WP/15/141

IMF Working Paper

Global Financial Spillovers to Emerging Market Sovereign Bond Markets

by Christian Ebeke and Annette Kyobe

 WP/15/141

IMF Working Paper

European Department and Strategy, Policy, and Review Department

Global Financial Spillovers to Emerging Market Sovereign Bond Markets[1]

Prepared by Christian Ebeke and Annette Kyobe

Authorized for distribution by Daria Zakharova and Luis Cubeddu

June 2015

Abstract

Foreign holdings of emerging markets (EMs) government bonds have increased substantially over the last decade. While foreign participation in local-currency sovereign bond markets provides an additional source of financing and reduces sovereign yields, it raises concerns about increased sensitivity of yields to shifts in market sentiment. The analysis in this paper suggests that foreign participation and an undiversified investor base transmit global financial shocks to local-currency sovereign bond markets by increasing yield volatility and, beyond a certain threshold, amplify these spillovers. These estimates are robust to a range of econometric techniques including panel smooth threshold regression.

JEL Classification Numbers: E43; G01; G15

Keywords: Financial shocks; EM bond markets; Spillovers; Non-linearity; Interest rates

Authors' E-Mail Addresses: CEbeke@imf.org; AKyobe@imf.org.

[1] We thank Julie Kozack, Mahmood Pradhan, Daria Zakharova, Francisco Vazquez, and Mousse Sow for useful comments and suggestions on an earlier draft. We also thank participants at the IMF seminar at the Ministry.

Content **Page**

Abstract 1

I. Introduction 3

II. Foreign Participation and Government Bond Yields 4
A. Empirical Approach 4
B. Results 6

III. Foreign Participation, Investor Base Concentration, and the Transmission of Shocks 7
A. Baseline Empirical Approach 7
B. Baseline Results 9
C. Robustness Checks: Evidence from Panel Smooth Transition Regressions (PSTR) 10

IV. Conclusion 12

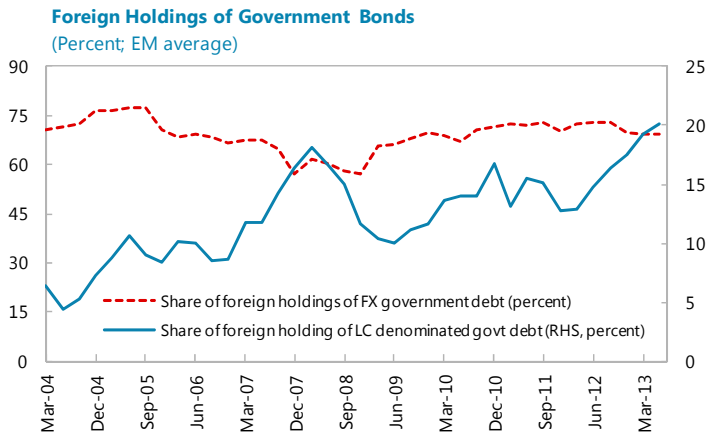
Figures
1. Global Financial Conditions and Foreign Participation in EMs Government Bond Markets 13
2. International Financial Spillovers into EMs 14
3. PSTR Estimates of Global Financial Spillovers into EMs 15

Tables
1. Foreign Holdings of FX Debt and Yield Volatility. Period 2004:Q1–2013:Q2 16
2. Foreign Holdings of LC Debt and Yield Volatility. Period 2004:Q1–2013:Q2 17
3. Foreign Holdings of FX Debt and FX Yield Level. Period 2004:Q1–2013:Q2 18
4. Foreign Holdings of LC Debt and LC Yield Level. Period 2004:Q1–2013:Q2 19
5. Panel Non-Linear Estimates 20

References 21

I. INTRODUCTION

Foreign participation in EM local-currency sovereign bond markets has increased. EM sovereigns are increasingly overcoming "original sin" and are able to borrow domestically long-term and abroad in local currency.[2] While the risk of currency mismatches has decreased, increased foreign participation in local currency markets is associated with increased sensitivity of overall portfolio flows to global financial conditions and increased volatility of yields.[3]



Sources: Arslanalp andTsuda (2014); IMF staff calculations.

The increase in foreign participation in EM sovereign bond markets gives rise to questions about the transmission of global shocks. In mid-2013, and more recently in January 2014, global uncertainty, including over the future path of United States (U.S.) monetary policy, led to sizeable capital outflows from EMs and increased volatility in financial markets. Indeed, Ebeke and Lu (2014) provide a robust empirical finding that the increase in foreign holdings of local-currency sovereign bonds in Poland and other EMs has been associated with higher volatility but lower yields. Their analysis also revealed the key role played by macroeconomic fundamentals (especially lower public debt and higher international reserves) in dampening the adverse effects of foreign participation on the volatility of EM sovereign bond yields. The structure of the investor base also matters in trasmitting instability. IMF (2014) finds the mix of global portfolio investors makes portfolio flows more sensitive to global financial conditions. Investment from institutional investors in local currency markets is more stable during normal times, but these investors pull back more strongly and persistently when facing an extreme shock.

