector includes official loans and foreign central bank holdings of EM government debt as reserve assets.

### ***Foreign holdings***

**Foreign holdings are estimated from the QEDS database.** The QEDS database, launched in 2004, brings together external debt statistics that are compiled by countries that subscribe to the standards of IMF's Special Data Dissemination Standard (SDDS) to provide comparable and standardized national data. The data are made available on a quarterly basis. Using this database, we estimate foreign holdings as the sum of (i) general government securities (money market instruments; bonds and notes) held externally; and (ii) general government loans held externally, consistent with the residency definition of investors used in the paper. Debt securities are recorded at face value for all countries except for Hungary, Latvia, Lithuania, Poland, South Africa, and Thailand, where they are converted to face value.

**For some countries, QEDS data do not include foreign holdings of locally-issued government debt** (Brazil, China, Colombia, Egypt, Malaysia, Peru, Philippines, and Turkey). For these countries, QEDS data are supplemented with national data that specifically provide information on foreign holdings of locally-issued debt (from Tesouro Nacional, ChinaBond, Ministry of Finance and Public Credit of Colombia, Central Bank of Egypt, Bank Negara

Malaysia, Central Reserve Bank of Peru, and the Turkish Undersecretariat of Treasury, respectively). For the Philippines, as there are no official figures on foreign holdings of locally-issued government debt, we infer them from balance of payment statistics reported by Bangko Sentral ng Pilipinas (“portfolio liabilities of general government”).

**Finally, QEDS data do not go all the way back to 2004 for a few countries** (Bulgaria, Egypt, India, Indonesia, Philippines, and Romania). For these countries, historical data are obtained from national sources and compared with the data reported under QEDS in later years to ensure the two series are consistent.

### *Foreign official sector holdings*

Foreign official sector holdings consist of (i) government securities held by foreign central banks as reserve assets; and (ii) foreign official loans.

### *Foreign central bank holdings*

**Foreign central bank holdings are estimated from the IMF’s Currency Composition of Official Foreign Exchange Reserves (COFER) and Coordinated Portfolio Investment Survey (CPIS) databases.** Based on the approach used in Arslanalp and Tsuda (2012), we estimate foreign central bank holdings in two steps. In particular:

- **COFER database.** Currently, more than 140 economies report the currency composition of their foreign exchange reserves to the IMF COFER database. In terms of size, these represent more than half of the worldwide foreign exchange reserves. COFER provides quarterly data on the currency breakdown of these “allocated” reserves into seven major currencies (U.S. dollar; Euro; Pound sterling; Japanese yen; Swiss franc; Australian dollar; and Canadian dollar) and “other currencies.” Worldwide reserve assets in “other currencies” are estimated assuming that the currency composition of the “unallocated” part is similar to the “allocated” part. Moreover, 80 percent of these reserve assets are assumed to be in the form of government debt securities.<sup>7</sup>
- **CPIS database.** Next, we decompose reserve assets in “other currencies” into specific EM countries based on the CPIS database. In particular, Table 6.2 of the CPIS reports the residency of the issuer of debt securities held as reserve assets by foreign central banks (as well as international organizations). This data can be used to calculate specific EM country shares within the “other currencies” group. These country shares are then applied to the aggregate data obtained from COFER to get country estimates.

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<sup>7</sup> This assumption is based on data from *IMF Data Template on International Reserves and Foreign Currency Liquidity* and *IMF CPIS data*, which show that, on average, about 80 percent of foreign exchange reserves consist of government debt securities, while the rest comprise currency and deposits with foreign banks and central banks, debt securities of international institutions, and equities (Arslanalp and Tsuda, 2012).

**This calculation reveals a number of interesting findings.**

- Although still relatively limited, foreign central bank holdings of EM government debt have grown rapidly from minimal amounts only a few years ago. Our estimates based on COFER/CPIS data suggest that foreign central banks held about US\$40 billion of EM government debt, out of a total of about US\$1 trillion of total foreign holdings, as of end-2012. This estimate includes central bank holdings only (i.e. not sovereign wealth funds), and covers only our sample of emerging markets (i.e. not including Korea, Singapore and other recently industrialized countries that are sometimes referred to as emerging markets).
- At the same time, our estimates suggest that foreign central bank holdings are, so far, concentrated in the sovereign debt of only seven EMs: **Brazil, China, Indonesia, Malaysia, Mexico, Poland, and South Africa**. Other EM government debt securities do not seem to be included in central bank reserve assets, as of end-2012. This is in line with a recent study by Henderson, Harr, Suwanapruti, and Kusuma (2012), which identifies the same seven countries as receiving the lion share of foreign central bank flows, based on discussions with reserve managers.
- Our list of seven countries is also in line with a recent IMF survey of reserve managers that found that the minimum credit rating allowed in most risk management frameworks of reserve managers is single-A from a major credit rating agency (IMF, 2013c). There were only seven EMs that satisfied this criterion on their local currency bonds as of end-2012: Brazil, Chile, China, Malaysia, Mexico, Poland, and South Africa. Except for Chile, which has a relatively small market, all are identified in our list of seven.
- Finally, our list of seven includes all emerging market economies included in Citibank's World Government Bond Index (WGBI): Malaysia, Mexico, Poland, and South Africa. The fact that countries included in the WGBI need to satisfy a number of rating and liquidity standards suggests that central banks pay attention to traditional metrics of reserve management (safety and liquidity) in their choice of EM reserve assets.<sup>8</sup>

**These estimates may still underestimate the full extent of central bank holdings of EM government debt.** IMF's statistical guidelines recommend that only assets denominated or settled in convertible foreign currencies should be included as reserve assets.<sup>9</sup> Indeed,

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<sup>8</sup> To join the WGBI, the country must satisfy market size, credit, and barriers-to-entry requirements. The entry criteria for inclusion are (i) an outstanding amount of marketable debt of at least US\$50 billion; (ii) a minimum credit quality of A-/A3 by both S&P and Moody's; and (iii) active encouragement of foreign investor participation. Poland, Malaysia, Mexico, and South Africa were included in the WGBI in May 2003, July 2007, October 2010, and October 2012, respectively.

<sup>9</sup> IMF's *Balance of Payments and International Investment Position Manual* (6th edition) states that reserve assets must be liquid in that the asset can be bought, sold, and liquidated for foreign currency (cash) with minimum cost and time, and without unduly affecting the value of the asset (para 6.69) and generally should be of high quality (para 6.70). Furthermore, to be liquid, reserve assets must be denominated and settled in convertible foreign currencies, that is, currencies that are freely usable for the settlement of international transactions (para 6.72).

information provided by countries through the *IMF Data Template on International Reserves and Foreign Currency Liquidity* suggests that some foreign assets may not be included as reserve assets. In particular, countries report that there were about \$40 billion of assets recorded as “other foreign currency assets” as of end-2012 (in particular through the part identified as “securities not included in official reserve assets”). It is not clear how much of this amount reflects EM government debt. However, if all were EM government debt, central bank holdings would be twice as large as our estimates based on CPIS/COFER alone. Indeed, a recent study by Harr, Trounce, Lai, and Oswald (2013) estimated that foreign official institutions held about US\$98 billion of EM government debt at end-2012, although their estimate includes sovereign wealth fund holdings and Korea is included in their sample of EMs.

### *Foreign official loans*

Foreign official loans include bilateral loans from other countries and multilateral loans from international financial institutions. We rely on external loan statistics in QEDS to capture both types of loans.<sup>10</sup>

### *Foreign bank holdings*

**Foreign bank holdings are estimated primarily from BIS International Locational Banking Statistics.** Banks resident in 43 countries currently provide these statistics to the BIS (a list of BIS reporting banks is available on the BIS website on Guidelines to the International Locational Banking Statistics). These statistics provide creditor-side information on BIS reporting banks’ claims on non-resident borrowers, consistent with the residency principle of external debt statistics. However, they do not provide information on the share of external claims on the government sector versus other nonbank borrowers. To address this data limitation and estimate this share, we use information from the BIS International Consolidated Banking Statistics (on an immediate borrower basis). In particular, foreign banks’ holdings of government debt are estimated as follows:

$$\text{Foreign bank holdings}_{i,t} = \text{Locational claims on nonbank sector}_{i,t} * \frac{x_{it}}{x_{it} + y_{it}}$$

Where:

Locational claims on nonbank sector  $_i$  = External positions of reporting banks vis-à-vis nonbank sector of country  $i$  (BIS Locational Banking Statistics Table 6B).

$x_i$  = Total international claims on public sector of country  $i$  on an immediate borrower basis (BIS Consolidated Banking Statistics Table 9A:G),

$y_i$  = International claims on the nonbank private sector of country  $i$  on an immediate borrower basis (BIS Consolidated Banking Statistics Table 9A:H).

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<sup>10</sup> In principle, external loans in QEDS could also include loans from foreign banks (e.g. syndicated loans). We explored whether this could be an important source of funding and found that our sample countries do not report significant borrowing from such sources, at least in recent years.

While claims on an immediate borrower basis are most comparable to our measure of external debt, the use of Consolidated Banking Statistics in the calculation of the share parameter does not fully comply with the residency principle used in this paper. However, in countries with limited international banking business, there is often little difference between external debt owed to banks based on locational statistics and the same variable based on the international component of consolidated statistics (McGuire and Wooldridge, 2005). Indeed, an alternative estimation approach using data from Tables 6B and 7B of the Locational Banking Statistics alone produces similar estimates.

### ***Foreign nonbank holdings***

Foreign nonbank holdings are estimated as the difference between total foreign holdings and the holdings of the foreign official sector and foreign banks.

### ***Domestic investor holdings***

Domestic investor holdings are estimated as the difference between total debt and foreign debt holdings.

### ***Domestic central bank and domestic bank holdings***

Domestic bank and central bank holdings are obtained from the IFS, which provides data on the claims of depository corporations (banks and the central bank) on the central government and the local government. For Brazil and Mexico, these statistics are supplemented by national data.

Domestic central bank and domestic bank holdings of government debt are obtained from the IFS, based on the gross claims of monetary authorities and “other depository corporations” (IFS definition) on the central government and local government.

### ***Domestic nonbank holdings***

Domestic nonbank holdings are estimated as the difference between total domestic holdings and the holdings of domestic banks and the central bank.

## **C. Robustness Checks and Adjustments**

**We undertook the following tests to check the robustness of our estimates, in particular for domestic and foreign nonbanks:**

### ***Comparison with national data***

If countries publish comprehensive data on holders of government debt, such data can be used for testing the robustness of our estimates. An exact comparison often turns out to be difficult, because national data vary in terms of sector (central or general government), instrument (securities or total debt), and/or valuation (face or market value). Despite these limitations, we were able to compare our estimates with national data for about half of the sample. For these countries, we found that our estimates are in line with national data sources.



### ***Basic consistency checks***

We checked the following basic identities. First, we checked whether foreign central bank holdings are lower than total foreign holdings of debt securities. Second, we checked whether foreign bank holdings are less than the difference between total foreign holdings and foreign official holdings. This turned out to be the case except for six countries in some periods (Bulgaria, Chile, India, Romania, and Thailand). For these cases, we calculated alternative measures of foreign bank holdings, using other emerging markets a benchmark. In particular, we distributed the difference between total foreign holdings and foreign official holdings between foreign banks and foreign nonbanks according to the overall trend in the relative share of the latter two investors in the investor base of other emerging markets.

## **D. Limitations and Extensions**

### ***Investor Holdings***

**Although our estimates are based on comparable and standardized data sources, like all estimates, they have a number of limitations.** These limitations, which are mainly due to data constraints, include:

- ***Foreign central bank holdings.*** As we noted earlier, our estimates for foreign central banks may be somewhat understated. Estimate based on COFER/CPIS data suggest central bank holdings of around \$40 billion of EM government debt as reserve assets at end-2012 (or 4 percent of total foreign holdings of about \$1 trillion). Adding the amount of central bank security holdings not included in reserve assets—and assuming all are EM government debt—would raise this estimate to about US\$80 billion (or 8 percent of total foreign holdings) as of end-2012.
- ***Foreign banks.*** Our foreign bank estimates partially rely on BIS consolidated banking statistics to gather the share of claims on government within total nonbank claims, as this information is not provided by BIS locational statistics. This means our foreign bank estimates may be somewhat overstated for countries where there is a large difference between locational and consolidated BIS statistics. In a number of such cases, we have made adjustments to our foreign bank estimates, as explained in Section III.C.
- ***Foreign and domestic nonbanks.*** Foreign and domestic nonbanks are calculated as implied values in our approach, and, as such, may include measurement errors. For example, foreign nonbanks may include holdings of foreign banks residing in countries that do not report locational banking statistics to the BIS (e.g. China, Russia), although these are likely to be a relatively small share of the cross-border assets of banks globally.

### *Foreign Investor Transactions*

**While our dataset is primarily about investor holdings, it can also be used to gather information about foreign investor flows.** In general, changes in foreign investor holdings between two periods are due to (i) transactions; (ii) price revaluations; (iii) exchange rate changes (in the case of instruments denominated in currencies other than the local currency); or (iv) statistical reclassifications. Regarding (ii), (iii), and (iv):

- **Price revaluations.** Since our estimates of foreign holdings are compiled at face value, this issue is already addressed by the way we compile our estimates.
- **Exchange rate changes.** This is an important issue for emerging markets that still have large foreign-currency denominated debt outstanding. We deal with it directly in our calculation of flows, as explained below.
- **Statistical reclassifications.** We are not aware of important cases of large statistical reclassifications in our data sources on foreign holdings.<sup>11</sup>

**We calculate exchange-rate adjusted foreign flows as follows.**

$$Flow_t = (FC Debt_t - FC Debt_{t-1}) * \varepsilon_t + (LC Debt_t - LC Debt_{t-1})$$

Where:

$Flow_t$ : Foreign flow (denominated in local currency) during t  
 $FC Debt_t$ : Foreign holdings of foreign-currency debt securities (denominated in U.S. dollars) at end-t  
 $LC Debt_t$ : Foreign holdings of local currency debt securities (denominated in local currency) at end-t  
 $\varepsilon_t$ : Average exchange rate against the U.S. dollar during t

Data on foreign ownership of local-currency *central* government debt securities are available for most countries in the sample from national data sources (see Annex Figure 2). We use this as a proxy for foreign ownership of local-currency *general* government debt securities, assuming that foreign holdings of local government debt securities (issued in local-currency) are relatively small, if they exist at all. With that assumption, we can calculate exchange-rate adjusted flows based on the formula above, as we can deduce the foreign holdings of general government debt securities in foreign-currency as a residual from total foreign holdings of debt securities (or from QEDS Table 2.1 for a few countries that report it). The estimated foreign flows, adjusted for exchange rate changes, are reported in detail in Annex Figure 3.

