

# **Effects of Foreign Investor Participation on Emerging Market Sovereign Bond Yields and Volatility**

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## ABSTRACT

This paper estimates the impact of foreign investor participation in determining long-term government bond yields and volatility in a group of emerging market (EM) economies from 2005 to the second quarter of 2013. Using a pooled sample of 17 emerging markets, econometric analysis shows that greater share of foreign investors in EM government bonds is associated with a reduction in yields. The effect is still present when foreign participation is broken into three subgroups of foreign investors, after controlling for endogeneity using an instrumental variable strategy. However, the study results do not show that foreign investors have the effect of inducing volatility, once macroeconomic fundamentals are taken into account.

## I. INTRODUCTION

The recent financial crisis pointed out the importance of understanding the demand-side dynamics of the market for government bonds. As the global financial market became evermore integrated, many countries enjoyed capital inflows that seemingly allowed them to enjoy lower borrowing cost and spread risks more broadly among investors. However, as the recent crisis demonstrated, foreign demand was subject to sharp reversal in times of increased risk aversion, and such capital outflows led to rising sovereign bond yields and increased volatility. This issue is more relevant for emerging markets as the region has historically been more vulnerable to sudden reversal of capital flows, despite emerging economies' efforts to improve their public debt profiles and develop their local bond markets (IMF, 2005).

Unfortunately, there exist an insufficient number of studies designed to formalize the relationship between foreign investor participation and yields. The situation is more discouraging for emerging markets, mainly due to lack of standardized data (Daniel, 2008). Though case studies and anecdotal evidence have suggested that foreign participation in emerging markets reduces yields while inducing volatility, a more systematic study encompassing a wide range of countries can help establish generally applicable relationships based on robust empirical evidence.

This paper seeks to build on earlier works that explore the benefits and costs of foreign participation in bond market development (Peiris, 2010; Andritzky, 2012; Ebeke and Lu, 2014). The main contributions of this study to the existing literature are twofold. First, it takes advantage of a recent dataset made available by Arslanalp and Tusda (2014) to quantify the impact that different classes of foreign investors have on emerging market sovereign bonds'

yields and volatility. Previous studies do not make the distinction between different subgroups of foreign investors. Second, we expand the sample size to include 17 EM countries across different regions, so the results are more representative of emerging markets as a whole, compared to past research that are often limited to 10 or 12 countries at most.

The rest of the paper is organized as follows. Section II elaborates further on recent observations that have motivated the paper. Section III discusses in detail the relevant issues and considerations related to investor base composition and surveys earlier works that have covered those topic. Section IV provides the regression specifications for the paper, while section V utilizes the new dataset to present stylized facts and descriptive analysis of emerging economies' sovereign bond markets. Section VI elaborates on the paper's empirical results, and the final section provides a conclusion.

## **II. MOTIVATION**

It is widely believed that demand from foreign investors can help reduce a country's borrowing cost. Since the supply of government debt is set by the government in the short run, simple supply-and-demand analysis suggests that the price of sovereign bonds, and therefore their yields, should be set by demand. Starting with an investor base consisting solely of domestic investors, the addition of foreign investors will create new source of demand that can push up the price of bonds and in turn lower their yields.

However, the recent sovereign debt crisis revealed that foreign investors can quickly abandon markets that are perceived to be risky, and this sudden capital outflow can lead to soaring bond yields and heightened volatility. This is what happened to the so-called peripheral

countries in Europe as growing doubts on their solvency led to massive capital outflows that drove up bond yields and further exacerbated the funding problem for the peripherals. In contrast, the large, stable domestic investor base of Japan has consistently been cited as the main reason why Japan has been able to enjoy low and stable yields on its government bonds, despite having one of the world's heaviest debt-load relative to GDP. So to the extent that significant reliance on foreign investor can induce instability in the bond market, this can influence investors' perception of sovereign bonds' riskiness and hence affect their yields.

This problem can be more relevant for emerging markets, especially as about half a trillion dollar of foreign flows went into EM government debt during 2010-12 (Arslanalp and Tsuda, 2014). Most of these funds came from asset managers searching for yields in an ultra-low rate environment, and as a result the inflows were less differentiated than if they were driven by more permanent shifts in portfolio allocation. While such increased presence of foreign investors most likely resulted in lower borrowing cost for EM governments, it also increased the risk that an abrupt reversal of funds could lead to soaring bond yields and a crisis similar to the recent sovereign debt crisis in Europe.

### **III. INVESTOR BASE AND BOND YIELDS: A LITERATURE REVIEW**

#### *A. Does Investor Base Matter?*

Until recently, the role of the investor base – and in particular the effects of foreign investors – has not really been a core part of the study of sovereign bond yields. Even after the topic began to receive attention following the financial crisis, most of the literature in the area were in the form of case studies. The case of Japan has been of particular interest to many

researchers, as the country enjoyed ultra-low yields on their government debt despite having one of the highest debt-to-GDP ratios in the world. As factors that could explain the relative stability of Japan's sovereign bond yields, Tokuoka (2010) points to the country's sizable pool of household savings, strong home bias among investors, and the presence of large and stable institutional investors. Yet, the dominant domestic investor base could eventually start to erode away in the future as Japan's aging population slows down the growth of private sector savings and as the level of debt continues to increase without proper fiscal reforms (Hoshi and Ito, 2012).

The official sector has increasingly played an important role in the bond market, and its effects have been analyzed in a number of studies. Foreign official holdings of U.S. Treasuries have increased dramatically since the 1990s, largely driven by the reserve accumulation policies of emerging market economies running current account surpluses (Beltran et al., 2012). Their study estimates that if these governments were to reduce their purchases in a given month by \$100 billion, 5-year Treasury rates would rise by about 40-60 basis points in the short-run. While foreign private investors could be induced by the drop in prices to make more purchases, their impact in the long-run would be about 20 basis points, not enough to offset the impact from the reduction in purchases made by the foreign official sector. Looking at foreign inflows into the U.S. Treasuries market in general, Warnock and Warnock (2009) argue that foreign inflows reduced the yield on 10-year Treasuries by about 80 basis points.

The recent financial crisis also added a new dimension to the role of the official sector, as many governments around the globe engaged in quantitative easing programs that entailed mandated statutory purchases of government bonds. Neely (2010) evaluates the effects of the Federal Reserve's large scale asset purchases on international and domestic long bond yields, and applies a simple portfolio choice model to explain the large reduction in both foreign and

U.S. bond yields following the asset purchase program. In the United Kingdom, mandated asset purchases under the Bank of England's quantitative easing policy are thought to have depressed medium to long-term U.K. government bond yields by about 100 basis points, while they do not seem to have international ramifications similar to those of easing policies in the U.S. (Joyce et al., 2010).

*B. Why Is Domestic Demand More Inelastic? Home Bias*

As mentioned above, the presence of large, stable domestic investor base with strong home bias has consistently been cited as one of the key reasons why Japan has enjoyed low, stable yields on its government bonds. Then, why is domestic demand more “sticky” than that of foreign investors? This strong home bias of investors has been a widely covered topic in literature, as researchers try to explain the observed level of international diversification that falls short of what is implied by economic theory. Baxter and Jermann (1997) claim that because the returns to human capital and physical capital are very highly correlated within countries, investors would have to establish a short position in domestic marketable assets in order to hedge out human capital risk. Because empirical evidence suggests that global investors hold most of their assets in the form of domestic securities, the authors suggest the “international diversification puzzle” is worse than most people think.

On the other hand, other studies present models that do a better job of reconciling theory with observation. Heathcote and Perri (2008) use the stochastic growth model with two country and two goods to explain that home bias arises because endogenous international relative price fluctuations make domestic assets a good hedge against non-diversifiable labor income risk. Fidora, Fratzscher, and Thimann (2006) argue that exchange rate volatility can explain most of

the home bias observed in the bond market, while the explanatory power is significantly reduced for the equity market. Specifically, they use a Markowitz-type portfolio selection model to show that real exchange rate volatility can induce stronger home bias for assets with low local currency return volatility, and claim that in case of bonds, a reduction of monthly real exchange rate volatility from its sample mean to zero reduces home bias by up to 60 basis points (2006).

Institutional factors can also bias bond investors toward domestic assets. Though not as popular as before, many fixed-income portfolios engage in immunization and dedication strategies to minimize the portfolio's interest risk and to match the income flows with any future liabilities (Adler, 1983). Because it is extremely difficult to immunize or dedicate portfolios of foreign currency in local currency terms, fixed income funds that employ such strategies may be less inclined to hold foreign currency bonds. Furthermore, the regulatory changes that have been taking place after the recent crisis may also bias fixed-income investors toward the domestic market. In particular, while banks are often the largest holders of government bonds in general, the low risk weight in the calculation of regulatory capital for domestic sovereign debt may induce banks to prefer such securities over foreign bonds (Peiris, 2010).