This paper investigates the role of foreign participation in transmitting global financial shocks into EM government bond markets. It models the sensitivity of EM sovereign bond yields to global financial shocks, conditioned on the extent of foreign participation and the concentration of the investor base. The paper also examines whether the impact of foreign participation differs between sovereign foreign-currency denominated bond yields and local-currency denominated yields. Our sample uses quarterly data for 17 emerging market economies over 2004:Q1–2013:Q3. Countries in the sample are Argentina, Brazil, Colombia, Egypt, Hungary, India, Indonesia, Latvia, Lithuania, Malaysia, Mexico, Peru, Philippines, Poland, Romania, South Africa, Thailand, and Ukraine.

[2] The opposite has been true for offshore issuance by the financial and non-financial corporate sectors which have taken advantage of depressed yields and ample liquidity to issue foreign exchange (FX) debt.

[3] The paper does not address whether higher volatility in local currency yields (likely also reflected in swings in the exchange rate—if it is flexible) is detrimental to growth.

The paper finds that foreign participation and the lack of diversification of the investor base matter for the transmission of global shocks.

- Higher foreign participation in *local-currency denominated* sovereign bond markets increases the transmission of global financial shocks, but especially once a threshold has been reached (foreign participation above 30 percent). Countries which have foreign holdings of local-currency government bonds around or above the 30 percent threshold are: Argentina, Hungary, Indonesia, Latvia, Malaysia, Mexico, Peru, Poland, South Africa, and Ukraine. For most of these countries, foreign-currency government bonds also tend to be held mostly by foreigners (the average foreign participation in foreign-currency government markets is 70 percent) except in Argentina and South Africa where domestic investors are the main holders of foreign-currency government bonds.
- At the same time, higher foreign holdings of *foreign-currency denominated* bonds do not appear to have an impact on the transmission of shocks. Possible reasons for this finding are discussed below (Section B). But such a distinction between the behavior of foreign investors in EM local versus foreign-currency bond markets does not exist in the literature to our knowledge.
- A higher concentration of the investor base (approximated using disaggregated data of the institutional profile of investors holdings EM total government debt) makes EM local-currency sovereign yields more sensitive to global financial shocks. Conversely, a diversified investor base can help ameliorate the impact of shocks.
- Finally, the paper finds that strong macroeconomic fundamentals—such as low inflation, strong and stable output growth, and moderate public debt levels—help reduce the level and the volatility of EM sovereign bond yields.

The remainder of this paper is structured as follows: Section 2 examines the impact of foreign participation on the level and volatility of government bond yields. Section 3 assesses the transmission of global financial shocks, and Section 4 concludes.

II. Foreign Participation and Government Bond Yields

A. Empirical Approach

We examine the impact of foreign participation on the level and volatility of local- and foreign-currency denominated government bond yields. The specification extends the work of Ebeke and Lu (2014) in two areas. First, we explicitly differentiate between EM foreign-currency sovereign bonds and local-currency sovereign bonds when investigating the effect of foreign participation. As Figure 1 shows (see Appendix), EM foreign-currency sovereign bonds are mostly held by non-residents and these holdings appear relatively stable compared to foreign holdings of EM local-currency bonds. Second, we have a larger sample of countries and cover a longer period (which includes both the pre and post-crisis period) to better capture the dynamics in the foreign participation in EM sovereign debt markets.

The estimated model takes the form:

$$r_{it} = \vartheta_1 F_{it} + X_{it}^{'}\Gamma + u_i + \tau_t + \varepsilon_{it} \qquad (1)$$

- The dependent variables (r_{it}) are the level and volatility of the *5-year local currency yield* and *EMBI benchmark foreign currency yield*.[4] Volatility is computed as the log of the standard deviation of weekly changes in the yield over each quarter (12 weeks) capturing the within country-quarter volatility of the government bond market in each country over time.
- Foreign holdings of local and foreign currency-denominated bonds are denoted by F_{it}. In the case of local-currency (foreign-currency) denominated sovereign bonds, foreign participation is measured as foreign holdings of local-currency (foreign-currency) denominated government debt in percent of total government local-currency (foreign-currency) denominated government debt. Foreign holdings data are drawn from the Arslanalp and Tsuda (2014) dataset, which draws on a range of official sources and provides a decomposition of holdings of government bonds by the residency of the holders (foreign versus domestic) and by type of investors (official sector, banks, non-banks).[5]
- X_{it} are controls for country fundamentals: (i) the ratio of current account balance to GDP; (ii) real GDP growth (or the volatility of growth); (iii) inflation; and (iv) forward exchange rate volatility (if policy makers mismanage their economy and the risk premium on their assets rises, then the volatility of their currency will also rise).[6]