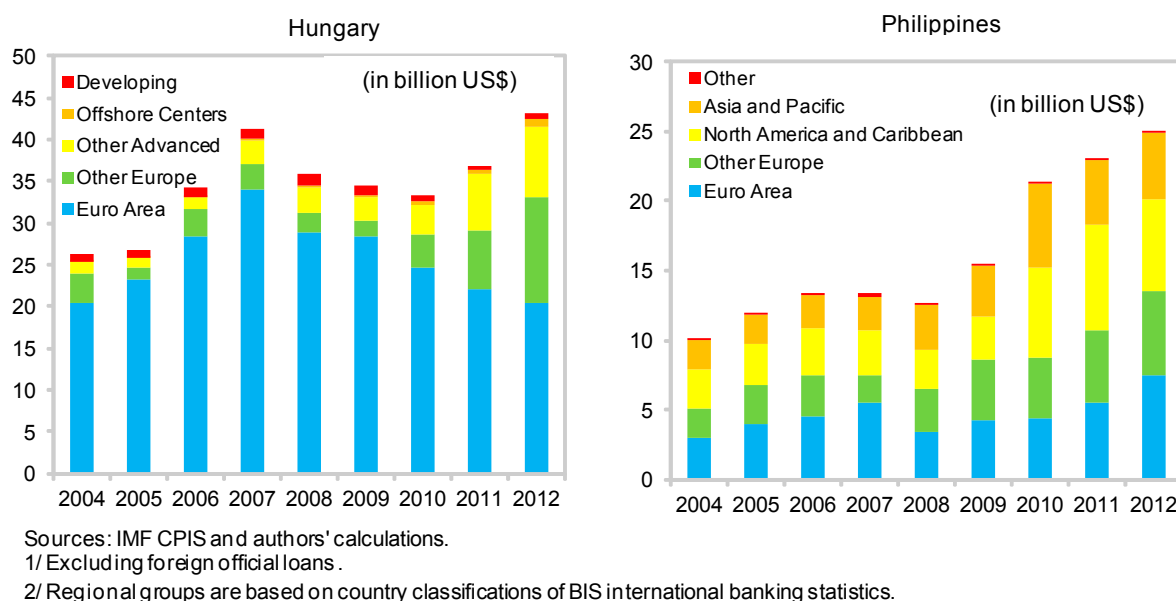
### *Investor Holdings by Country of Origin*

**Finally, our data can be extended to estimate investor holdings by country of origin.** While this is not the focus of the paper, we show below how estimates of the investors' country of origin can be made using our dataset and the CPIS database on portfolio holdings (Table 5.2). The only assumption we have to make is that the country of origin of foreign investors for

<sup>11</sup> A comprehensive list of statistical reclassifications can be found directly from our data sources.

government debt is similar to the country of origin of foreign investors investing in other securities issued in that country (i.e. including corporate debt). The higher the percentage of government debt in external debt statistics, the more plausible this assumption becomes. For illustration, Figure 4 shows country decompositions of foreign investors for Hungary and the Philippines, where this assumption holds relatively well. Our estimates suggest that while most Hungarian government debt is held within the euro area, the Philippines' government debt is held more broadly including by investors outside of Asia.<sup>12</sup>

**Figure 4. Foreign Holdings of Government Debt by Country of Origin, 2004–12 1/2/**



<sup>12</sup> At the same time, these estimates cannot attribute country origin with complete accuracy if a security is purchased by a foreign investor and held in a custodial account in another country, say, an offshore center. Put differently, these estimates reflect exposures on an immediate borrower basis, not an ultimate risk basis.

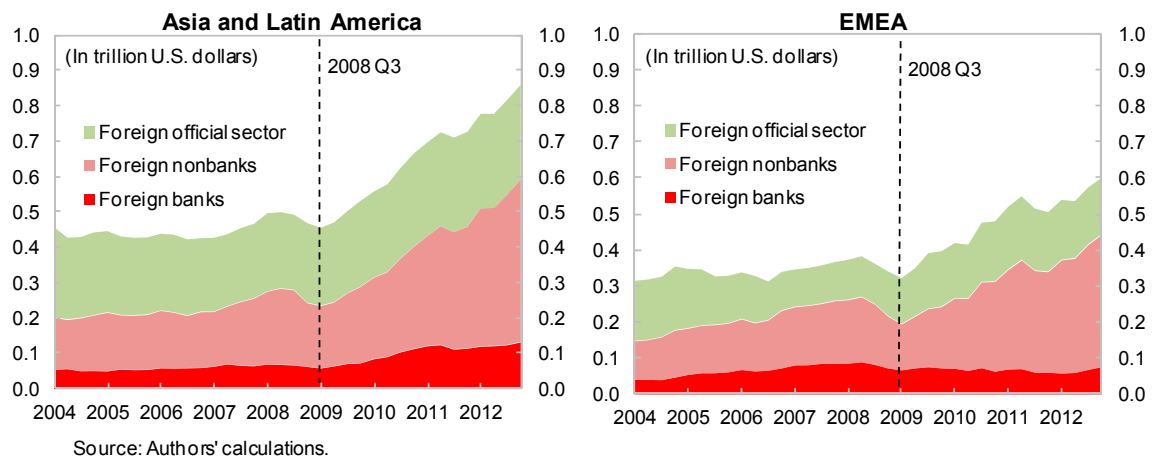
#### IV. KEY TRENDS IN THE EM SOVEREIGN DEBT INVESTOR BASE

**In this section, we explore how demand for emerging market sovereign debt has evolved during and after the global financial crisis.** In particular, we examine two main questions based on the issues raised in Section II: (i) How did foreign demand for government debt, and the related funding risk, change for emerging markets? (ii) How did domestic banks' demand for own government debt, and the related sovereign-bank linkages, change?

##### A. Foreign Investors of EM Sovereign Debt

**We estimate that about half a trillion dollars of foreign investment went into emerging market government debt during 2010–12, mostly coming from foreign asset managers.** We estimate that total foreign investors held about US\$1 trillion of EM government debt (excluding foreign official loans) at end-2012 (Figure 5). About half of these holdings were accumulated during the three years from 2010 to 2012 (Annex Figure 3, last chart). As of end-2012, we estimate that foreign nonbanks (i.e. foreign asset managers) held about US\$800 billion of EM government debt, or about 80 percent of total foreign holdings (excluding foreign official loans). In addition, as discussed in the previous section, we estimate that foreign central banks held about US\$40-80 billion of EM government debt, with a concentration in a seven countries (Brazil, China, Indonesia, Poland, Malaysia, Mexico, and South Africa). Foreign official loans remain important for some countries (Bulgaria, Romania, and Ukraine), but have become less important for others (Indonesia, Russia, and South Africa). Similarly, the share of foreign banks in total foreign holdings has been declining steadily.<sup>13</sup>

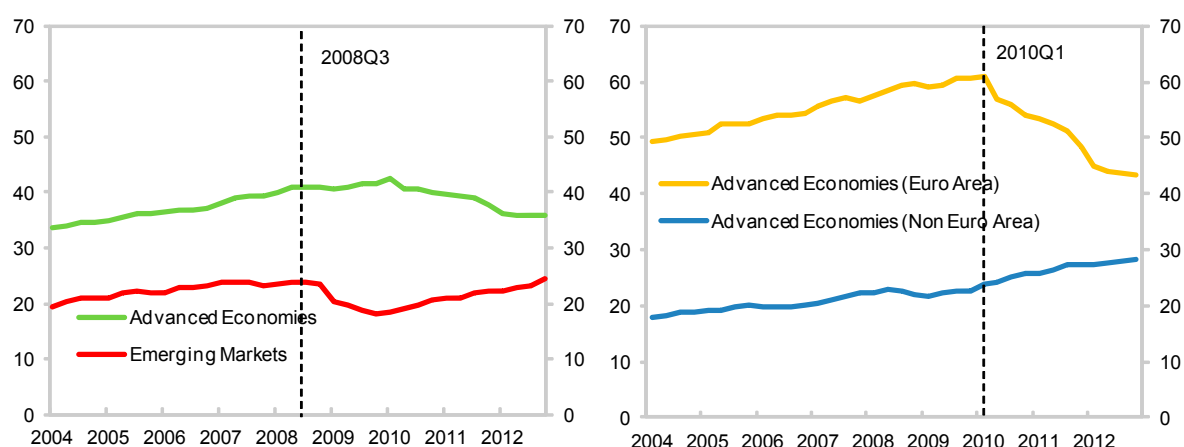
**Figure 5. Emerging Markets: Foreign Investors as an Investor Class, 2004–12**



<sup>13</sup> This contrasts with advanced economy government debt, which is held more broadly by foreign banks, as it can be zero risk weighted for bank regulatory purposes (euro area) or held as liquid assets. It may also be costlier for foreign banks to hedge against the currency risk component of EM bond holdings given the wider exchange rate fluctuations in EM currencies. Finally, the market structure may have changed over the past few years, with fewer banks able to warehouse risk and act as market makers for EM government securities.

**Foreign participation in EM government debt markets has been rising, but not yet to the level of advanced economies (AEs), which could partly be explained by the fact that foreign central banks are not yet a large investor class for EMs.** Foreign participation in the EM government debt universe has been rising, except for a temporary decline during the GFC. However, the average foreign share in EM sovereign debt markets was only 24 percent at end-2012, more than 10 percentage points lower than the average foreign participation rate in advanced economies (Figure 6). This could partly reflect the still limited demand by foreign central banks for EM government debt. That, in turn, could reflect the still relatively small number of EMs that have reached single-A status or have been included in the WGBI index.

**Figure 6. Advanced Economies and Emerging Markets: Foreign Share in Total Government Debt, 2004–12 1/**

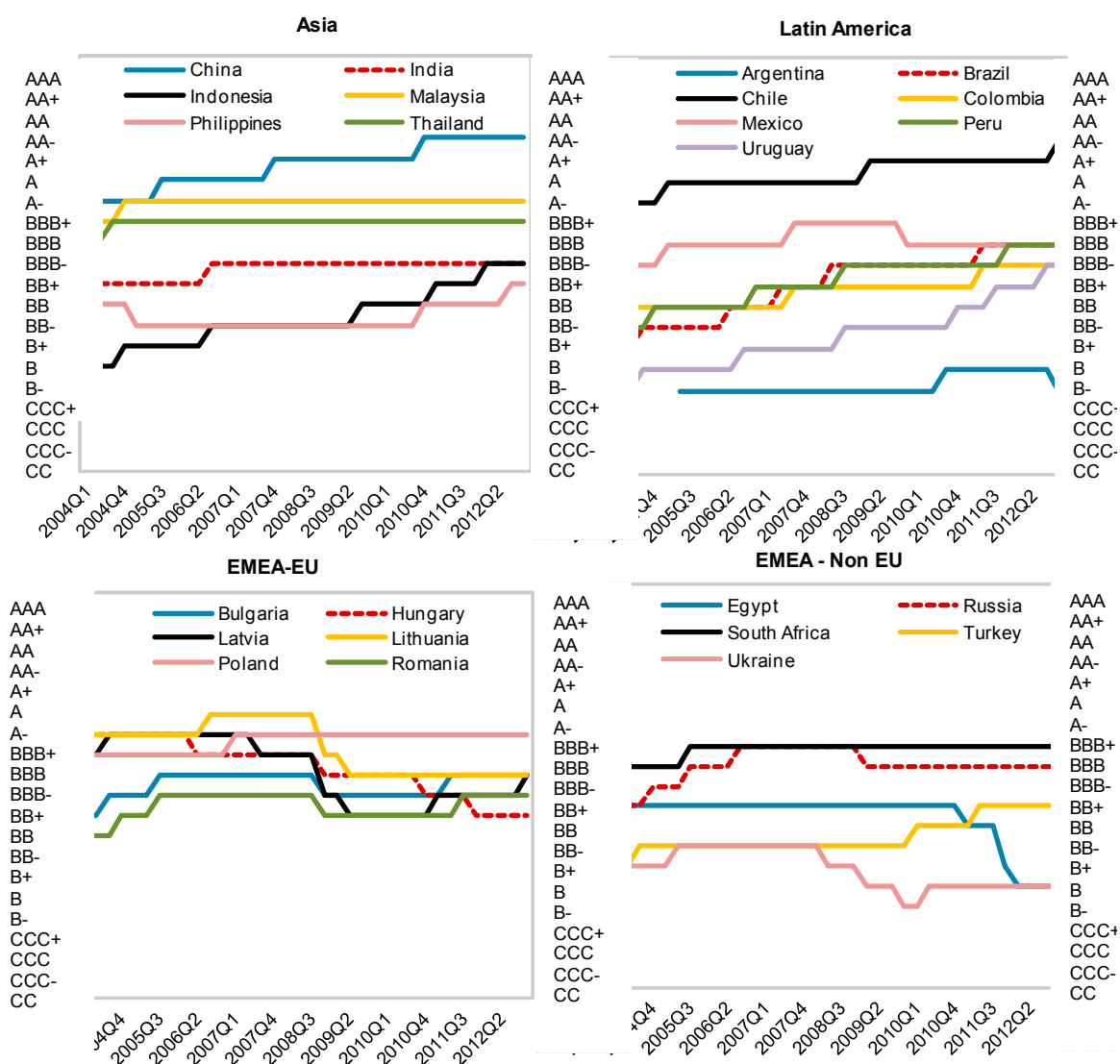


Source: Authors' calculation

1/ Simple average for each group. Foreign holdings excluding foreign official loans and SMP holdings.

**Foreign holdings of EM government debt have risen in tandem with the improved credit ratings of EMs** (Figure 7). One-third of our sample reached investor grade status (BBB- or higher) during 2005–12, notably Brazil, Bulgaria, Colombia, Indonesia, Peru, Romania, Russia, and Uruguay. This opened these countries' government debt up to foreign institutional investors with strict mandates that link their asset allocation policies to external credit ratings. Further, four EMs were included in Citibank WGBI (Poland, Malaysia, Mexico, and South Africa), making them eligible for investors that typically invest in AE government debt.

Figure 7. Emerging Markets: Sovereign Credit Ratings, 2004–12 1/



Sources: Fitch Ratings, Moody's, S&P, and staff calculations.

1/ Foreign currency long-term ratings at the end of each quarter. For each country, the rating was computed based on either the best two out-of-three ratings or simple average when all three agencies assigned different ratings.

**With regard to how foreign investors differentiated among EMs, three distinct periods can be identified—before, during, and after the GFC.** This distinction can be illustrated by standardizing foreign investment flows to EM government debt (Figure 8). Before the GFC (2006–08), foreign investors showed moderate differentiation among countries, with some receiving inflows while others facing outflows. During the GFC (2008–09), as it usually happens in a crisis, this differentiation became much sharper. A number of countries faced large outflows, such as Hungary, Malaysia, Peru, and Poland. After the GFC (2010–12), however, foreign flows to EMs became almost always positive and much less differentiated (Figure 8). Next, we discuss these three distinct periods in more detail.