### *C. Foreign Investor and the Government Bond Market*

Intuitively speaking, foreign investors should play both positive and negative roles in EM bond markets. On the benefit sides, perhaps the clearest gain from having more foreign investors is that they can expand the investor base and improve liquidity (Baluga, et al, 2011). The increased role of foreign asset managers in emerging markets can be especially beneficial, as these institutional investors, including hedge funds and mutual funds, tend to trade more actively than central banks or domestic banks. More active trading will foster price discovery, and the



interaction among heterogeneous population of investors with varying risk profiles, views, and trading strategies will force bond prices to better reflect all the relevant information, including sovereign credit risks (Baluga et al, 2011). The relevance is even greater for many emerging markets where regulatory bottlenecks have left the domestic institutional investor base relatively weak and underdeveloped. At the policy and regulatory level, greater presence of foreign investors can also encourage governments to implement policy reforms to further develop their capital markets and establish modern trading infrastructure (Arslanalp and Tsuda, 2014). And to the extent that the interest in EM sovereign debt can spillover into the corporate bond market, greater scrutiny of foreign investors and credit analysts can help reduce principal-agent problems and force higher quality reporting and governance (Obstfeld 1998).

On the flipside, one common reason for concern is that foreign demand is often considered to be more elastic and hence associated with increased volatility. Foreign investors could be a less stable source of demand in times of stress, and given the broader pool of investible assets, they may be more inclined to sell and move to a different market, rather than rolling over their positions (Arslanalp and Tsuda, 2014). Sudden exit of foreign funds triggered by increased risk aversion can also impact the conduct of monetary policies, prompting central banks to intervene and stabilize government bond yields and exchange rates (Baluga et al, 2011). This is exactly what EM governments did following the collapse of Lehman Brothers in September 2008 as borrowing costs jumped up and volatility peaked. At the opposite end of the spectrum is the issue of asset bubbles in EM, whereby excessive inflows of funds into “hot” EM economies like China or India can lead to credit bubbles and overvalued assets (Arslanalp and Tsuda, 2014). Because policy makers understand that these flows can reverse at any moment if risk aversion jumped, foreign investors can indeed complicate the issue of macroeconomic

management.

In light of these benefits and costs, few studies in the past have attempted to explore the relationship between foreign investors and bond yields. Andritzky uses a newly composed dataset of G20 advanced economies to estimate that increases in the share held by foreigners by 1 percentage points are associated with a reduction in yields by about 4 basis points (2012). Studies focusing on EM are constrained by the lack of consistent data. Despite the limitations, Peiris estimates that a one percentage point increase in the share of foreign investors in the government bond market will tend to lower yields by about six bps, after controlling for all the relevant macro factors (2010). Another study that focuses on the post-Lehman period (Peiris' study ran from 2000 to 2010) concludes that the effects were somewhat higher following the crisis, with one percentage point increase in foreign participation leading to about 7 to 9 bps reduction in yield (Ebeke and Lu, 2014).

On the other hand, studies about the effect of foreign investors on volatility show mixed results. The study by Peiris focusing on individual EM countries during the pre-crisis period finds that six out of the ten countries in the sample do not show significant relationship between yield volatility and foreign participation (2010). In fact, three EM countries in the study actually have negative coefficients, meaning increases in foreign participation lowers volatility. While Ebeke and Lu's baseline estimates show insignificant relationship, they find statistical significance once they correct for possible endogeneity issues (2014). When G20 advanced countries are used instead, there seems to be no significant relationship between foreign investors and bond yield volatility (Andritzky, 2012). These mixed results suggest that while foreign participation may induce heightened volatility in some markets, the effect may depend on country-specific macro conditions or even the time period considered.

#### *D. Developments in Emerging Markets*

The local bond markets of many emerging markets today reflect the persistent effort by these countries to develop their capital markets following the pervasive dislocations that swept across many emerging economies during the 1990s. Whereas large portions of government obligations prior to the 1997 emerging market crisis included official loans, many EM governments have successfully developed local bond markets that could serve as an alternative source of debt financing for the public and corporate sectors (IMF, 2005). Just in emerging Asia alone, the outstanding local currency debt markets grew at an annual rate of 19.1 per cent from 1996 to the third quarter of 2010 (Baluga, et al, 2011). Considering that many emerging economies had faced difficulties paying back their dollar-denominated debt during the 1997/98 crisis, the growth of the local-currency bond market is encouraging from a policy standpoint (Baluga, et al, 2011). The Committee on the Global Financial System (CGFS) estimates that of the \$6.2 trillion domestic debt issued by emerging market economies, more than 95 percent was issued in local currency (2007). Even when government bonds outstanding in the international markets are taken into account, the share of foreign-currency denominated debt is very small and has been declining according to CGFS (2007). This trend indeed highlights the fact that many emerging markets have successfully defied the so-called “original sin” hypothesis that EM countries can typically borrow only in hard currencies such as the dollar (Eichengreen and Hausman, 1999).

Another important sign of improving debt profiles of emerging economies is the share of fixed-rate securities. Although issuing floating rate instruments could benefit the borrower in a declining interest rate environment, sovereign borrowers in emerging markets can find

themselves liable for larger coupon payments if rates go up. Because managing such interest rate exposure can be costly for EM economies, the rise in the proportion of straight fixed-rate debt in emerging economies (above 70 percent by 2007) marks an important development (CGFS, 2007). However, the proportion of fixed-rate debt in emerging markets is still below the average for major industrial countries, which stands at around 90 percent (CGFS, 2007). There are also large variations across countries and regions, as the share of fixed-rate debt in Latin America, at below 30 percent, is far below the levels found in Asia or Europe (Peiris, 2010).

Along with the declining share of floating-rate instruments, emerging economies have benefited from the rising maturities of government debt (Peiris, 2010). From the issuer's perspective, raising capital with longer-dated securities can mitigate funding risks that can result from the need to continually refinance outstanding debt. But from the buyer's perspective, investing in longer-maturity securities can entail significant interest rate risks as bonds with longer duration have greater interest sensitivity. In general, being able to successfully issue long-term bonds adds credibility to the sovereign borrower and signals investors' confidence in the issuing economy. Once again, Latin American countries lag behind their Asian peers in lengthening the maturities of government debt, with the exception of Brazil and Mexico (Peiris, 2010). These signs of progress reflect the continue efforts by EM Asia to implement prudent financial policy reforms such as the liberalization of capital accounts (Baluga, et al, 2011). While encouraging market liberalization, many countries in EM Asia fostered the growth of the domestic institutional investor base by developing privately managed pension, mutual funds and insurance sector, which sometimes meant restricting the inflow of foreign funds to encourage the development of local investors (Peiris, 2010).

#### IV. MODEL SPECIFICATION AND IMPERICAL DESIGN

##### *A. Estimating the effects of foreign ownership on the level of sovereign bond yields*

This study follows the panel data approach taken by Peiris (2010) which uses a pooled sample across multiple countries to overcome the short time series of quarterly data that are available on macroeconomic variables and foreign investor participation. As shown by past studies in the literature of yield determination, including Baldacci and Kumar (2009), the panel data estimation method provides an efficient methodology to study the impact of global factors as well as country specific explanatory variables across multiple countries in the sample space. Whereas the study by Peiris (2010) is restricted to a representative group of 10 emerging market countries, this study benefits from having access to the recent database on foreign investor participation compiled by Arslanalp and Tusda (2014), which covers 24 emerging market countries. However, because some of the relevant control variables are not available for seven<sup>1</sup> of the countries in the dataset, regression analysis will utilize a total of 17 EM countries.

While we focus on the impact of foreign investors on government bond yields, we also incorporate relevant macro and external determinants of long-term yields that are generally covered in the literature. Many of the existing studies focus on the effects that fiscal positions and debt levels of countries have on borrowing cost, the general conclusion being that these variables tend to have adverse effects on yields (Baldacci et al., 2010; Gruber et al., 2012; Caporale et al., 2002). In particular, Baldacci and Kumar (2010) analyze panel data of 31 advanced and emerging market economies to conclude that higher public debt lead to a significant increase in long-term interest rates, with greater impact on yields observed for countries with higher initial level of debt. Taking these findings into consideration, the set of

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<sup>1</sup> These seven countries are Argentina, Chile, China, Colombia, India, Indonesia, and Ukraine

explanatory variables included in this study incorporate the factors used in Baldacci and Kumar (2009) as well as Caporale and Williams (2002). The econometric model is specified as below:

$$Lr_{it} = \beta_1 FP_{it} + X'_{it}\gamma + c_i + u_t + \varepsilon_{it} \quad (1),$$

$$Lr_{it} = \beta_2 FG_{it} + \beta_3 FB_{it} + \beta_4 FNB_{it} + X'_{it}\gamma + c_i + u_t + \varepsilon_{it} \quad (2)$$

As briefly mentioned earlier, the above specification exploits the panel data structure and allows us to control for other determinants of sovereign bond yields besides foreign investor participation. The analysis spans over a total of 34 quarters, starting from the first quarter of 2005 to the second quarter of 2013, a decision that was driven primarily by the availability of data. For both equations (1) and (2),  $Lr_{it}$  denotes the 10-year local currency bond yields in each country  $i$  at each quarter  $t$ . For Brazil, Egypt, Turkey, and Uruguay, the 10-year bond yields were replaced with yields on shorter maturity securities, all of which were available either from IMF's International Finance Statistics (IFS) or Bloomberg. Though this seeming inconsistency is unfortunate, previous works by Peiris (2010) have demonstrated that this does not have material impact on the results.