A modified set of control variables is included for each specification, since determinants of the first (the quarterly average yield) and second moments (the standard deviation of the yield) of bond yields differ somewhat. The model includes country fixed effects, u_i to account for unobserved time-invariant factors and time effects, τ_t, to account for unobserved global shocks.[7]

We control for endogeneity in two ways. Foreign participation in EM sovereign bond markets is potentially endogenous to the current and expected dynamics of yields—the more volatile a country, the less likely foreign investors will be interested in holding its bonds. To control for endogeneity, we first simply instrument with two quarter lags of the foreign participation. Next, we use the *predicted* values of foreign holdings ratios explained by a geographical measure of "financial remoteness," the natural logarithm of the great-circle distance to the closest major financial center, London, New York, or Tokyo, which has the

[4] The 5-year bonds are chosen over other maturities to maximize sample size and to capture the most widely traded paper in the secondary market.

[5] We tested the disaggregated components (i.e. foreign bank and non-bank participation) individually but since coefficients are not significantly different from one another we use aggregate foreign holdings.

[6] Countries in the sample are feely floating or managed floating with no pre-determined path for the exchange rate.

[7] When global financial shock variables are accounted for, controlling for time dummies becomes redundant.

advantage that it is plausibly exogenous to fluctuations in EM sovereign bond yields.[8] While financial remoteness is time-invariant for a country, the time-varying estimates (quarter-by-quarter) of its impact on the composition of the investor base adds a time-varying dimension at the country level. In all bond yield models where foreign participation enters the equation contemporaneously, we use instrumental variable techniques to tackle endogeneity concerns.

B. Results

The results suggest that foreign investors behave differently in local-currency *versus* foreign-currency sovereign bond markets.

- In the case of local currency-denominated government bonds, higher foreign participation increases the volatility of the yield, but decreases the level of the yield (Tables 2 and 4). In all specifications, the results show a positive association between foreign participation and local-currency bond yield volatility, but the coefficient only becomes significant when we instrument foreign holdings with its lagged values or using the financial remoteness-based instrument. Similar findings are documented in Ebeke and Lu (2014) for the period after the global financial crisis and, Peiris (2010) for the period before the crisis.
- In contrast, the extent of foreign holdings of foreign currency-denominated bonds is not found to have an impact on either the level or the volatility of foreign currency-denominated bond yields (Tables 1 and 3). One possible explanation is the role of currency risk, which is important in the case of local currency-denominated bonds. Other explanations might be related to the type of investor (those choosing foreign-currency sovereign bonds may be buy-and-hold investors, while those holding local-currency sovereign bonds may have a shorter-term horizon), their associated degrees of risk aversion, and their ability to hedge foreign currency risk.

Stronger macroeconomic fundamentals are generally associated with lower yield levels and reduced yield volatility. Higher indebtedness increases yield volatility, as does higher output growth volatility. Both factors serve to increase uncertainty in the real economy, which likely spills over into greater bond yield volatility. Higher real GDP growth decreases the level and volatility of both local and foreign-currency bond yields, as better growth prospects encourage more capital inflows and the country's debt burden becomes easier to service. Higher inflation is positively associated with the level of bond yields.

[8] Rose and Spiegel (2009) discuss why geographical distance could matter for international finance. Empirical evidence suggests that distance exacerbates information symmetries. We use their data in our estimation. We control for the volatility of the forward bilateral exchange rate (as a proxy for market characteristics and expectations) in each auxiliary equation predicting the geographical-based measure of foreign holding and investor base concentration.

III. Foreign Participation, Investor Base Concentration, and the Transmission of Shocks

A. Baseline Empirical Approach

We examine the impact of foreign participation and the concentration of the investor base on the transmission of shocks.[9] Specifically, we focus on differences in the reaction of EM sovereign bond yields to global financial shocks depending on the level of foreign participation and the concentration of the investor base.

There are several channels through which external shocks may affect EM sovereign bond yields (see Lim et al., 2014):

- *The liquidity channel is captured by the U.S. 3 month t-bill rate (US3mt).* Higher t-bill rates raise the opportunity cost of investing in EM assets. A normalization of financial conditions in the U.S. would lead to a rise in U.S. short-term interest rates. This, in turn, would reduce global liquidity, possibly resulting in outflows from (or fewer inflows to) EMs and higher EM sovereign bond yields.
- *The portfolio balance channel is captured by the U.S. 10-year Treasury bond rate (US10Y).* This measure captures the effect Fed action can have on long-term yields, resulting in portfolio rebalancing. Changes in long-term U.S. yields may trigger portfolio rebalancing in favor or against risky assets, which include EM sovereign bonds.
- *The confidence channel indicator is the VIX (VIX).* The indicator captures market sentiment (global risk aversion) for investing in risky assets. As monetary policy normalizes in major advanced country central banks, uncertainty created by shifts in assets prices and associated spillovers into EMs could lead to an increase in the VIX.