**Figure 8. Emerging Markets: Net Foreign Purchases and Sales of Government Debt Securities, 2006–12**

	2006Q1	2006Q2	2006Q3	2006Q4	2007Q1	2007Q2	2007Q3	2007Q4	2008Q1	2008Q2	2008Q3	2008Q4	2009Q1	2009Q2	2009Q3	2009Q4	2010Q1	2010Q2	2010Q3	2010Q4	2011Q1	2011Q2	2011Q3	2011Q4	2012Q1	2012Q2	2012Q3	2012Q4
Asia																												
China	-0.7	-0.4	-0.1	0.1	0.2	0.2	0.2	0.3	0.1	0.0	-0.2	-0.3	-0.2	-0.1	0.0	-0.3	-0.4	-0.4	-0.4	0.1	0.6	0.6	1.1	0.8	0.2	0.8	0.3	4.1
India	0.2	3.1	1.7	2.1	0.2	0.8	1.2	1.3	1.5	1.0	1.8	0.1	-0.5	0.0	-0.5	0.3	0.8	0.7	0.3	0.5	1.4	0.8	1.4	1.9	0.9	1.0	0.5	0.1
Indonesia	1.8	0.6	0.5	0.1	-0.1	0.2	0.1	0.1	0.1	0.4	0.5	0.2	0.3	-0.2	-0.2	0.4	0.9	1.0	1.2	1.3	0.8	1.1	0.2	0.1	0.1	-0.4	0.2	0.7
Malaysia	-0.5	-0.6	-0.3	0.2	0.4	0.6	0.2	0.6	1.4	0.6	0.3	-0.4	-1.0	-1.2	-0.6	0.1	0.9	1.2	1.3	1.2	0.9	1.1	0.7	0.9	0.8	0.3	0.7	0.7
Philippines	0.3	-0.2	0.2	0.0	-0.1	-0.3	-0.6	-0.1	-0.2	-0.3	-0.1	-0.5	-0.4	-0.1	0.3	0.7	1.0	0.9	1.1	1.6	1.2	1.3	1.2	0.0	0.0	-0.3	-0.6	0.0
Thailand	0.1	0.1	-0.1	-0.2	-0.6	-1.1	-0.7	-0.5	0.2	0.7	0.8	0.6	0.3	0.0	0.3	0.4	0.9	1.0	1.6	1.2	1.3	1.2	1.3	1.1	1.2	1.8	1.5	1.7
Latin America																												
Argentina	0.1	0.7	0.6	0.6	0.5	0.7	0.5	0.4	0.3	-0.1	-0.3	-0.5	-0.4	-0.4	-0.2	0.0	0.0	0.2	0.6	0.7	0.8	0.6	0.1	-0.1	-0.1	-0.2	-0.2	0.0
Brazil			0.2	0.2	-0.4	0.4	0.7	0.2	0.7	0.5	0.3	0.1	-0.2	-0.1	0.1	0.5	0.9	1.1	1.0	0.7	0.3	0.1	-0.4	-0.2	0.2	0.2	0.6	0.7
Colombia																			0.1	0.0	0.4	-0.1	0.5	0.1	0.1	0.1	-0.3	-0.3
Mexico	-0.5	-0.5	-1.2	-0.5	-0.5	-0.5	0.3	0.5	0.9	0.6	0.7	-0.1	-0.7	-0.6	-0.4	0.2	0.9	0.8	1.0	1.7	1.6	1.8	1.7	1.4	1.6	1.4	1.7	1.8
Peru	0.0	-0.2	-0.7	-0.8	-0.8	-0.6	-0.3	-0.2	-0.2	0.1	-0.6	-1.3	-0.6	-1.0	0.0	0.2	-0.1	0.2	0.4	1.3	1.1	1.1	0.7	-0.1	0.4	0.5	0.3	0.3
EMEA-EU																												
Bulgaria			-0.2	0.2	-2.5	-0.3	-0.3	-0.4	0.2	0.1	-0.3	-0.9	-0.8	-0.6	-0.1	0.6	0.6	0.2	0.2	0.0	0.0	0.4	-0.2	-0.4	-0.3	-0.6	2.0	1.0
Hungary	-0.1	-0.3	-0.2	0.3	-0.1	0.0	0.2	0.1	0.0	0.2	-0.3	-1.3	-1.3	-1.5	-0.9	-0.6	-0.1	-0.4	-0.5	-0.3	0.5	1.1	0.9	0.5	0.0	-0.6	-0.3	0.1
Latvia											-0.3	-0.3	-0.5	-0.4	-0.4	-0.2	-0.1	-0.2	-0.1	-0.2	-0.3	0.4	0.1	0.1	1.4	0.3	0.5	1.5
Lithuania	-0.2	-0.1	0.0	0.8	0.1	0.2	0.2	0.5	0.4	0.4	0.0	-0.7	-0.9	-0.2	0.3	1.3	2.0	0.9	1.4	0.5	0.2	0.4	-0.3	0.1	0.5	0.1	0.3	0.2
Poland	0.1	-0.7	-0.7	-0.3	-0.5	-0.6	-0.5	-0.2	-0.6	-0.4	-0.8	-1.3	-1.3	-0.9	0.2	0.7	1.4	1.0	1.4	0.7	0.8	1.3	0.2	0.2	0.2	-0.2	0.2	0.6
Romania																						1.1	-0.5	-0.2	0.2	-0.7	-0.1	0.3
EMEA-Non EU																												
Egypt	0.7	0.5	-0.2	0.2	0.2	0.6	0.8	0.7	0.1	-0.3	-0.5	-1.8	-1.6	-1.3	-1.1	-0.4	1.3	1.0	1.7	1.2	-0.3	-0.5	-1.3	-1.3	-0.8	-0.6	-0.4	-0.2
Russia	-0.2	-1.0	0.0	0.1	0.1	0.1	-0.1	-0.5	-0.5	-0.6	-0.5	-0.5	-0.5	0.3	0.4	0.7	0.8	1.7	0.9	0.9	0.9	0.1	0.5	1.0	1.1	2.9	1.4	1.7
South Africa				-0.8	-0.2	-0.1	-0.8	-0.4	-0.3	-0.5	0.3	-0.1	-0.1	0.3	0.1	0.5	2.1	1.4	1.7	1.2	1.1	1.4	0.9	1.1	1.1	0.7	0.8	1.2
Turkey	0.2	-1.4	-0.1	0.2	0.2	0.7	0.2	-0.7	-0.9	-1.1	-0.8	-0.9	-0.9	-0.6	-0.6	-0.3	0.1	0.3	0.4	0.6	1.2	1.0	0.5	0.8	0.2	0.1	1.1	1.0
Ukraine								0.7	-0.1	-0.5	-0.4	-0.6	-0.9	-0.6	-1.2	-0.6	-0.4	-0.5	1.7	0.8	1.0	1.3	0.2	-0.1	-0.3	-0.8	0.5	0.7

Note: Based on z-scores that measure the relative size of net sales (red) or net purchases (green) of government debt by foreign investors compared to historical norms. Z-scores are defined as the distance from the mean, measured in units of standard deviations. Specifically, z-scores for each observation are calculated based on the 4-quarter moving average of foreign investor flows. The mean and the standard deviation are calculated for each country, using an expanding window starting from 2004Q1, in line with the sudden stop identification methodology of Calvo, Izquierdo, and Mejia (2004). The z-scores are then color coded as follows: red (less than -1); light red (between -1 and -0.5); light yellow (between -0.5 and 0.5); light green (between 0.5 and 1); and green (greater than 1). Net sale indicates foreign investors either sold or did not reinvest their maturing holdings. Foreign flows exclude foreign official lending and are adjusted for exchange rate changes.

### ***Before the GFC***

**Foreign flows to EMs were relatively modest before the GFC.** Countries that retired external bonds issued in the 1990s, such as Poland, Thailand, and Peru, saw declines in foreign holdings of their debt (Figure 8). At the same time, countries that traditionally had little foreign participation, including India and Egypt, saw gradual increases in foreign holdings. Meanwhile, the foreign participation rates in Indonesia, Lithuania, and Ukraine increased, as these countries issued more bonds in external markets (Figure 9). They declined modestly for a number of countries (Colombia, Philippines), partly due to the development of local debt markets which substituted for external debt issuance.

### ***During the GFC***

**Foreign flows to EMs became much more differentiated during the GFC.** The pattern of differentiation was much sharper than the pre-crisis period, as investors became more sensitive to risks (Figures 8 and 9). From a regional perspective, foreign outflows from EMEA were much more severe, compared to Asia and Latin America (Figure 10). For the EMEA region, foreign ownership of government debt declined from about 35 percent to 27 percent for EU countries and from over 20 percent to about 15 percent for non-EU countries. Latin American countries also saw foreign outflows, but these were relatively modest compared to the EMEA region. In contrast, EMs in Asia saw very little foreign outflows from their government debt markets, with the exception of Malaysia. In terms of nominal exposures, foreign investors reduced their holdings of EM government debt as a whole by about US\$ 40 billion during 2008–09. The largest outflows took place from countries that experience the largest credit rating downgrades, in particular in EMEA (Figure 7).

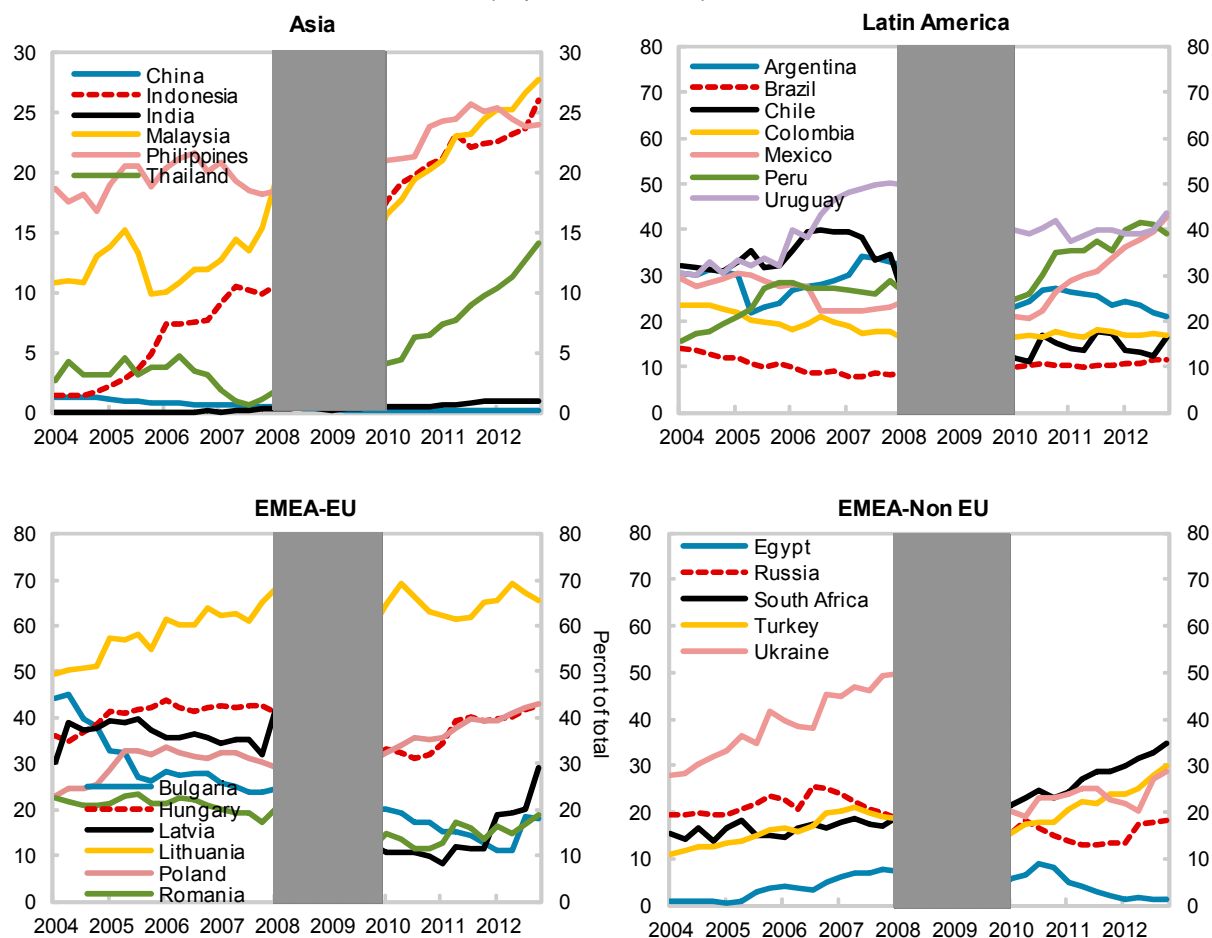
**The crisis episode suggests that foreign inflows to EM government debt markets could be highly cyclical.** Across our sample, countries experiencing the greatest foreign inflows before the crisis typically experienced the greatest outflows during the crisis (Figure 9). In terms of regions, the large drop in foreign ownership of government debt in the EMEA-EU region—a region that was financially more integrated given its close links with the rest of the EU region—is in stark contrast to what happened in Asia, which was largely insulated, possibly because Asian EMs had less foreign holdings to begin with. More specifically:

- ***Asia.*** Malaysia was hit the most, experiencing a nearly 10 percentage point fall from peak to trough in the foreign share of government debt, while the other Asian EMs experience smaller declines in foreign participation during the GFC. Prior to the GFC, Malaysia had the highest foreign participation rate compared to the others.
- ***Latin America.*** Within the region, Uruguay saw the largest decline in the foreign share of its government debt, reflecting in part a base effect as Uruguay was also the country where foreign participation was the highest in the region prior to the crisis. Foreign outflows from other countries were not as dramatic (for Chile, the decline in foreign share reflected mainly the retirement of external bonds). Foreign participation in Mexico also declined slightly, while it increased in Brazil, despite the crisis.



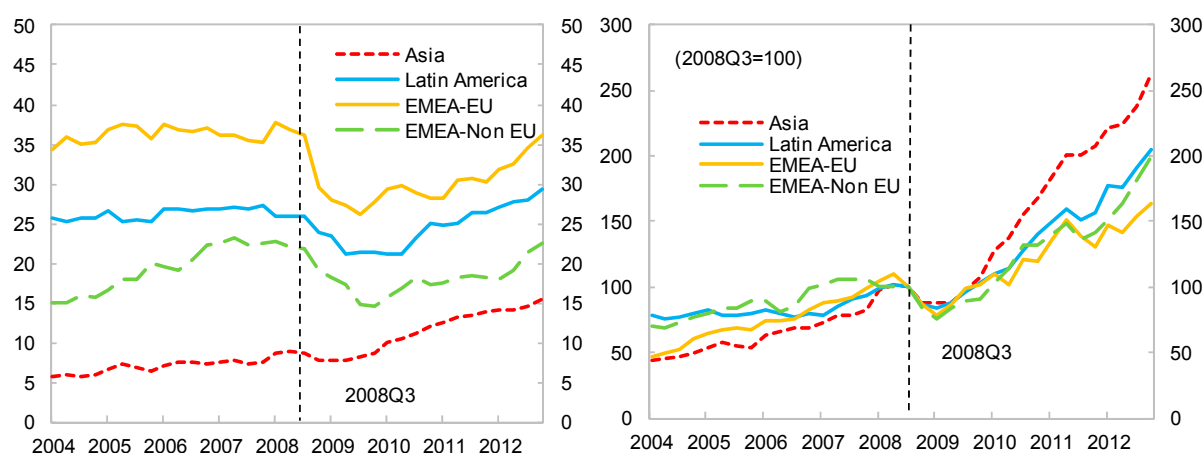
- **EMEA.** Foreign outflows were the largest in EMEA. The foreign participation rate dropped significantly in Latvia, Romania, Lithuania, Hungary, and Ukraine, all of which sought financial assistance from the IMF, or at least officially consider it. The largest decline was observed in Ukraine, where the foreign participation rate dropped from 50 to 20 percent within a year after the onset of the GFC. A key feature of these countries, especially those in the EU, was the high level of foreign holders of their government debt before the crisis, reflecting the higher level of financial integration within the EU region.

**Figure 9. Foreign Share in EM Government Debt by Country, 2004–12**  
(in percent of total)



Source: Authors' calculations.

1/ Foreign holdings excluding foreign official loans. Shaded area represents 2008-09.