$X'_{it}$  denotes the matrix of control variables that are also correlated with government bond yields, with  $\gamma$  representing their correlation coefficients.  $c_i$  and  $u_t$  are the country and quarter fixed-effects, respectively. Taking into account fixed effects in the regression analysis allows us to control for the unobservable country-specific factors that may be correlated with bond yields, so that the coefficients on foreign participation variables would measure the true impact of foreign investors, conditional on the presence of fixed effects. Such country-specific risk factors can be of greater importance for emerging market countries, where significant presence of

various political risks and institutional risks, in addition to the varying historical rates of default, could affect investors' risk perceptions. One significant improvement of this paper from Peiris (2010) or Ebeke and Lu (2014) is that we further break down foreign holdings into the three types of investors – foreign officials, foreign banks, and foreign non-banks – which are used in equation (2). As previously mentioned, such level of disaggregation was made possible with the dataset put together by Arslanalp and Tsuda (2014).

The matrix of control variables can be categorized into country-specific variables and global factors. Country-specific determinants include inflation as well as the rate of real GDP growth, which are expected to have opposite effects on bond yields as investors would demand higher nominal yields from countries with high inflation rate and low growth prospects. To control for the effects that countries' indebtedness may have on investors' risk perceptions, we also include the gross debt-to-GDP ratio. Each country's foreign exchange rate against the US dollar is also included, and we expect that EM countries with currencies that have depreciated against the dollar would have to pay higher borrowing cost as investors measure their returns in dollar terms. Following similar logic, each country's current account balance (relative to GDP) and level of foreign reserve assets is also included to control for the currency risk.

In addition to the country-specific variables elaborated above, more recent studies have increasingly focused on the role played by global factors in determining asset prices. These factors are especially relevant in light of the unprecedented level of interconnectedness exhibited by financial markets around the world, which was graphically demonstrated during the recent crises. Broadly speaking, global factors can be grouped into variables that capture global risk aversion and global liquidity. The most common proxy for investors' risk aversion is the VIX index, or the Chicago Board of Options Exchange (CBOE) Volatility Index. This index is

constructed from the implied volatilities of options on S&P 500, and is meant to be a 30-day forward looking indicator. While not as directly relevant, the yield on 10-year U.S. Treasury bonds is also included in the regression, as the variable can account for both global investors' risk appetite with the so-called "safe haven" effect. Regarding global liquidity factors, the U.S. federal funds rate is included in the specification. Because a lower Federal funds rate is associated with higher global liquidity, it seems logical to think that the beta coefficient on the factor would be positive, as lower Federal funds rate would imply there is ample liquidity in the market to induce investors to aggressively buy EM assets, especially as returns in advanced economies decline. But it is also possible that the correlation may be negative, as lower Federal funds rate would come during periods of market turmoil and heightened global risk-aversion. This would mean that as the Fed lowers its benchmark interest rate, yields on EM government bonds may go up as investors flee riskier EM markets in search for safer assets like the U.S. Treasury.

*B. Estimating the effect of foreign ownership on the **volatility** of sovereign bond yields*

The econometric model employed to study yield volatility is similar to the specification used for studying the level of yields. Because volatility is computed as the four-quarter rolling standard deviation of bond yields, the dataset used for this study starts from the first quarter of 2006, unlike the previous specification detailed above that started from 2005. This approach is similar to the one taken by Peiris (2010), while the study conducted by Ebeke and Lu (2014) used the average standard deviation over 12 weeks (one quarter). Similar to the model used for the level of yields, we also utilize fixed-effects specification in our study of yield volatility to capture the effect arising from a "within-country" increase in foreign holdings on the country's



yield volatility. The regression model is specified as follows:

$$\sigma_{it} = \theta_1 FP_{it} + X'_{it}\gamma + c_i + \varepsilon_{it} \quad (3),$$

$$\sigma_{it} = \theta_2 FG_{it} + \theta_3 FB_{it} + \theta_4 FNB_{it} + X'_{it}\gamma + c_i + \varepsilon_{it} \quad (4)$$

In the above specification,  $\sigma_{it}$  denotes the four-quarter rolling volatility for each country. Similar to equations (1) and (2),  $X'$  is used to represent the matrix of control variables, which include most of the factors included in the previous two regression equations. One major difference is that equations (3) and (4) include the quarterly standard deviation of the foreign exchange rate (in dollar terms) for each country. We expected the correlation coefficient on the exchange rate volatility to have a positive sign, as government bonds denominated in volatile currencies would suffer from induced volatility in prices.

## V. DATA AND DESCRIPTIVE ANALYSIS

### A. Description of Data

The dataset on investor base composition is largely drawn from a recent study by Arslanalp and Tsuda (2014) that tracks nearly US\$1 trillion of emerging market government debt held by foreign investors in local and hard currency. The estimates were collected on a quarterly basis to cover time period from 2004 to mid-2013, and as of December 2012 the sample covers about US\$ 9 trillion government debt. Table 1 provides the full list of countries that are covered in the sample, and Table 2 lays out an overview of how the numbers were compiled. While we utilize the data for all the countries listed below to present some stylized facts, the regression

analysis that follows will exclude Argentina, Chile, China, Colombia, India, Indonesia, and Ukraine due to the limited availability of macro variables for these countries. Nevertheless, as most previous studies on emerging economies have been confined to 10 or 12 countries, having 17 countries in the analysis marks a meaningful improvement made possible with the new dataset. While regression analysis will be limited to the 17 countries specified above, the following section will provide trends analysis using the data for all 24 countries.

**Table 1. Sample of Countries<sup>2</sup>**

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

As used in this paper, general government gross debt is defined as the sum of the debt of the central government, state and local governments, and social security funds, where applicable. For most emerging market economies concerned in this paper, central government was the primary debtor, covering both securities and loans. This definition, as adopted by Arslanalp and Tsuda (2014), allows for efficient cross-country comparisons. While the data for countries in the European Union come mostly from Eurostat's Quarterly Government Finance Statistics, the gross government debt numbers for other countries were mostly available from either the

<sup>2</sup> The italicized countries are excluded in the regression analysis

IMF/World Bank Quarterly Public Sector Debt Statistics (QPSD) or IMF's Government Finance Statistics (GFS).

**Table 2. Summary of Data Sources<sup>3</sup>**

	<b>Data Source</b>	<b>Coverage, by instrument</b>	<b>Valuation of debt securities</b>
<b>Total Debt</b>	Eurostat, Quarterly Public Sector Debt Statistics (QPSD), Government Financial Statistics (GFS), and national sources	Loans and Securities	Face Value
<b>Foreign Holders</b>	IMF/World Bank Quarterly External Debt Statistics (QEDS), and national sources	Loans and Securities	Face value, with a few exceptions
<b>Foreign Banks</b>	BIS, International Banking Statistics	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)	Securities	Market Value
<b>Foreign Official: Official Loans</b>	IMF/World Bank, Quarterly External Debt Statistics (QEDS)	Loans	N/A
<b>Domestic Banks</b>	IMF, International Financial Statistics (IFS)	Loans and Securities	Book Value
<b>Domestic Central Bank</b>	IMF, International Financial Statistics (IFS)	Loans and Securities	Book Value

While Arslanalp and Tsuda (2014) breaks down the investor base into six categories – three for foreign and three for domestic – this paper focuses primarily on the three foreign investor categories: foreign official sector, foreign banks, and foreign non-banks. The total

<sup>3</sup> Source: Arslanalp and Tsuda (2014)

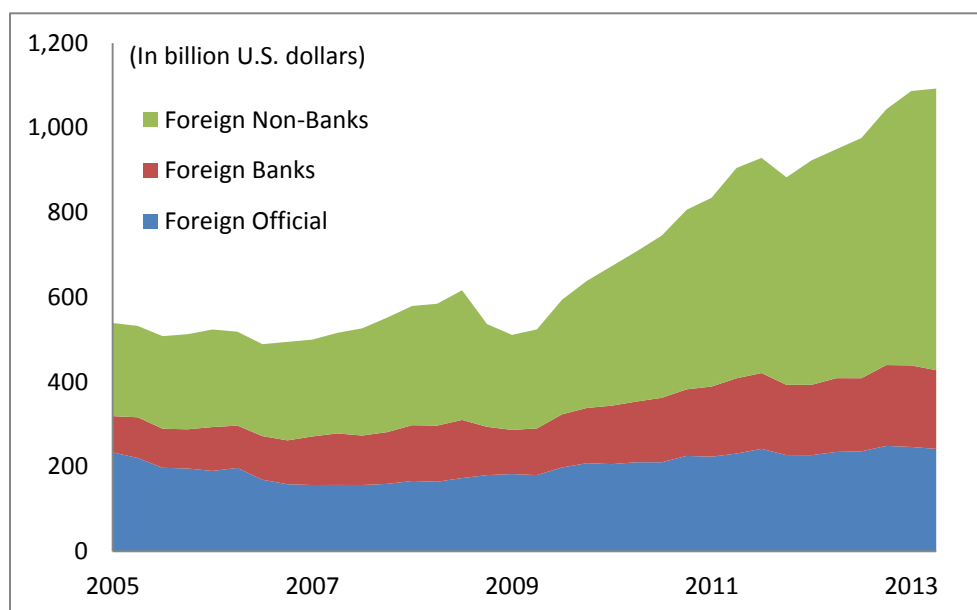
amounts of debt held by foreign investors are estimated from the QEDS database of IMF. The numbers are available on a quarterly basis, and they are calculated as the sum of general government securities held externally and general government loans held externally. Foreign official sector holdings consist of government securities held by foreign central banks as reserve assets as well as foreign official loans. Foreign bank holdings are estimated primarily from BIS International Banking Statistics, and lastly, foreign non-bank holdings, which mainly consist of non-bank financial institutions including asset managers, are calculated as the difference between total foreign amount and the holdings of foreign official sector and banks.

Besides the data on investor ownership, the other data used in the paper are collected from multiple sources (Appendix I), although most were available from IMF's International Finance Statistics (IFS) database. As briefly elaborated earlier, because the 10-year yields for Brazil, Egypt, Turkey, and Uruguay were not available from IFS, they were replaced with 5-year generic government bond yields from Bloomberg. The volatilities of long-term bond yields were calculated as four-quarter rolling standard deviations using the same data from IFS. Because the yield data on all countries were available only from 2005, the annualized, rolling standard deviations only begin from 2006. Also, using quarterly yields to calculate annualized standard deviation numbers may not reflect the true volatility with so few data points, but most countries did not disclose the yield data on higher frequency – weekly or daily. All of the country-specific macro variables were available from IFS, as well as the U.S. Federal funds rate. Meanwhile, the data for the VIX Index and the yield on 10-year U.S. Treasury securities was collected from the database maintained by the Federal Reserve Bank of St. Louis.

### *B. Descriptive Analysis: Key Trends and Stylized Facts*

The dataset shows that as of the second quarter of 2013, slightly more than US\$1 trillion of emerging market government debt was held by foreign investors (Figure 1). After a temporary decline during the 2008 financial crisis, the amount held by foreign investors rebounded from about US\$500 billion and quickly rose above the trillion-dollar mark in 2013. While the share of foreign governments or foreign banks stayed relatively stable or only grew marginally, dominant portion of foreign inflows after the crisis came from foreign-non bank financial institutions such as mutual funds or hedge funds (Arslanalp and Tsuda, 2014). The dramatic increase in portfolio flow highlights investors' "search for yield" in an environment where many major advanced economies, including the United States and Japan, have resorted to quantitative easing programs that resulted in ultra-low interest rates. While the trend varies somewhat depending on the different EM regions considered, the overall resemblance suggests that foreign inflows were rather undifferentiated across emerging economies (Appendix II).

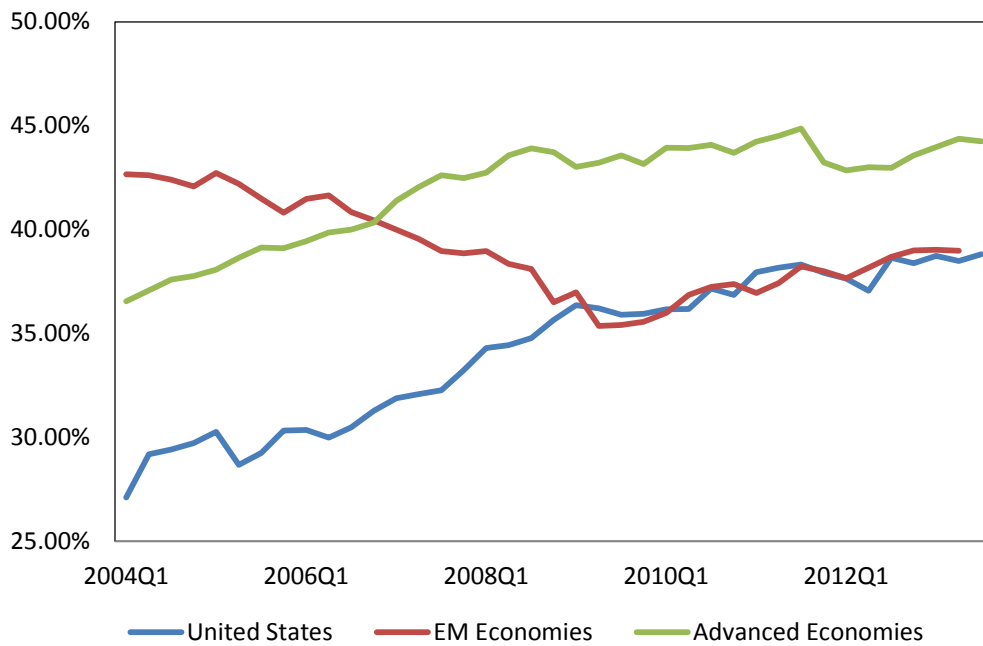
**Figure 1. EM Government Debt Held by Foreign Investors, 2004-12**



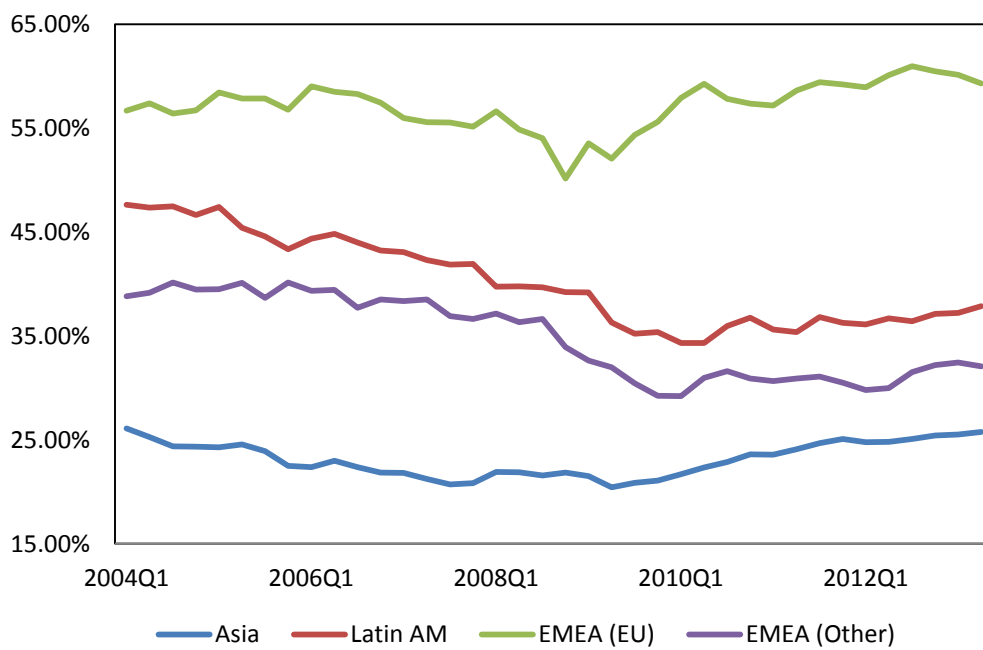
Looking at the average foreign participation rate, foreign investors make up smaller share of total investor base for sovereign debt in emerging economies than in advanced economies or the United States. From 2004 to 2013, the gap between the average foreign participation rate in EM sovereign debt markets and in advanced economies was about 10 percentage points, although the size of the gap was reduced following the crisis. This seems less surprising given the fact that due to their lower credit ratings, emerging market debt securities are in less demand from global fixed income investors. More interestingly, when the “foreign participation rate,” defined as the percentage share of government debt held by foreign investors, is averaged across the 24 emerging economies in the dataset, the share of foreign investors seems to have decreased from about 43% in 2004 to slightly below 40% in 2013 (Figure 2). Yet the trend has been upward sloping since the financial crisis in 2008, in contrast to the average foreign participation rate for advanced countries that somewhat flattened out after 2008. Meanwhile, the foreign participation rate for the U.S. exhibits a constant upward trend, which was primarily driven by emerging market countries that have purchased large amounts of Treasury securities using their current account surpluses (Beltran, et al, 2012).