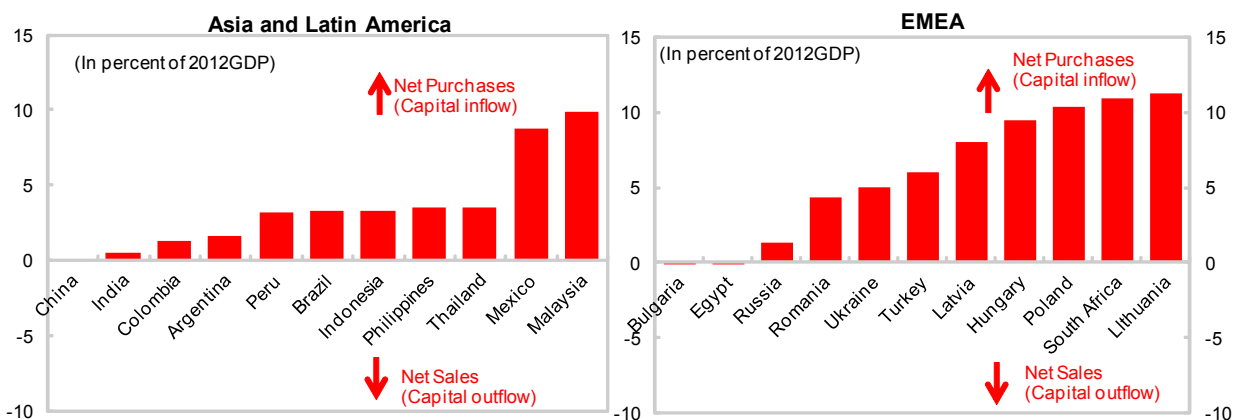
**Figure 10. Foreign Share in EM Government Debt by Region, 2004–12**

Source: Authors' calculations.

1/ Simple average for each region. Foreign holdings excluding foreign official loans.

### *After the GFC*

The post-crisis period was marked by large monetary accommodation in most parts of the advanced world, including unconventional monetary policies.<sup>14</sup> It was also associated with an improved growth outlook for EMs, as well as deteriorating credit conditions for some advanced economies. In this environment, EMs saw large across-the board foreign flows during 2010–12 (Figure 11).

**Figure 11. Cumulative Net Foreign Purchases of EM Government Debt, 2010–12**

Source: Authors' calculations. Flows are adjusted for exchange rate changes.

<sup>14</sup> Most advanced economies had near-zero policy rates by early 2009, but unconventional monetary policies began in earnest after 2009.

**Part of these inflows can be explained by improving economic fundamentals in EMs, as most EMs weathered the GFC well, with a relatively quick return to high growth.** In turn, better growth prospects may have raised expectations of currency appreciation in these EMs, attracting further demand from foreign investors. Separately, five EMs reached or regained investment grade status during 2010–12 (Figure 7). At the same time, even countries whose credit ratings deteriorated or showed no improvement during this period continued to receive inflows, such as Hungary and Russia (Figure 11).

**Investors' search for yield in an environment of near-zero interest rates in most advanced economies likely also played a role in these inflows.** IMF (2013a) finds that, while Federal Reserve liquidity injections and Large Scale Asset Purchase (LSAP) announcements in the early part of the crisis induced investors to repatriate capital from abroad to the U.S., later LSAP announcements generally buoyed foreign market sentiment and seem to have boosted investment flows to EMs. Similarly, De Bock and de Carvalho Filho (2013) find that higher-yielding EM currencies became more sensitive to “risk-off” episodes after the GFC, suggesting that search for yield may have become more prominent in the post-crisis period. Moore et al. (2013) also find that the U.S. LSAP programs reduced long-term U.S. Treasury yields, and thus, may have contributed to U.S. outflows to EMs. Finally, the euro area debt turmoil that began in early 2010 may have helped investors turn to EM markets, as bond yields in core euro area countries declined on safe haven demand.

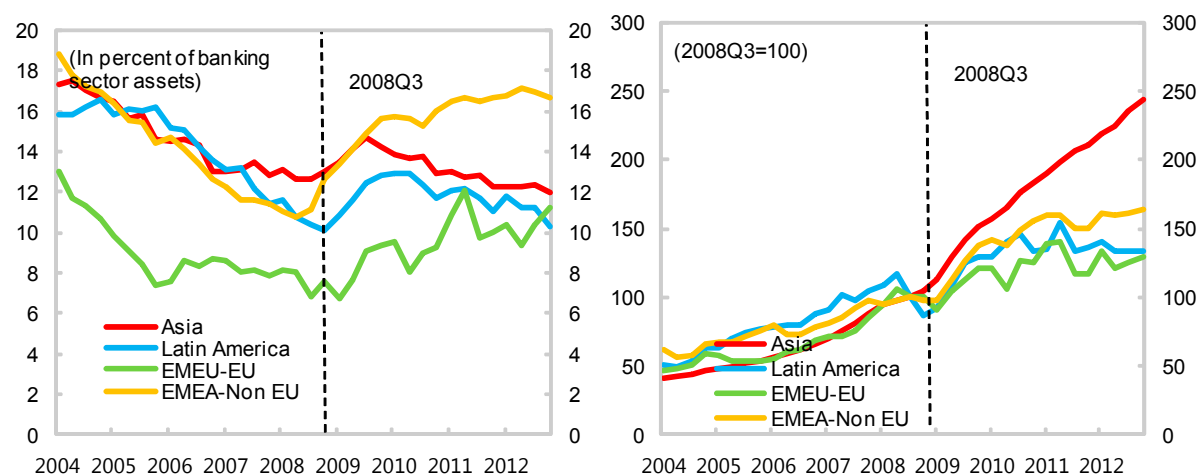
## **B. Domestic Bank Holdings of Sovereign Debt**

**Domestic bank sovereign exposures (as percent of bank assets) rose across all regions during the GFC, but have been declining since then in Asia and Latin America** (Figures 12 and 13). In particular:

- For *Asia* and *Latin America*, after the significant increase in bank holdings of sovereign debt during the GFC, domestic banks started to reduce their sovereign exposures (as percent of asset), as the recovery took hold and as bank balance sheets shifter towards private sector credit. For most of the countries in these regions, banks' sovereign exposures are now lower than where they were at end-2009 (Figure 13).
- For *EMEA*, bank holdings of government debt remained elevated after 2009 and even rose further in a few cases (Romania, Egypt), reflecting country-specific factors as well as slower growth in the region after the GFC. However, in a few countries (Poland, Turkey), bank holdings of own government debt declined significantly.

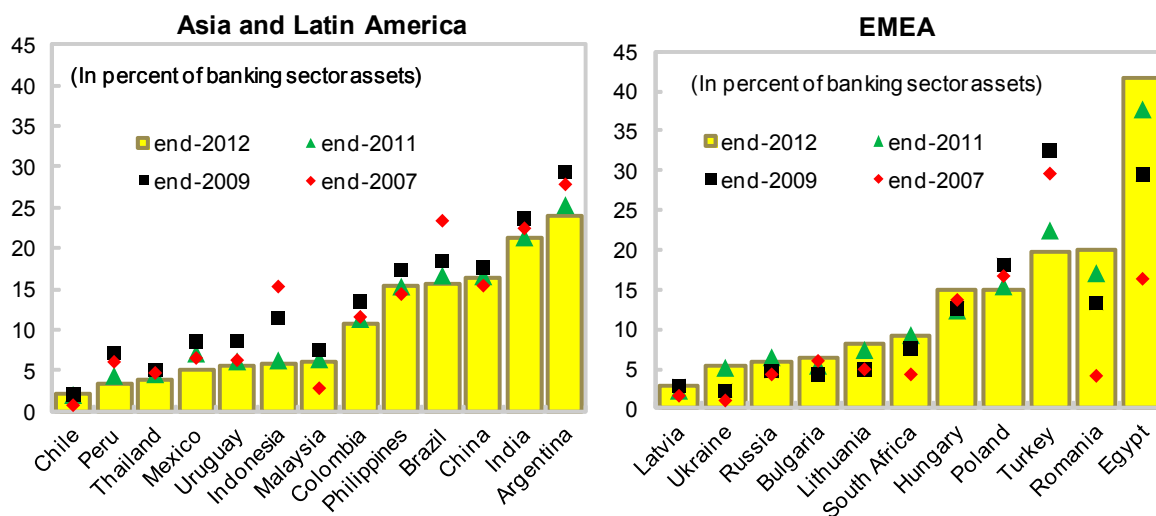
**As of end-2012, domestic bank sovereign exposures remain high in Argentina, Egypt, and India, where they make up more than 20 percent of assets.** Domestic bank sovereign exposures are also relatively high in Brazil, China, Hungary, Philippines, Poland, Romania, and Turkey, where they make up more than 15 percent of assets (Figure 13).

**Figure 12. Emerging Markets: Bank Holdings of Own Government Debt by Region, 2004–12**



Sources: IMF International Financial Statistics and authors' calculations.

**Figure 13. Emerging Markets: Bank Holdings of Own Government Debt by Country, 2007–12**



Sources: IMF International Financial Statistics and authors' calculations.

## V. SOVEREIGN FUNDING SHOCK SCENARIOS (FSS)

**The investor base for government debt is a critical indicator of a country's vulnerability to funding shocks.** If a country's debt is held mainly by foreign private investors, the country could become vulnerable to an external funding shock (a "sudden stop"). On the other hand, if it is held mainly by the national central bank or investors with home bias, the funding risk for the government is substantially diminished. With this in mind, we developed a framework (FSS) in Arslanalp and Tsuda (2012) to examine more formally how potential funding shocks, in particular external funding shocks, may impact government debt markets (Box 1 provides a summary of the methodology). We extend our approach to emerging markets in this section. All scenarios are hypothetical and involve a common funding shock that occurs over 2013 for all emerging markets irrespective of country fundamentals.<sup>15</sup>

### Box 1: Methodology of Sovereign Funding Shock Scenarios (FSS)

The FSS aims to assess the potential impact of sudden foreign outflows from a government debt market on domestic bond yields and domestic sovereign-bank linkages. The exercise envisages a funding shock that is triggered when foreign private investors stop rolling over their holdings or pull out of a government debt market over a one-year horizon. We then examine whether the domestic financial system can absorb the outflows with ease. In particular, we assume that domestic nonbanks (insurance companies, pension funds, and investment funds) remain steady buyers of government debt in line with their asset-liability mandates ("stable buyers"), while any remaining gap is filled by domestic banks ("swing buyers").<sup>16</sup> Finally, we assume that foreign official lenders and the domestic central bank act only as "lenders of last resort."

We then examine whether domestic banks can absorb the outflows, given the size of their balance sheet and the amount of government debt they already own. If the amount that needs to be absorbed by domestic banks is large (as percent of total assets), this could suggest that either (i) sovereign bond yields may have to rise as there may not be enough buyers in the market during a foreign sale; or (ii) bank-sovereign linkages may rise as domestic banks end up purchasing large amounts of government debt. The latter could have financial stability implications to the extent that it raises domestic banks' exposure to sovereign and interest rate risk. It could also have growth implications, as banks may lend less to the private sector as they shift a large part of their balance sheet to public debt ("crowding out").

The shock scenarios rely on three parameters regarding the investment decisions of foreign private investors, namely: (i) their contribution to the funding of the overall fiscal deficit over the next year ( $\alpha$ ); (ii) their rollover of *short-term* government debt holdings by residual maturity (i.e. debt maturing over the next year) ( $\beta$ ); and (iii) their sale of *long-term* government debt holdings by residual maturity ( $\gamma$ ).  $\alpha$  determines the extent to which foreign private investors contribute to the *net* financing needs of the

<sup>15</sup> An earlier version of this scenario approach was used in the October 2012 *Global Financial Stability Report* (pages 58-60), available at <http://www.imf.org/External/Pubs/FT/GFSR/2012/02/>. See Blancher et al. (2013) for more details on how the FSS could be used with other systemic risk monitoring tools. The approach is in line with Broner et al. (2013) which show how sovereign debt can get reallocated from foreign to domestic holders in turbulent times due to creditor discrimination.

<sup>16</sup> There are at least three reasons why domestic banks could play a more prominent role than nonbanks in absorbing foreign outflows. First, banks can use government debt as collateral to access liquidity either at the central bank or the interbank markets. Second, banks that act as primary dealers typically have an obligation to hold a minimum inventory of government debt. Third, in terms of asset size, banks make up a much larger share of the financial system in most sample countries and hence are the only ones available to absorb the outflows.

government, while together,  $\alpha$  and  $\beta$  determine the extent to which they contribute to the *gross* financing needs of the government. Finally,  $\gamma$  determines how much debt is liquidated beyond gross financing needs.

Fiscal funding needs and rollover needs are calculated based on data from the IMF's Fiscal Monitor. In particular, we use the projected general government deficit and debt maturing over a year in the following equations:

First, we can decompose the gross financing needs of the government as follows:

$$GFN_t = D_t + M_t = FD_t + OD_t + FM_t + OM_t$$

Where: GFN, D, and M stand for gross financing needs, fiscal deficit, and maturing debt, respectively. FD and OD stand for fiscal deficit financed by foreign private and other investors, respectively, while FM and OM stand for maturing debt held by foreign private and other investors, respectively.

Then we assume that foreign private investors' respective share of the contribution to financing the fiscal deficit and short-term debt is proportional to their share in the total debt stock:

$$\begin{aligned} FD_t &= D_t * FS_t / TS_t & OD_t &= D_t * OS_t / TS_t \\ FM_t &= M_t * FS_t / TS_t & OM_t &= M_t * OS_t / TS_t \end{aligned}$$

Where: FS, TS, and OS stand for debt stock held by foreign private investors, total debt stock, and debt stock held by other investors, respectively.

We assume further that foreign private investors contribute to  $\alpha$  percent of the annual fiscal funding needs, roll over  $\beta$  percent of their share of the maturing debt, and sell  $\gamma$  percent of their remaining stock.

Hence, foreign outflows can be computed as follows:

$$Foreign\ Outflows = (1 - \beta)FM_t + \gamma(FS_t - FM_t)$$

In turn, the additional government debt stock taken up by domestic banks can be obtained as follows:

$$Additional\ Debt = D_t(1 - \alpha) + Foreign\ Outflows - Debt\ take\ up\ by\ domestic\ nonbanks$$

Domestic nonbanks' take-up of government debt is projected based on their average net purchase of government debt over the last three years for each country. This ranges between 0-3 percent of GDP for most countries in our sample.

Finally, the resulting domestic bank holding of own government debt is obtained as follows:

$$Bank\ Holding\ of\ Own\ Government\ Debt = DBS_t + Additional\ Debt$$

Where: DBS stands for domestic bank holding at time t.

With respect to the specific scenarios considered in this paper, the parameters are set as follows:  $\alpha$  is equal to 0 in all scenarios;  $\beta$  is equal to 0 in Scenario 1 and 50 percent in Scenarios 2 and 3;  $\gamma$  is equal to 0 except in Scenario 3 where it is equal to 30 percent.

**In particular, we envisage three illustrative scenarios.** In all scenarios, the projected supply/issuance of government debt over the next year remains unchanged. In contrast, the demand for government debt changes, as foreign private investors alter their allocations. In particular, the following scenarios with increasing severity are considered:

- ***Scenario 1 (maintain exposure).*** Foreign private investors maintain their exposure to the country by fully rolling over their holdings maturing in a year, but do not provide new financing to the government.
- ***Scenario 2 (passive sale).*** Foreign private investors roll over only 50 percent of their government debt holdings maturing in a year.
- ***Scenario 3 (active sale).*** In addition, foreign private investors sell 30 percent of their long-term debt holdings in *local currency* to domestic investors. This is a severe scenario broadly based on a historical episode during the 2008 crisis.

**These scenarios illustrate that EM government debt markets have different exposures to an external funding shock** (Figure 14, second chart). In particular:

- Scenario 1. Most countries appear resilient to this scenario. For all countries, except Egypt, Lithuania, and Poland, domestic bank purchases of government debt required to close government funding needs would not be more than 3 percent of bank assets.
- Scenario 2. When combined with a rollover shock, the impact could be more widespread. In addition to the countries mentioned above, Argentina, Hungary, Mexico, and Ukraine may become sensitive to foreign outflows.
- Scenario 3. The possibility of an active sale by foreign investors would extend the list to a wider group of emerging markets, including Indonesia, South Africa, Turkey, and Uruguay. Under this scenario, domestic banks in these and other countries mentioned above may have to re-allocate more than 3 percent of their assets to government debt in a single year.

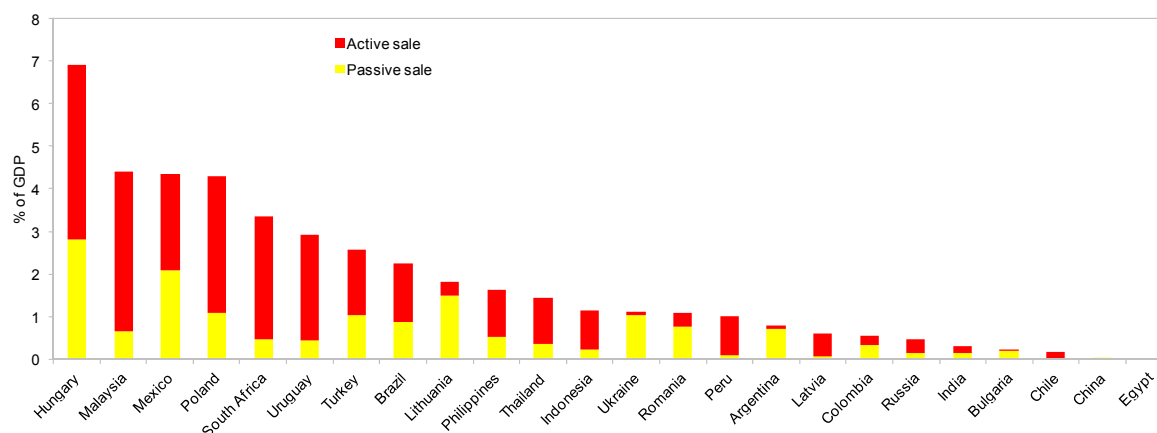
**These illustrative scenarios highlight the importance of keeping ample liquidity buffers and extending the debt maturity profile to protect against external funding shocks, as done by a number of countries identified above.** A back-loaded amortization profile or ample liquidity buffers, such as government deposits or contingent credit lines, can reduce a government's need to borrow from the markets in turbulent times, and therefore, make the countries less vulnerable to the type of foreign outflows outlined above under Scenarios 1 and 2. In that context, it is important to note that Colombia, Poland and Mexico have access to the IMF's Flexible Credit Line (FCL). Meanwhile, Uruguay has a very high average maturity of debt as well as large liquidity buffers that can help mitigate refinancing risks.<sup>17</sup>

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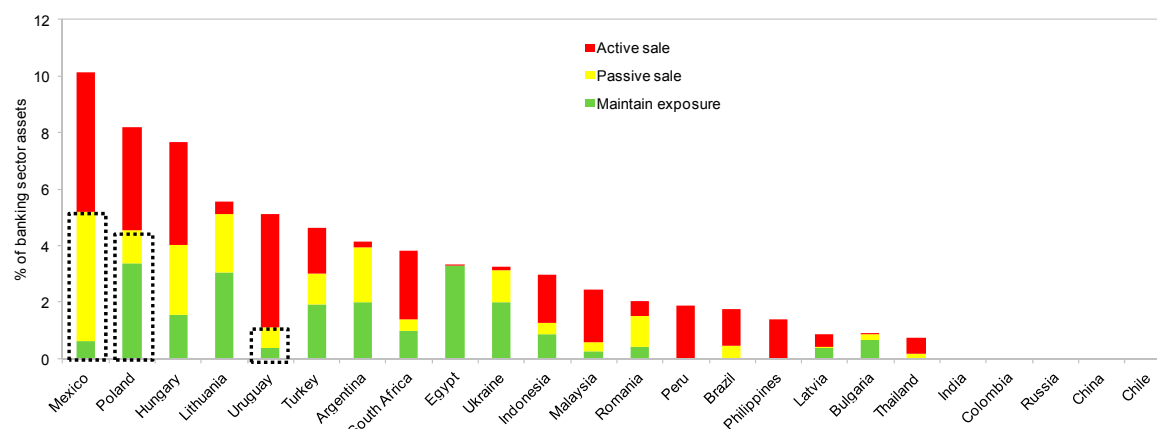
<sup>17</sup> Uruguay has deposits that could cover around 3 years of central government debt amortization and access to contingent credit lines worth \$1.4 billion with international and regional organizations as of end-2012.

**Figure 14. Emerging Markets: Sovereign Funding Shock Scenarios**

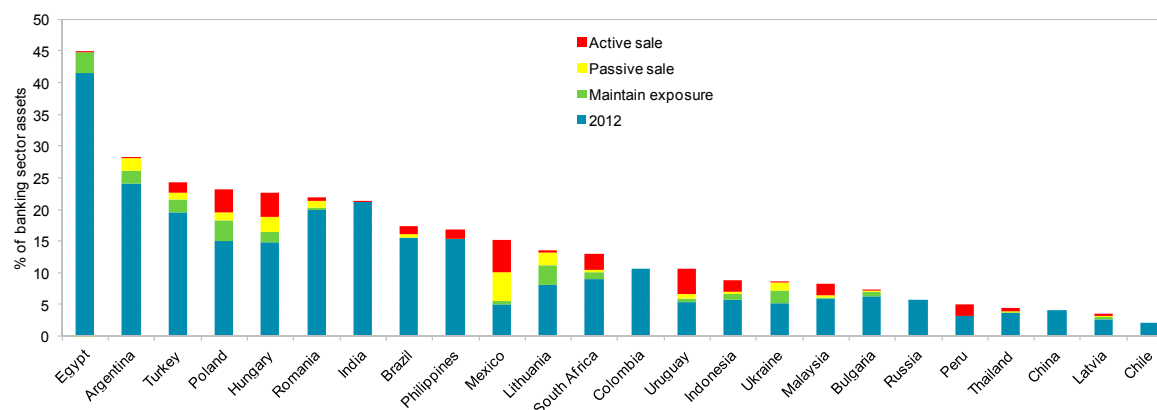
**Illustrative Foreign Outflows, 2013**



**Net Purchases of Government Debt by Domestic Banks under Illustrative Scenarios, 2013**



**Bank Holdings of Own Government Debt under Illustrative Scenarios, end-2013**



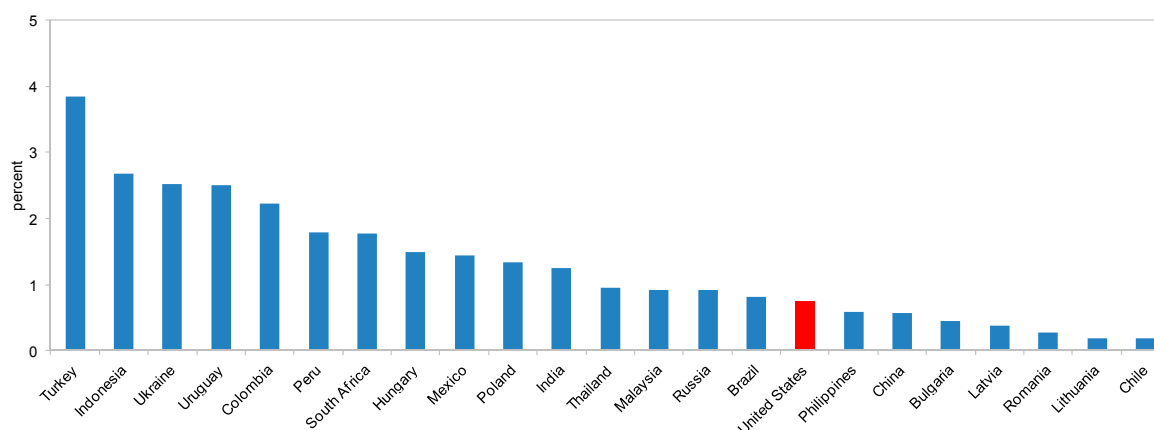
Sources: IMF/World Bank QEDS; IMF IFS, IMF Fiscal Monitor, IMF WEO; and authors' estimates.

Notes: Government debt indicates general government debt. The share of foreign investors in the short-term and long-term debt markets are calculated based on data available from BIS and QEDS. Domestic banks refer to depository institutions classified in the BIS and IFS as "deposit-taking corporations other than the central bank." The dotted lines in the middle chart indicate potential use of large liquidity buffers that can help reduce the impact of shocks under Scenarios 1 and 2.



The pressure on EM government bonds during the summer of 2013 was broadly in line with the results of this illustrative analysis. After Chairman Bernanke suggested in May that the U.S. Federal Reserve may begin to withdraw monetary accommodation, many emerging markets saw substantial rises in their long-term local-currency bond yields (Figure 15). The ten countries that saw the largest rise include eight of the countries identified above. Furthermore, as we highlight above, liquidity buffers seems to have helped, as countries with high liquidity buffers, such as Mexico and Poland, experienced less market impact than others despite the higher share of foreign holdings in these two countries. Finally, countries that appear resilient under the FSS (Chile, China, and Latvia) indeed experienced less market pressure on their government bond yields in the summer of 2013.

**Figure 15. Local-Currency Government Bond Yields After Tapering Discussions**  
(Change from May 22 to end-August, 2013)



Source: Bloomberg.

Notes: Based on 10-year generic bond yields, where available. For Brazil and Chile, 9-year generic bond yields are used instead. For Latvia and Uruguay, 6-year and 15-year rates are used. Comparable data on long-term government bond yields are not available for Argentina and Egypt from Bloomberg.

**Limitations.** There are a number of limitations to this approach. In particular:

- **Impact versus likelihood.** The exercise is about a common external shock due to a rise in global risk aversion, not a country-specific shock. It assesses the *impact* of the shock on all countries, not the *likelihood* of the shock for each country. The latter issue could be taken into account by calibrating the size of the shock for each country, by linking the severity of the shock to a measure that tracks the strength of country fundamentals such as the growth outlook, current account trends, and other macro-economic and institutional variables.
- **Correlated funding shocks.** If the funding shock for the government is accompanied by a correlated funding shock for the domestic banking and corporate sectors, then the pressure on government bond yields could be larger. In such a case, banks may find themselves forced to deleverage while corporates may need to rely on domestic banks to fill the gap left by foreign outflows, creating even less room for banks to take-up government debt. If the shock is accompanied by capital outflows by domestic residents (households), and related pressure on bank deposits, this could worsen the picture even further.

- **Composition of bank assets.** At the same time, banking systems that hold large liquid assets (other than government bonds) may absorb the external shock more easily, as that would allow banks to adjust their balance sheets with less difficulty, potentially without cutting credit to the private sector. Large-scale central bank provision of liquidity to banks could also improve the liquidity position of banks and help generate additional demand for domestic government debt.
- **Exchange rate.** The main focus of the exercise is to assess the potential impact of foreign outflows on government bond yields, not the exchange rate. The latter would be driven by other capital flows (corporates, loans, equities etc.), as well as investor hedging behavior and central bank intervention policies. At the same time, the exchange rate can have an impact on the scenarios to the extent that depreciation of the local currency helps stem foreign outflows.

## VI. FOREIGN INVESTOR POSITION INDEX (FIPI)

**Examining foreign holdings of government debt in aggregate can also help assess the relative exposures of global investors to different emerging markets.** In our previous paper, we developed a simple index—Foreign Investor Position Index (FIPI)—to track how foreign investors maintain (and change) their exposure to different advanced economies. Here, we apply the same approach to emerging markets.

**The FIPI measures the position of foreign investors against a global benchmark, in this case the JPMorgan GBI-EM Global.** The GBI-EM Global is one of the most widely used benchmarks by global investors participating in local-currency EM bond markets. Our dataset includes all countries in the GBI-EM Global except for Nigeria and 99 percent of the index by country weights. By examining how foreign investors change country weights within this group, in relation to the country weights of the GBI-EM Global, we can get a sense of how foreign investors are taking active positions (i.e. overweight or underweight) with respect to particular countries. In particular, the FIPI is constructed as follows:

$$FIPI_i = \frac{F_i}{\sum_i^N F_i} - \frac{D_i}{\sum_i^N D_i}$$

$FIPI_i < 0$ : Underweight

$FIPI_i > 0$ : Overweight

Where:

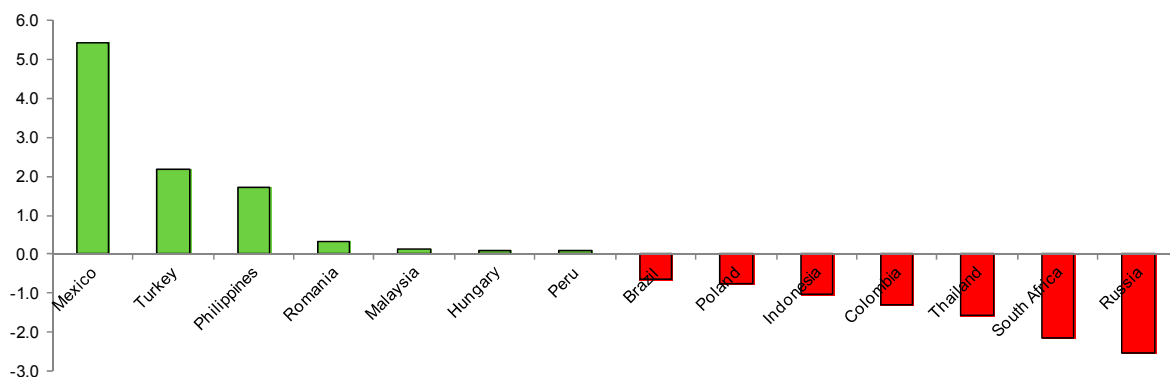
$F_i$ : Foreign investor holding of country  $i$ 's government debt in local currency, as available from our dataset.

$D_i$ : Outstanding government debt of country  $i$  included in JPMorgan GBI-EM Global, where  $i$  refers to all countries in the index except Nigeria.

**The FIPI could provide insights into how active foreign investors view EM debt markets.** We assume that passive foreign investors, by definition, follow the index. Hence any deviations in the country weights of foreign investors from the country weights of the index could suggest, to a large extent, active positions of foreign investors. In turn, this may give insight as to the extent of investor confidence in a country, as well as the degree of foreign flows that may occur, if there was a sudden change in investor sentiment.<sup>18</sup>

**The FIPI suggests that foreign institutional investors were overweight Mexico, Turkey, and Philippines, and underweight Russia, South Africa and Thailand at end-June 2013** (Figure 16). Foreign investors were especially overweight Mexico where, according to the FIPI measure, they were five percentage points above the country weight in the GBI-EM Global index. Meanwhile, the FIPI suggests that foreign investors were underweight Russia, South Africa, and Thailand at end-June 2013. This could reflect a relatively bearish view on those countries, but also the impact of capital flow management measures, notably for Thailand.

**Figure 16. Emerging Markets: Foreign Investor Position Index (FIPI), end-June 2013**  
(percent deviation from JPMorgan GBI-EM country weights)



<sup>18</sup> In principle, deviations from benchmark weights could also reflect capital account measure to stem foreign inflows. However, the FIPI does not closely match measures of capital account openness, such as those constructed by Quinn and Toyoda (2008), suggesting that it is not only driven by capital account measures.