Looking at the emerging market economies by region, the data suggests that not all emerging market economies went through the same path in regards to foreign investor participation. While the share of foreign investors in EM Asia followed a relatively smooth path and began a steady increase following the financial crisis, other regions tend to exhibit more dramatic patterns (Figure 3). Countries in EMEA-EU, for instance, witnessed a sharp withdrawal of foreign investors from their government bond markets during the financial crisis, and Latin America as well as Non-EU EMEA also witnessed more dramatic withdrawal than EM Asia. Meanwhile, emerging economies in Europe clearly had the greatest percentage of their sovereign

**Figure 2. Percentage of Government Debt Held by Foreigners**



**Figure 3. Percentage of Government Debt Held by Foreigners: EM by Region**



debt held by foreign investors, and the gap between EMEA-EU and Asia has remained around 30% throughout the period covered. This may seem to suggest that sovereign debt of EM countries with higher foreign participation rate may be subject to greater yield volatility, which this study seeks to examine through regression analysis.

Looking at country-level data, however, suggests that the relationship may not be as clear-cut. Before the global financial crisis, Romania had one of the highest foreign investor participation rates among EM countries, with almost 85% of its government debt in the hands of foreign investors (Appendix III). As the global economy started to turn sour around 2006, it suffered a dramatic outflow of foreign capital as the share of government debt held by foreigners eventually dropped by nearly 40% to reach 45% level around 2009. The case of Peru, however, tells a different story, even though Peru also had extremely high foreign participation rate of around 80% before the crisis. While foreigners did seem to exit Peru's government bond market, there was no dramatic reversal of fund flow like the one observed in Romania or many other EM countries. In contrast, the foreign share in Peru's sovereign debt market went through a relatively smooth trajectory and slowly declined to about 70% by 2013. One possible explanation could be that the different macroeconomic conditions of those two countries induced foreign investors in Romania and Peru to react differently during the economic crisis. More formal econometric analysis will be needed shed light on this issue.

## **VI. EMPIRICAL RESULTS**

### *A. Baseline Estimates: Foreign holdings and the level of sovereign bond yields*

The results of the regression analysis are presented in Table 3. Column (1) shows the



resulting coefficients and the corresponding t-statistics when the yields on EM long-term government bonds are regressed against the overall foreign participation rate, along with a set of relevant control variables. The coefficient on the foreign participation rate suggests that a 1 percentage point increase in the share of holdings by foreign investors is associated with about 3 basis points lower yields. The results, statistically significant at the 5 per cent level, are slightly lower than the effect calculated by Peiris using 10 EM countries from 2000 to 2009, which suggests a 6 basis points drop in yields (2010). The coefficient estimates are also lower compared to the 7 basis points drop estimated by Ebeke and Lu, though their study focuses on the post-Lehman period (2014). On the other hand, the results from the current study are surprisingly similar to the estimates made by Andritzky for G20 advanced economies, suggesting a 3 basis points reduction in yields for a percentage drop in foreign participation (2012).

Column (2) of Table 3 shows the results when we replace the overall foreign participation rate with three subcategories of foreign investors: foreign official sector, foreign banks, and foreign non-banks. The coefficients on both foreign banks and foreign non-banks financial institutions are strongly negative and significant at the 1 per cent level, but the foreign official sector does not seem to have statistically significant effects on yields. A 1 percentage point increase in the share of foreign bank holdings is associated with 27 basis points reduction in yields, while the effect of foreign non-banks is estimated to be about 10 basis points. Though these magnitudes seem quite large, there is no analogous study in the literature that directly looks at the effects of foreign banks or asset managers, thereby limiting our ability to make meaningful comparisons. In a related study, however, Andritzky looks at the regression coefficient for domestic non-bank financial institutions using a sample of G20 countries and calculates the effects to be about 3 basis points, which is substantially less than our results (2012).

**Table 3. Regression Results: Foreign Holdings and Yields**

Dependent Variable: Emerging Market Long-term Government Bond Yield				
Period: 2005 Q1 - 2013 Q2				
	Baseline Estimates		IV Estimates	
	(1)	(2)	(3)	(4)
Foreign Participation Rate	-0.02996*		-0.0310065**	
	[-2.34]		[-2.15]	
Foreign Official		-0.0052572		-0.0264167*
		[-0.38]		[-1.68]
Foreign Bank		-0.2694859***		-0.3364355***
		[-4.92]		[-3.80]
Foreign Non-bank		-0.1016469***		-0.0866147***
		[-5.32]		[-3.64]
Inflation Rate	0.06440*	0.1164991***	0.0649038*	0.1200231***
	[1.78]	[3.25]	[1.78]	[3.18]
Gross Government Debt-to-GDP	-0.01068	-0.0395805***	-0.0103915	-0.0380076***
	[-0.87]	[-3.26]	[-0.83]	[-2.78]
Real GDP Growth Rate	-0.13561**	-0.1451426***	-0.1353423***	-0.1492692***
	[-6.12]	[-6.67]	[-6.09]	[-6.72]
Current Account Balance-to-GDP	0.07105***	0.0295631	0.0712296***	0.0385195*
	[3.83]	[1.55]	[3.83]	[1.95]
Reserve Assets-to-GDP	-0.09064**	-0.0838952***	-0.0905304***	-0.0779832***
	[-4.60]	[-4.36]	[-4.59]	[-3.96]
Foreign Exchange Rate	0.00034**	0.0002396	0.0003365**	0.0002222
	[2.07]	[1.52]	[2.07]	[1.39]
U.S. 10-year Treasury Yield	0.56228**	0.3674293**	0.560731***	0.4456089***
	[4.07]	[2.59]	[4.05]	[3.03]
Federal Funds Rate	-0.13674*	-0.067286	-0.1360149*	-0.048765
	[-1.76]	[-0.88]	[-1.76]	[-0.62]
VIX Index	0.00023**	0.0000441	0.0002242**	0.0000784
	[2.18]	[0.65]	[2.16]	[0.72]
Observations	578	578	578	578
R-squared	0.9456	0.9498		
Number of countries	17	17	17	17

Note: T-statistics in brackets. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Looking at the effects of macro variables, the real GDP growth rate of emerging market economies has a coefficient that is strongly negative and statistically significant for both regressions. This suggests that when investors evaluate government securities of EM countries, each economy's growth prospects play a significant role in determining portfolio allocation. Similar to the case for EM equities, government securities for high-growth EMs seem to attract heavy inflow of funds, resulting in a significant negative relationship between real GDP growth and bond yields. The negative, statistically significant coefficient on reserve assets-to-GDP is also interesting, as it suggests that investors favor government securities of EM economies that have strong buffer against sudden capital outflow or currency depreciation. On the other hand, while the VIX index shows a statistically significant coefficient in the first regression, it loses some its explanatory power once we focus on the three subcategories of foreign investors.

*B. Robustness checks: Foreign holdings and the level of sovereign bond yields*

One possible source of bias in our estimates is the endogeneity of the foreign holding variable. Endogeneity can be a problem because it is very natural to expect foreign investors to target markets depending on the expected return on their assets (Ebeke and Lu, 2014). In fact, past research suggests that foreign participation in local bond markets is influenced by return prospects, which is most easily proxied by the yield level (Baluga et al, 2011). In this case, the relationship between bond yields and foreign participation should be positive, since higher bond yields should attract more foreign investors. So the resulting bias from this source of endogeneity should not pose a significant threat to the baseline estimates, as they would be conservative underestimations of the "true" negative association between foreign holdings and the level of the yields (Ebeke and Lu, 2014). However, if the source of endogeneity is the presence of some

unobservable factors which are both correlated with the foreign participation rate and yields, the resulting bias could indeed be more distorting. To address these concerns, this study follows the approach taken by Ebeke and Lu (2014) and instruments the foreign participation rate variable with its second and third lag. This two-stage least squares strategy assumes that while the lagged variables are not part of the error term in the original specification, they are correlated with the current levels of foreign holdings and hence can serve as good instruments.