## VII. CONCLUSION

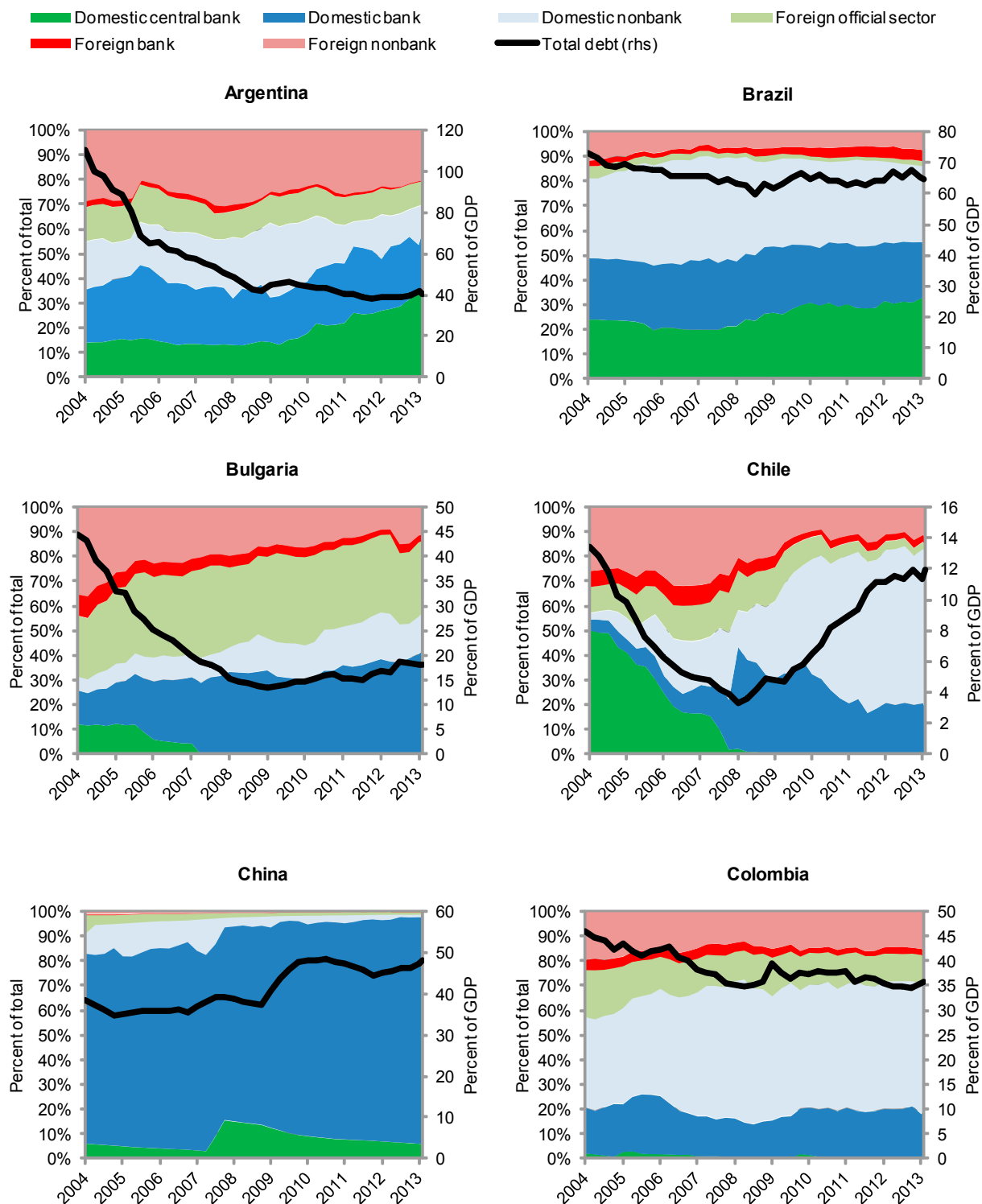
**We compile internationally comparable estimates of EM sovereign debt holdings, capturing \$1 trillion of foreign investor holdings.** The dataset, which covers 24 major emerging markets, provides quarterly data from 2004 to mid-2013, and is available along with the paper. Combined with the investor base dataset constructed for advanced economies in Arslanalp and Tsuda (2012), it provides a wide coverage of investor holdings of sovereign debt that can be used by other researchers.

**We present some stylized facts about EM sovereign debt investors.** First, we find that about half a trillion dollars of foreign flows went into EM government debt during 2010–12, mostly coming from foreign asset managers. Second, we find that foreign central banks, while becoming larger players, still play a limited role in EM government debt markets as their holdings remain concentrated in the government debt of a few countries: Brazil, China, Indonesia, Poland, Malaysia, Mexico, and South Africa. Third, we find that foreign investor flows to emerging markets were less differentiated during 2010–12 against the background of near-zero interest rates in advanced economies.

**We extend some of the indicators proposed in our earlier paper to demonstrate how the investor base data can be used for further analysis.** In particular, the sovereign Funding Shock Scenarios (FSS) can be used along with standard Debt Sustainability Analysis (DSA) to assess a sovereign's sensitivity to external funding shocks, since funding shock is not a risk factor typically covered by the DSA. The scenarios highlight the importance of extending the maturity of government debt, developing a local investor base, and maintaining liquidity buffers to mitigate potential external funding shocks. We also show how the foreign investor position index (FIPI) can be used to track the relative exposures of foreign investors to different markets within a global benchmark portfolio.

**An area for future research is to examine further the tradeoff between benefits and risks of foreign ownership in bond markets.** As we suggest in the paper, rising foreign participation in government debt markets can help lower borrowing costs and spread risks more broadly among investors, but it can also raise funding risks for the government. Several questions naturally arise: What is the tradeoff between these benefits and risks? Is there an “optimal” level of foreign ownership? The literature is still exploring these topics and has not yet come to a strong conclusion. However, our analysis through the FSS suggests that an optimal level, if any, would be country specific. In particular, countries with the following characteristics would benefit more from foreign participation (all else equal): (i) lower debt-to-GDP ratio; (ii) lower gross financing needs; (iii) more developed domestic financial systems; and (iv) larger liquidity buffers to protect against external shocks, as these would make them less sensitive to the types of external funding shocks illustrated in the paper.

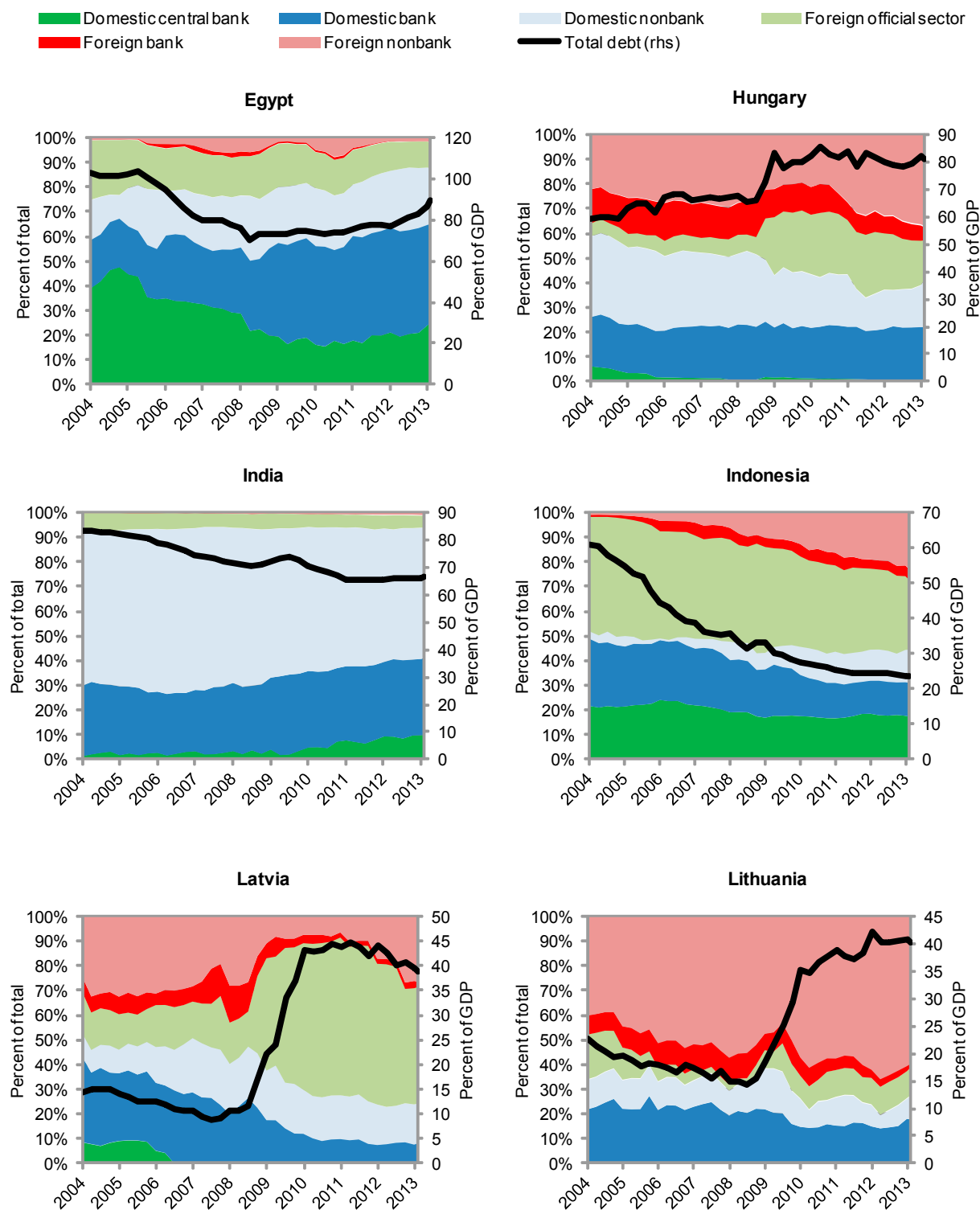
**Annex Figure 1. Emerging Markets: Holders of Government Debt, 2004–13Q2**  
(components in percent; total in percent of GDP)



Source: Authors' calculations.

Note: Government debt indicates general government gross debt. Domestic banks are depository corporations residing in the country (IFS definition). Foreign banks are BIS reporting banks residing outside the country. Foreign official loans indicate loans from bilateral and multilateral creditors. Foreign nonbanks and domestic nonbanks are imputed from external and total debt.

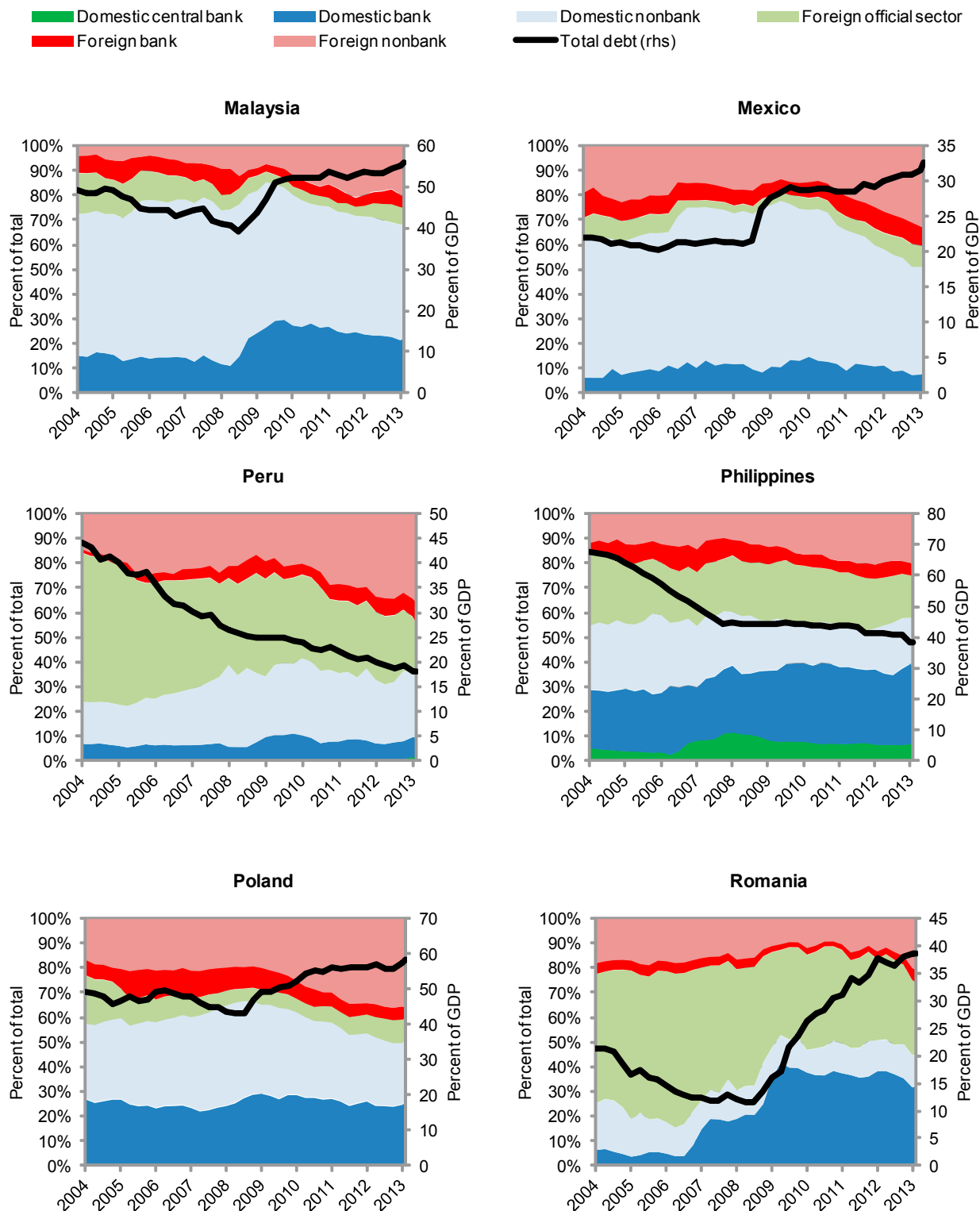
**Annex Figure 1. Emerging Markets: Holders of Government Debt, 2004–13Q2 (continued)**  
(components in percent; total in percent of GDP)



Source: Authors' calculations.

Note: Government debt indicates general government gross debt. Domestic banks are depository corporations residing in the country (IFS definition). Foreign banks are BIS reporting banks residing outside the country. Foreign official loans indicate loans from bilateral and multilateral creditors. Foreign nonbanks and domestic nonbanks are imputed from external and total debt.

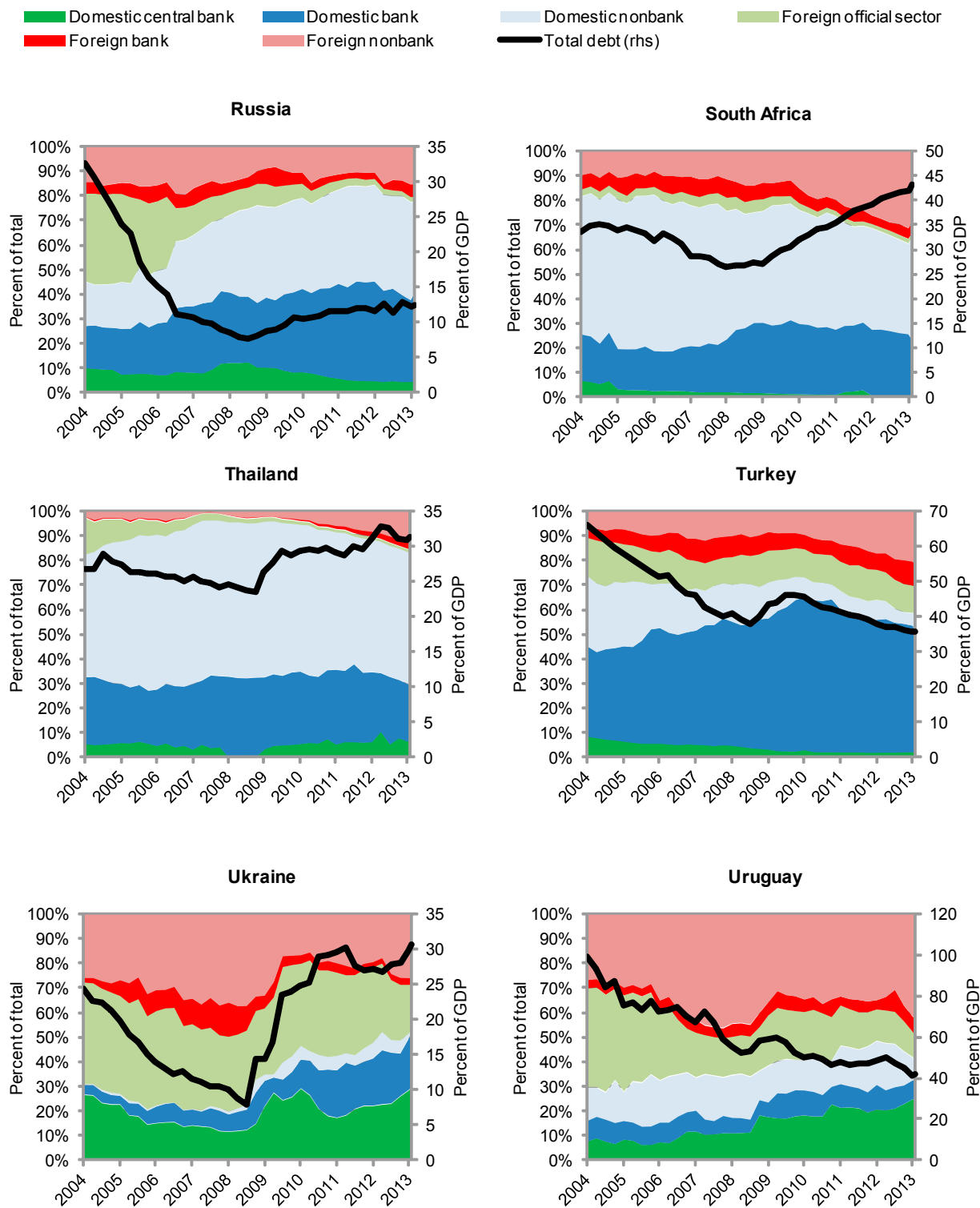
**Annex Figure 1. Emerging Markets: Holders of Government Debt, 2004–13Q2 (continued)**  
(components in percent; total in percent of GDP)



Source: Authors' calculations.

Note: Government debt indicates general government gross debt. Domestic banks are depository corporations residing in the country (IFS definition). Foreign banks are BIS reporting banks residing outside the country. Foreign official loans indicate loans from bilateral and multilateral creditors. Foreign nonbanks and domestic nonbanks are imputed from external and total debt.

**Annex Figure 1. Emerging Markets: Holders of Government Debt, 2004–13Q2 (continued)**  
(components in percent; total in percent of GDP)

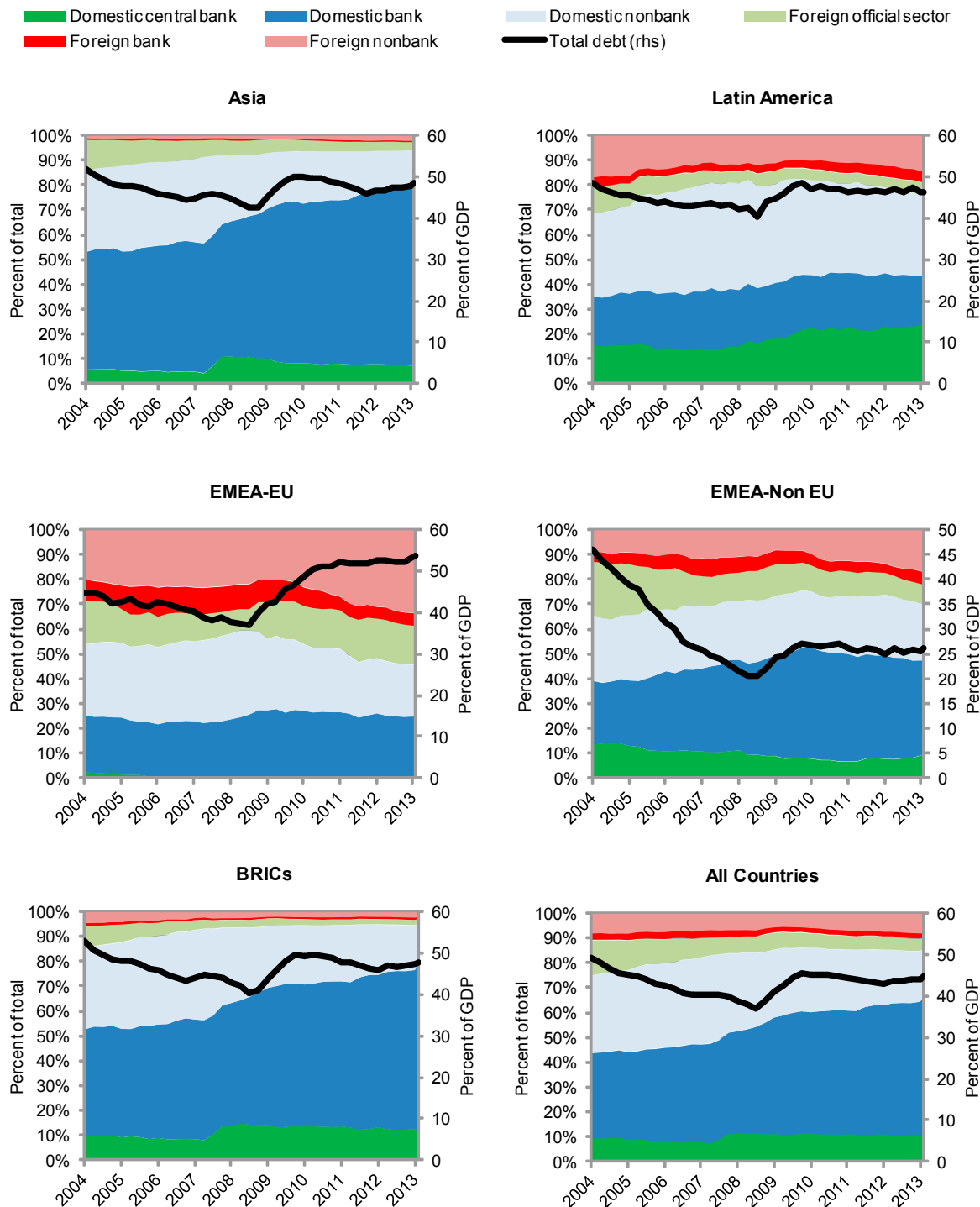


Source: Authors' calculations.

Note: Government debt indicates general government gross debt. Domestic banks are depository corporations residing in the country (IFS definition). Foreign banks are BIS reporting banks residing outside the country. Foreign official loans indicate loans from bilateral and multilateral creditors. Foreign nonbanks and domestic nonbanks are imputed from external and total debt.



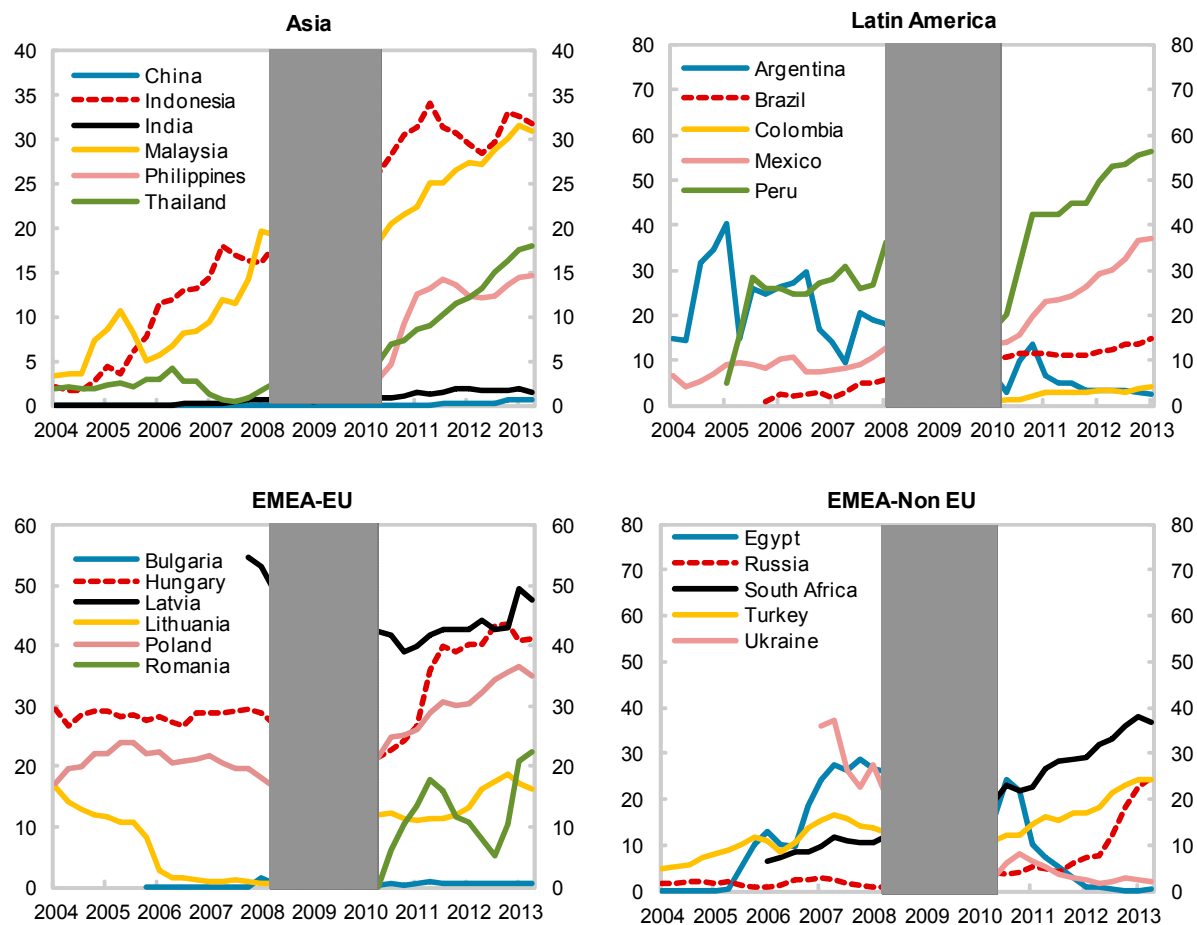
**Annex Figure 1. Emerging Markets: Holders of Government Debt, 2004–13Q2 (continued)**  
(components in percent; total in percent of GDP)



Source: Authors' calculations.

Note: Government debt indicates general government gross debt. Domestic banks are depository corporations residing in the country (IFS definition). Foreign banks are BIS reporting banks residing outside the country. Foreign official loans indicate loans from bilateral and multilateral creditors. Foreign nonbanks and domestic nonbanks are imputed from external and total debt.

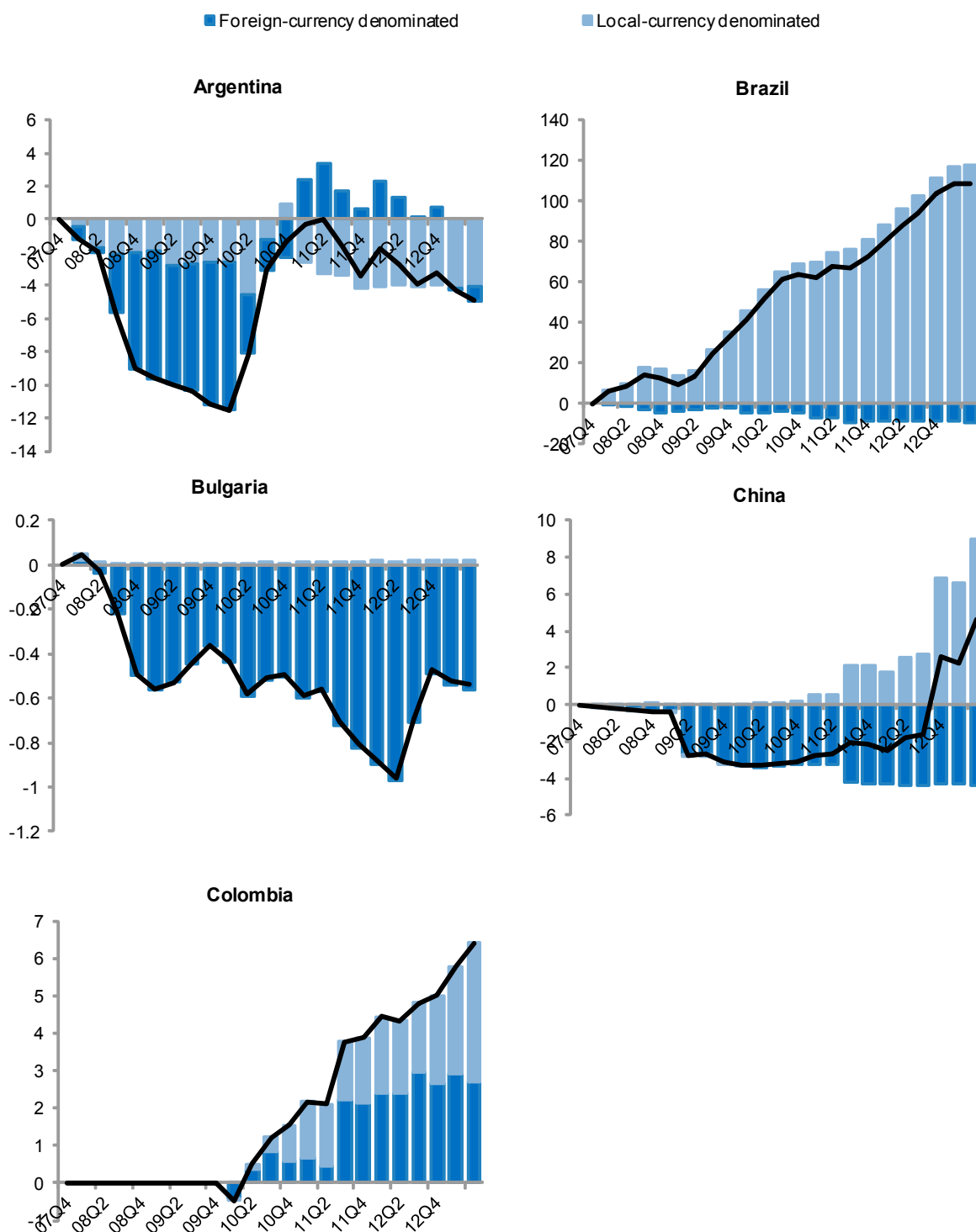
**Annex Figure 2. Foreign Holdings of Local-Currency Government Debt Securities, 2004–13Q2**  
(in percent of total)



Source: National sources and authors' calculations.

Note: Government debt indicates central government debt securities denominated in local currency. For Egypt, they include only Treasury bills. For South Africa, they include only government bonds (excluding retail bonds).