The results of this instrumental variable strategy are shown in columns (3) and (4) of Table 3 above. While the results in column (3) differ very little from the baseline estimates in column (1), we observe meaningful changes when the three subgroups of foreign investors are instrumented using their respective lagged variables. In contrast to our baseline estimates that fail to detect significant relationship between the foreign official sector and bond yields, the point estimates under the instrumental variable strategy show that the coefficient on the official sector is negative and significant, albeit at the 10 percent level. Once we control for the potential endogeneity of the foreign holdings, all three subgroups of foreign investors show negative coefficients that are statistically significant.

Closer examination of the data for foreign participation sheds more light on why the coefficient on the official sector is not significant under the baseline estimates. The share of EM debt held by the foreign official sector is broadly divided into two categories, foreign central bank holdings and official loans (Arslanalp and Tsuda, 2014). Interestingly, foreign central bank holdings are concentrated in the sovereign debt of only five EMs: Brazil, Malaysia, Mexico, Poland, and South Africa<sup>4</sup>. The government securities of these EMs have at least a single-A rating from a major credit rating agency, and except for Brazil, they are also included in

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<sup>4</sup> The original study also mentions China and Indonesia, but they are excluded from our regression analysis due to the lack of data on other macro variables.

Citibank's World Government Bond Index (WGBI) (Arslanalp and Tsuda, 2014). These considerations suggest that the reserve managers of central banks only purchase EM government securities that meet certain reserve management criteria such as safety or liquidity. The official sector holdings of other EM economies in the sample must then consist mostly of official loans received from foreign governments, the nature of which do not bear obvious economic relationship with yields on long-term sovereign bonds. In fact, high proportion of foreign official loans could signal that the EM borrower is in some form of financial distress, a factor that could potentially result in biased coefficient estimates. The instrumental variable strategy outlined above would allow us to control for this source of endogeneity and ensure that our estimates better reflect the true relationship between the foreign official sector and EM bond yields.

*C. Baseline Estimates: Foreign holdings and the **volatility** of sovereign bond yields*

Table 4 shows the results of regression analysis when the dependent variable is the volatility of EM government bond yields. Column (1) shows that the coefficient on the foreign share of EM government bond is not statistically significant, although the positive sign captures the weak positive relationship between foreign participation and long-term yield volatility. As a comparable study, Peiris employs a Generalized Autoregressive Conditional Heteroskedasticity (GARCH) framework to estimate the regression coefficients for 10 individual EM countries in his sample (2010). His findings show that foreign participation has insignificant effects on yields in 6 of the 10 countries, and it even has negative effects in 3, meaning that greater share of foreign investors is associated with a reduction in volatility. Only one country, South Korea, has regression coefficient that is positive and significant. In contrast, Ebeke and Lu's study focusing on the post-Lehman period finds that the coefficient on foreign holdings is significant and

**Table 4. Regression Results: Foreign Holdings and Yield Volatility**

Dependent Variable: Emerging Market Long-term Government Bond Yield Volatility				
Period: 2006 Q1 - 2013 Q2				
	Baseline Estimates		IV Estimates	
	(1)	(2)	(3)	(4)
Foreign Participation Rate	0.0087843 [1.10]		0.0135988 [1.48]	
Foreign Official		0.018113** [2.00]		0.0175394* [1.68]
Foreign Bank		0.0327741 [1.01]		0.0049934 [0.10]
Foreign Non-bank		-0.0061149 [-0.56]		0.0058593 [0.42]
Inflation Rate	-0.0557992** [-2.66]	-0.0559812** [-2.58]	-0.0565455*** [-2.69]	-0.0533744** [-2.35]
Gross Government Debt-to-GDP	-0.0057825 [-0.73]	-0.0049769 [-0.58]	-0.0068932 [-0.86]	-0.0083317 [-0.92]
Real GDP Growth Rate	-0.0694855*** [-5.61]	-0.0696418*** [-5.58]	-0.0711158*** [-5.69]	-0.0720512*** [-5.71]
Current Account Balance-to-GDP	0.0288491*** [2.71]	0.0223436* [1.95]	0.0284257*** [2.67]	0.0242341** [2.03]
Reserve Assets-to-GDP	-0.001244 [-0.11]	-0.0006529 [0.06]	-0.0022034 [-0.19]	-0.0012332 [-0.11]
Foreign Exchange Rate	0.0000142 [0.15]	0.0000265 [0.29]	0.0000115 [0.12]	0.0000107 [0.11]
Foreign Exchange Volatility	0.0000385 [0.26]	-0.0000218 [-0.14]	0.0000375 [0.25]	0.0000145 [0.09]
VIX Index	0.0001155** [2.13]	0.0001012* [1.79]	0.0001189** [2.19]	0.0001045* [1.75]
Observations	510	510	510	510
R-squared	0.6644	0.6679		0.6701
Number of countries	17	17	17	17

Note: T-statistics in brackets. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

positive, once they adjust their baseline estimates using various instrumental variables (2014).

Table 4 above also summarizes the regression results using the three subcategories of foreign investor as explanatory variables. Column (2) shows that the coefficient on the foreign official sector is positive and significant, meaning that the increase in the share of foreign central banks and foreign official loans is associated with higher volatility in bond yields. In contrast, the holding ratios of foreign banks and non-bank financial institutions do not have significant effects, and in fact the estimated coefficient on foreign non-banks is weakly negative. These results may seem somewhat surprising given that foreign governments are usually considered to be a more stable source of demand than foreign asset managers or even banks. On a comparative note, Andritzky's study using G20 nations show that the estimated coefficients on domestic private asset managers and the public sector are statistically insignificant, while his study finds overall foreign participation to have weakly positive but significant effects.

Once again, the real GDP growth rate of emerging market economies is found to be a significant factor in explaining the volatility of EM government bond yields. The strong negative coefficient suggests that emerging markets with robust economic growth enjoy greater stability in the sovereign debt market, which is in line with what economic intuition would predict. Though the VIX index has significant, positive coefficients in both columns (1) and (2), the relatively small t-statistics are somewhat surprising given the apparent degree of interconnectedness observed in global markets. But it may also be the case that the VIX index, which directly captures the implied volatility of the large-cap equity market in the United States, is a poor measure of risk-aversion in EM government bond markets.

*D. Robustness checks: Foreign holdings and the **volatility** of sovereign bond yields*

We employ the exact same instrumental variable strategy used in the previous section dealing with the level of bond yields. As seen in columns (3) and (4) of Table 4 above, controlling for the potential endogeneity of foreign holdings does not produce results that are drastically different from the baseline estimates. While the t-static for the overall foreign participation rate increases, the coefficient estimate still fails to show significance at the 10 percent level. When we focus on the three subgroups of foreign investors, the instrumental variable strategy reduces the significance of the foreign official sector, and now the coefficient estimate is only significant at the 10 percent level. Controlling for endogeneity does change the sign on the coefficient for the foreign non-bank sector from negative to positive, yet the t-statistic is far from being significant. This results stand in contrast to the study conducted by Ebeke and Lu, in which the use of the exact same instrumental variable strategy results in statistically significant results despite the baseline estimates that show no such relationship (2014). Nevertheless, the estimates of our study seem to be consistent with the findings from past studies that show rather mixed relationships between yield volatility and foreign participation, varying with the time periods covered or the countries under study (Andritzky, 2012; Peiris, 2010; Ebeke and Lu, 2014).

## **VII. CONCLUSION**

This paper finds foreign investors' participation in EM sovereign debt market to have the effect of lowering the yields on EM long-term government bonds. One implication of this result is that regardless of macro fundamentals, the benefit of foreign investors in lowering bond yields is consistently found across EM countries in the sample. The effect is present not only when we



consider the overall foreign investor participation rate, but also when we examine the effects of the three subgroups of foreign investors. Of the three foreign investor groups, foreign non-bank financial institutions and foreign banks seem to have greater effect in lowering sovereign bond yields, compared to the foreign official sector. However, we should be cautious in drawing any definitive conclusions from these results, as the causality can go either way. While controlling for endogeneity can mitigate the concern, more in-depth theoretical discussion as well as econometric analysis is needed to gain greater understanding of the exact nature of the relationship.

On the other hand, we fail to find strong relationship between the share of foreign holdings and the volatility of EM government bond yields, even after controlling for endogeneity using an instrumental variable strategy. The results suggest that once we control for the relevant macro fundamentals such as the GDP growth rate or the level of global risk-aversion, greater presence of foreign investors per se does not seem to be associated with greater volatility. This is particularly relevant in the current macro environment, where recent market turmoil have highlighted the increased role of foreign investors in EM bond markets. While excessive reliance on foreign investors can easily – and justifiably – become a source of concern during periods of increased risk aversion, proper policy responses would have to take into account country-specific economic fundamentals as well as market infrastructure, rather than simply focusing on the flow of foreign funds. Also, while strict capital controls may help reduce volatility in some emerging markets and allow for the development of the domestic institutional investor base, this may come at the cost of higher borrowing cost, as suggested by the empirical results discussed above.

To gain deeper understanding into the nature of foreign fund flows in EM bond markets, it may be insightful to consider the difference when foreign capital actively flows into emerging

markets and when foreign investors rush to exit out of the market. To the extent that these two types of fund flows have different effects on the yield level and volatility, the study may have policy implications in managing both asset bubbles as well as market crises in emerging markets. Lastly, any study on EM government bond market and the role of foreign investors can benefit substantially from improved collection of data. Compared to the case for advanced economies, it is more difficult to compile a database of emerging market economies that is consistent across all countries. The dataset put together by Arslanalp and Tsuda is the first step in the right direction (2014). Such improvements, accompanied by more in-depth theoretical analysis and sophisticated econometric tools, can shed more light on the role of foreign investors in EM sovereign debt market and point policymakers in the right direction in effectively managing the debt profiles emerging market governments.

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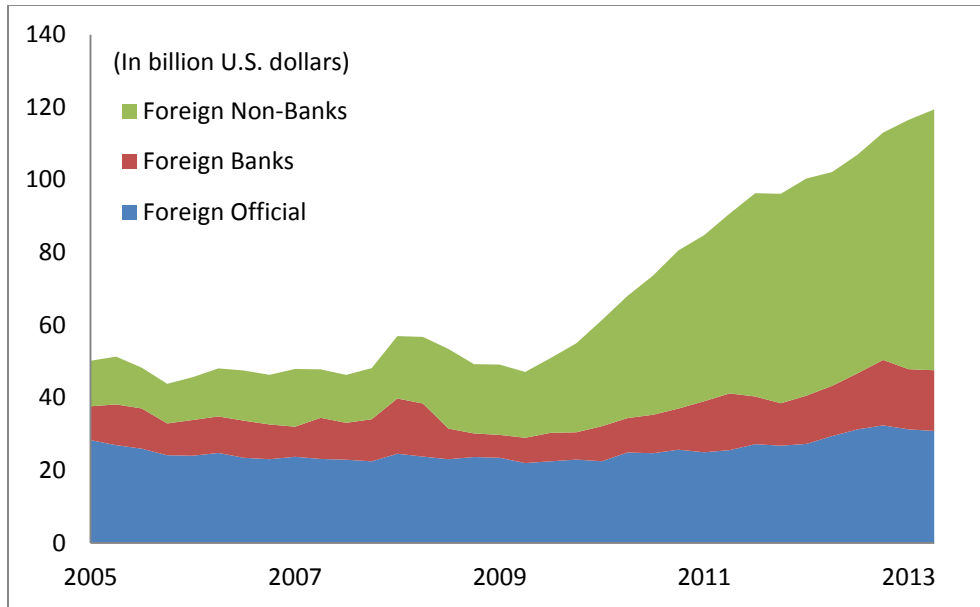
Warnock, F., and V. Warnock, 2009, "International Capital Flows and U.S. Interest Rates," *Journal of International Money and Finance* 28: 903-919.

### Appendix I. Data Sources

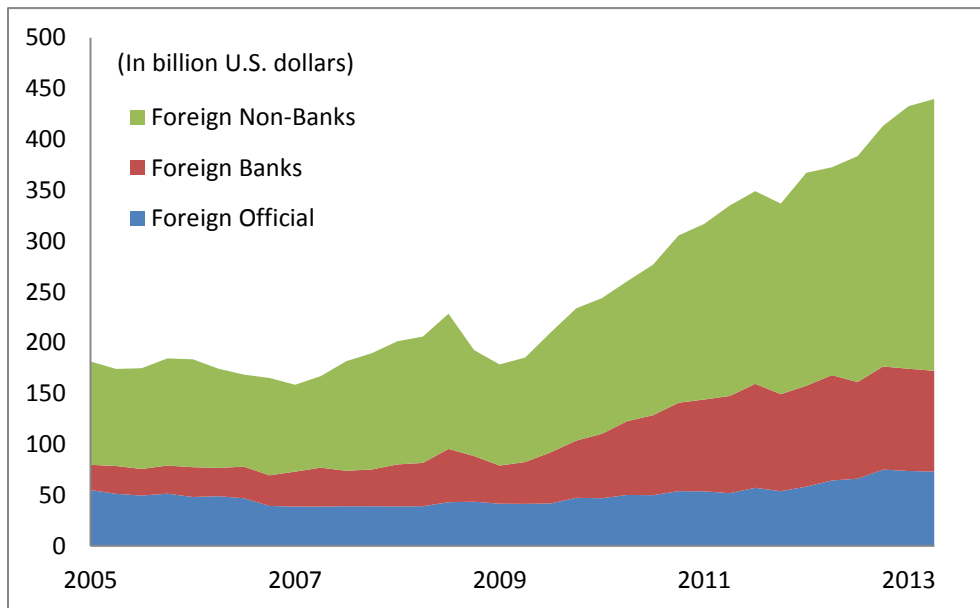
Data Description	Data Source
Foreign participation	Arslanalp and Tsuda (2014)
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CPI Inflation	IMF: International Finance Statistics
Real GDP growth	IMF: International Finance Statistics
Debt-to-GDP	IMF: International Finance Statistics
Current account balance-to-GDP	IMF: International Finance Statistics
Reserve asset	IMF: International Finance Statistics
Foreign exchange rate (foreign currency over U.S. dollars)	IMF: International Finance Statistics
10-year U.S. Treasury yields	Federal Reserve Bank of St. Louis
CBOE VIX Index	Federal Reserve Bank of St. Louis

**Appendix II. EM Government Debt Held by Foreign Investors, 2004-12**

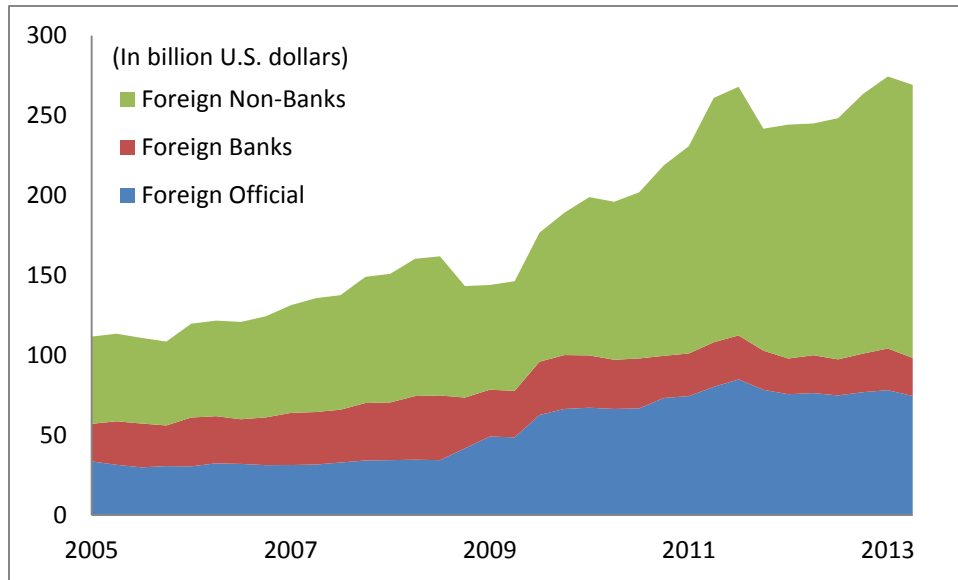
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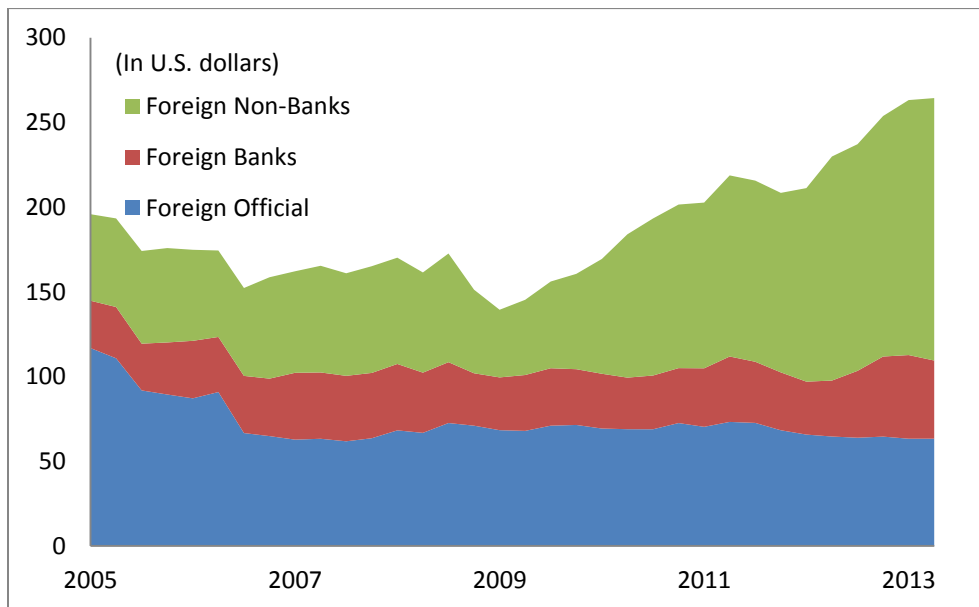
**EM Latin America**