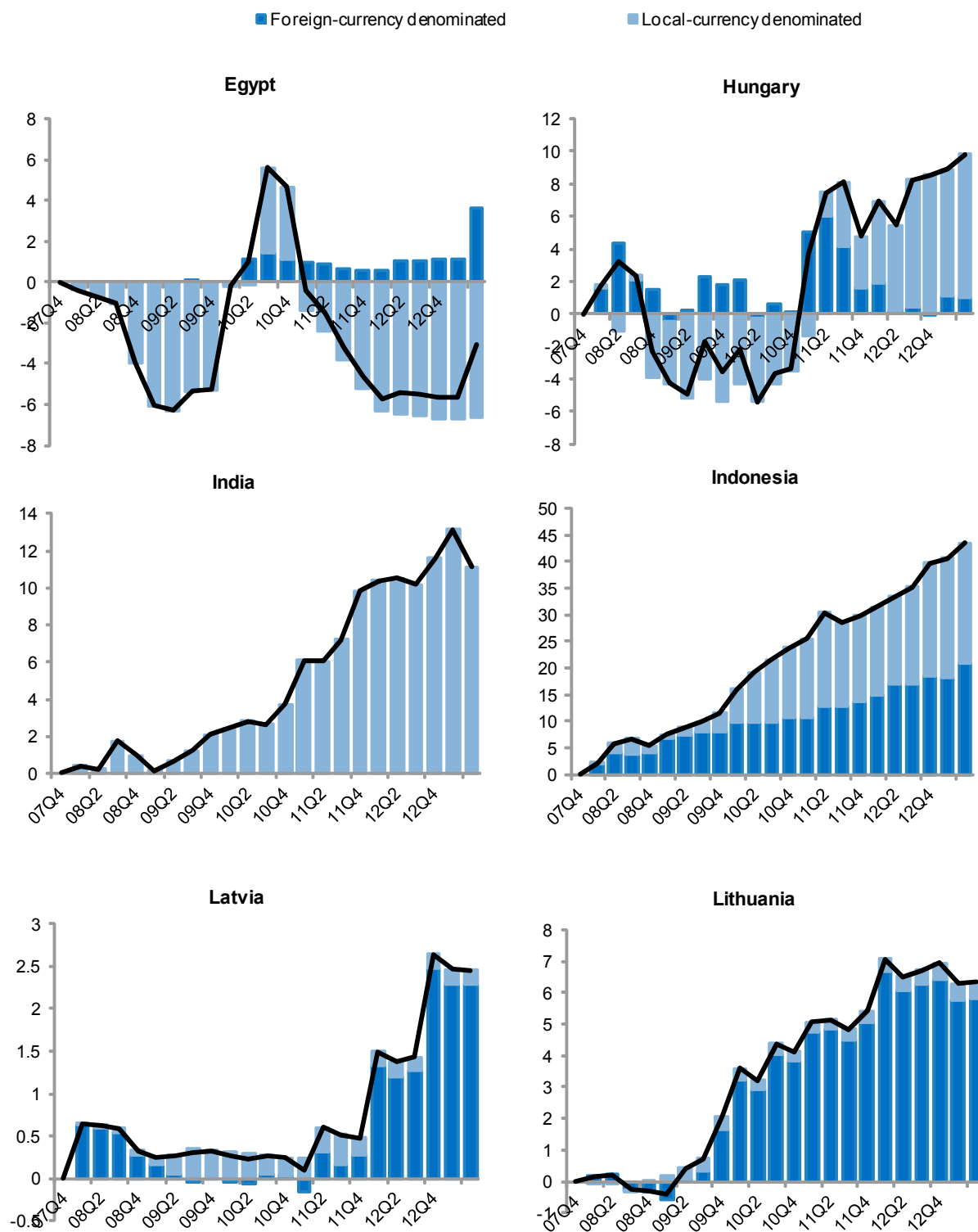
**Annex Figure 3. Cumulative Foreign Flows into Government Debt Securities**  
(billions of U.S. dollars since end-2007)



Source: Authors' calculations.

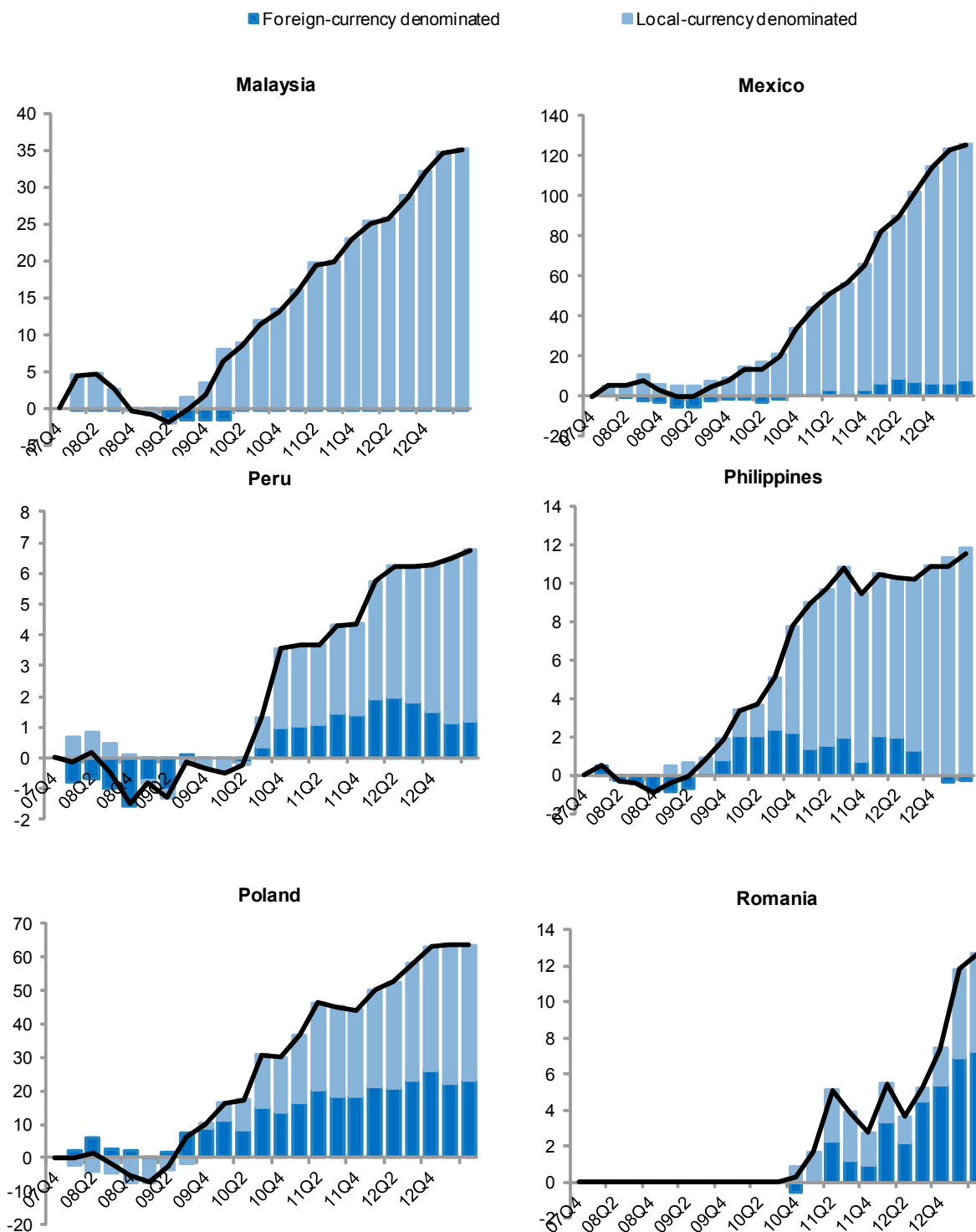
Note: Estimates are not available for Chile and start only after 2009Q4 for Colombia.

**Annex Figure 3. Cumulative Foreign Flows into Government Debt Securities (continued)**  
(billions of U.S. dollars since end-2007)



Source: Authors' calculations.

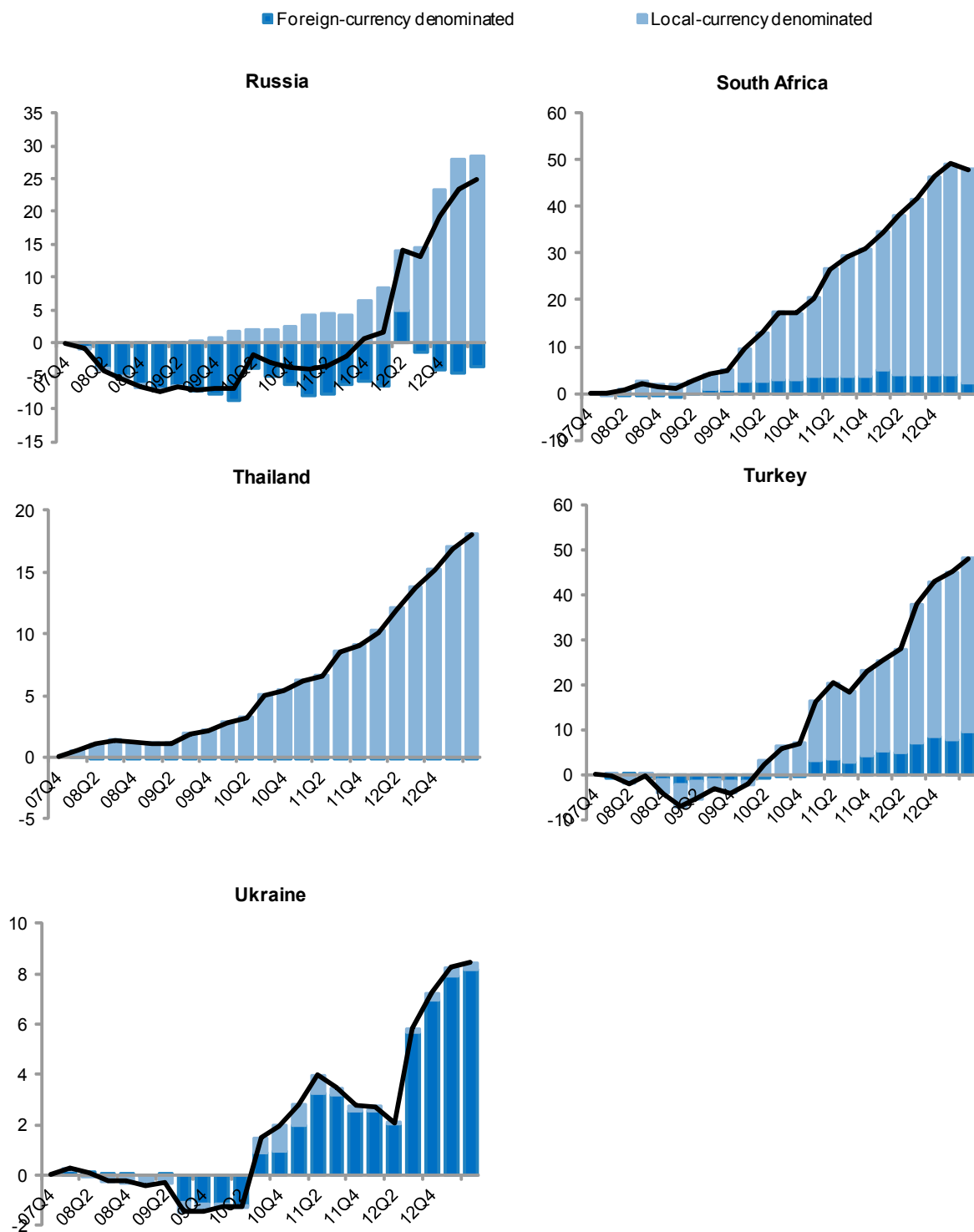
**Annex Figure 3. Cumulative Foreign Flows into Government Debt Securities (continued)**  
(billions of U.S. dollars since end-2007)



Source: Authors' calculations.

Note: Estimates are only available after 2010Q3 for Romania.

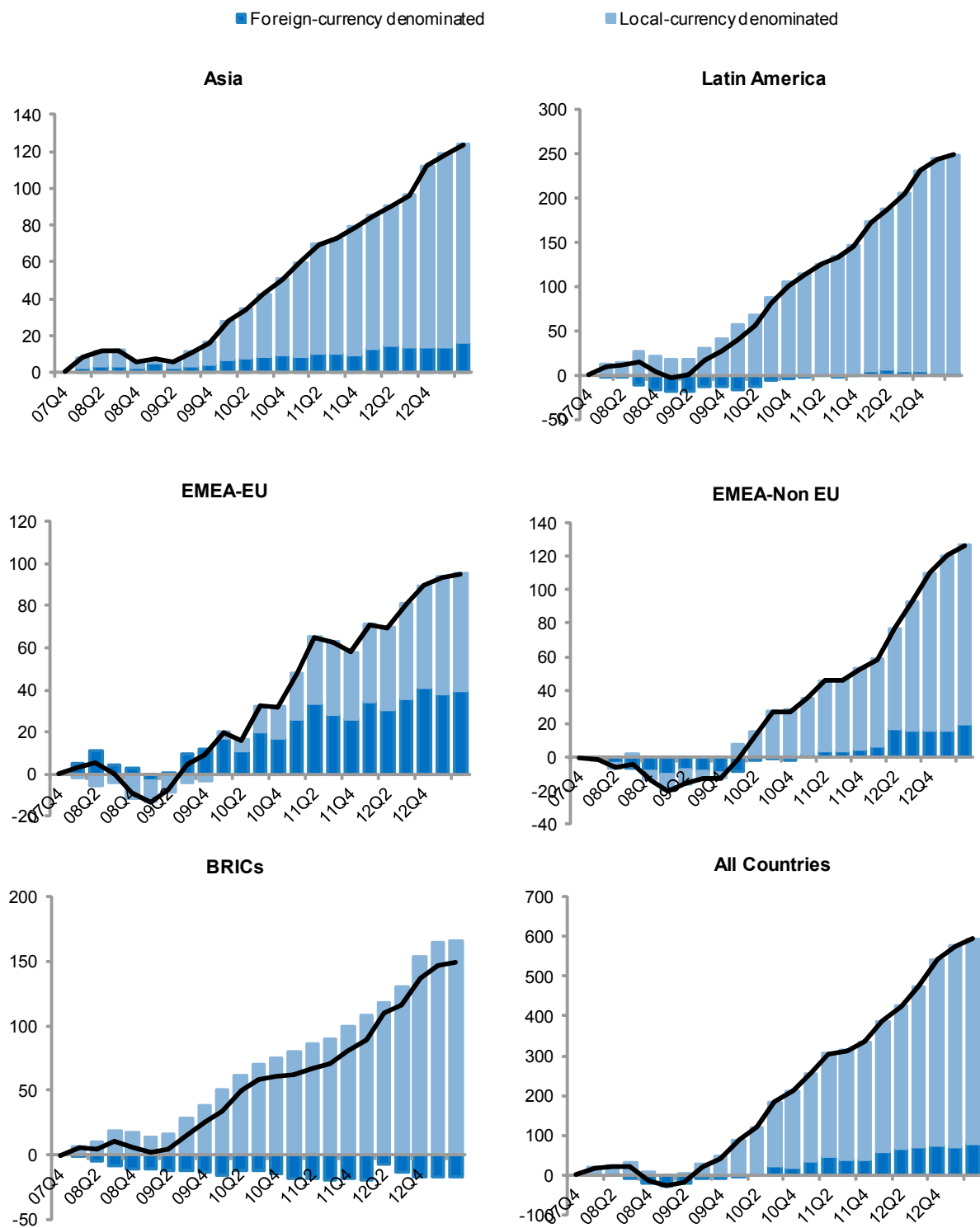
**Annex Figure 3. Cumulative Foreign Flows into Government Debt Securities (continued)**  
(billions of U.S. dollars since end-2007)



Source: Authors' calculations.

Note: Estimates are not available for Uruguay.

**Annex Figure 3. Cumulative Foreign Flows into Government Debt Securities (continued)**  
(billions of U.S. dollars since end-2007)



Source: Authors' calculations.

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