**EM EMEA (EU)**

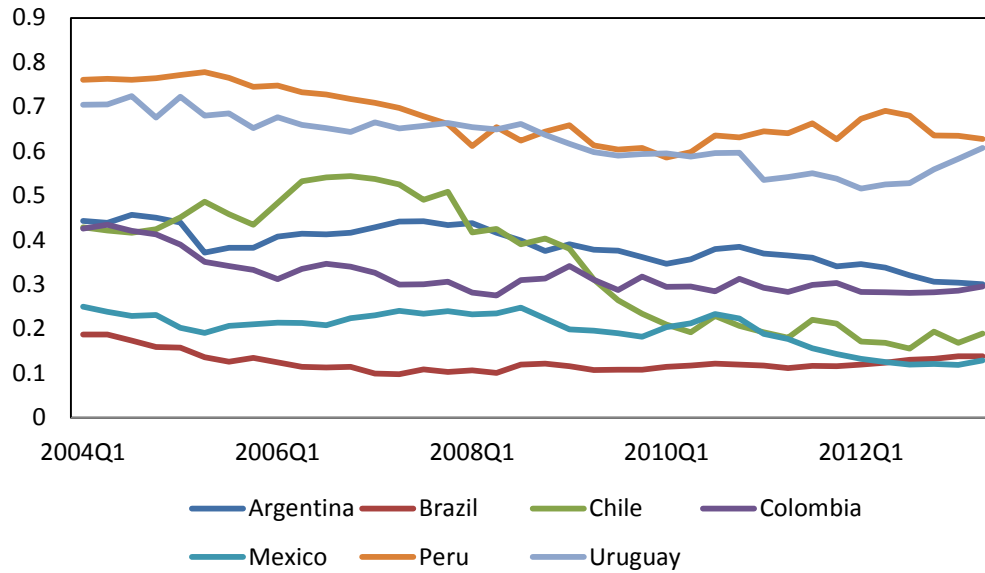


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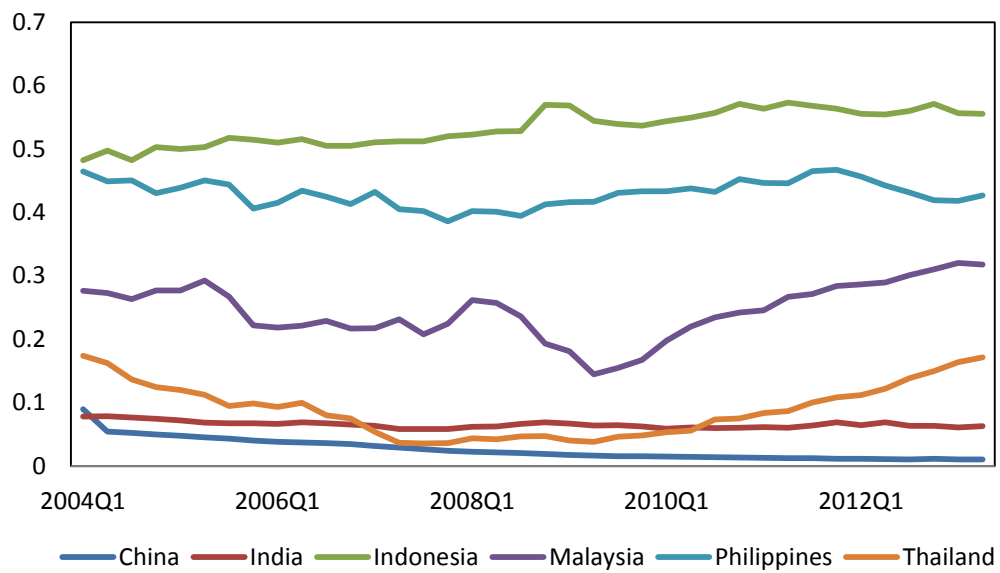


**Appendix III. EM Foreign Participation Rate – Country Level Analysis**

**EM Latin America**

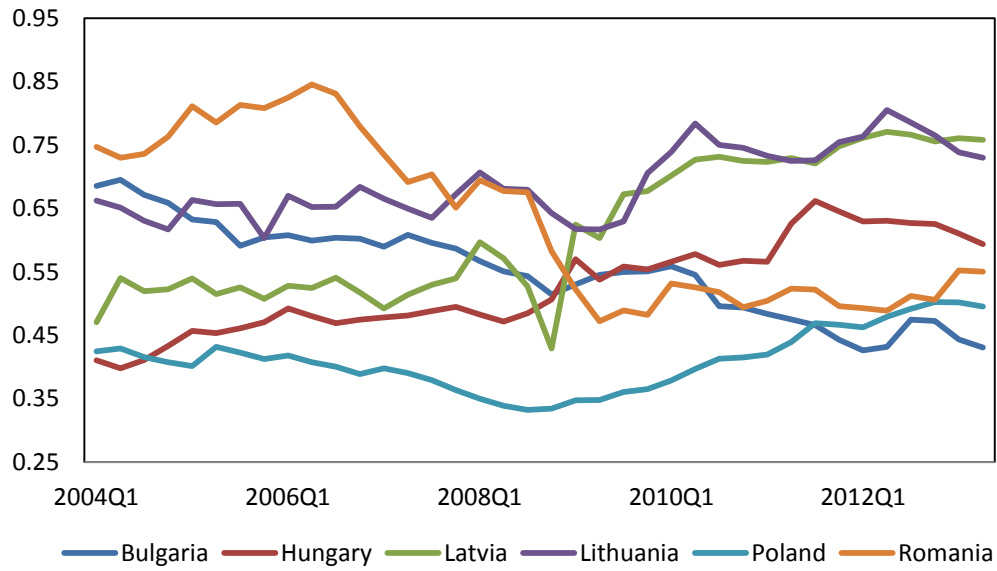


**EM Asia**

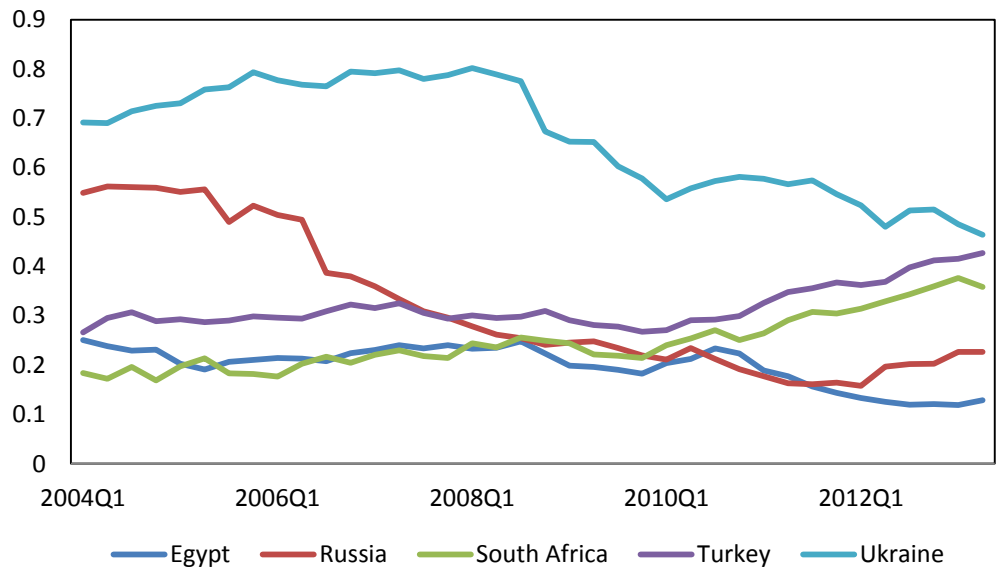




**EM EMEA (EU)**



**EM EMEA (Other)**



**Appendix IV. Foreign Holdings of Government Securities: All EMs**