The specification examines the impact of global shocks on EM sovereign bond yields, conditional on the level of foreign participation and the concentration of the investor base.[10] To capture the transmission of shocks, we interact U.S. interest rate shocks and global risk aversion (VIX) with foreign participation and the concentration of the investor base to investigate whether financial spillovers into EMs increase with the level of foreign participation or decrease with the diversity of investors holding EM assets.

The model takes the form:

$$r_{it} = \theta_1 IF_{it-1} + \left(\theta_2 + \theta_3 D_{it-1}\right) S_t + X_{it}\Gamma + u_i + \varepsilon_{it} \qquad (2)$$

[9] Our prior is that the structure of the investor base would not directly impact the level or the volatility of the yield (as does foreign participation) but rather serves to amplify or dampen global financial shocks. Hence, we include the concentration interacted with the global financial shock in this specification and not on its own as previously.

[10] As the financial shock is expressed in levels and we are interested in gauging the effects in basis points, we keep the dependent variable expressed in levels of the yield rather than standard deviations (the volatility of the yield).

- The dependent variable (r_{it}) measures either the yield associated with the 5-year government local-currency bond or alternatively, the country-specific sovereign benchmark bond yield.
- IF_{it-1} in this specification represents foreign participation (defined as in the previous specification) and, in alternative specifications, the concentration of the investor base. The concentration of the investor base is computed for each country and time period by creating a Herfindahl index using the decomposition of the holdings of total gross government debt into its 6 components: foreign (central bank, bank, and non-bank holdings) and domestic (central bank, bank, and non-bank holdings). The index is normalized to range between 0 and 1. A higher *H*-index implies more concentration and a less diversified investor base, which could amplify the transmission of adverse shocks. A more diversified investor base is generally considered to provide a cushion against shocks, as investors may have different preferences in terms of the maturity profile of their investments ("buy and hold" versus speculative), their degree of risk aversion, and their hedging capacity.
- $H = \dfrac{\sum_k (s_k)^2 - 1/n}{1 - 1/n}$ where $s_k = \dfrac{X_k}{\sum_{k=1}^{n} X_k}$ is the share of a certain type of investor and n is the number of categories (6 in this case).
- D is a dummy variable that takes the value 1 if the one quarter lagged foreign participation in local currency markets is large or equal to D^* (the threshold), and zero otherwise. More formally, we have $D_{it-1} = \mathbf{1}\left[IF_{it-1} \geq D^*\right]$. D ranges between 10 and 40 percent of foreign participation local currency debt; and between 0.1 and 0.25 for the concentration of the investor base.[11] D_{it-1} enters the model with a lag. This reduces the high colinearity between global financial shocks and foreign participation and also the structure of the investor base. Moreover, as threshold models are biased when the conditional variable is endogeneous, lagging foreign participation and the investor base reduces the endogeneity biases that may arise.[12]
- S_t are the global financial shocks: *US3mt, US10Y and VIX*. These are interacted with the dummy variable D and this interaction term is included as an additional explanatory variable in the regressions to test for the existence of a nonlinear effect of global financial shocks conditional on the exposure to foreign investors.
- X_{it} are controls for country fundamentals as defined above.

  θ_2 measures the effect of global financial variables on EM local currency government bond yields when foreign participation (or overall investor base concentration) is below the identified threshold.

[11] This interval is chosen to allow sufficient data on the left and on the right sides of the range.

[12] This methodology for threshold determination in the case of endogenous regressors in a system—GMM framework has been used by Masten et al. (2008) and Chami et al. (2009) and, Combes and Ebeke (2011).

- $\theta_2 + \theta_3$ gives the effect of global financial variables on EM yields when foreign participation (or overall investor base concentration) is above the given threshold.
- Finally, θ_3 measures the differential impact of global shocks between the two regimes (above *versus* below the threshold of foreign participation or investor base concentration).
- Foreign holdings ratio (alternatively the concentration of the investor base) cutoffs in the sample are explored, by 1 percentage point increments (or 0.01 unit increments in the case of the concentration of the investor base). The test for no nonlinear effect amounts to a test of the null hypothesis that the coefficient (θ_3) on the interactive variable is equal to zero. Under OLS, the optimal cutoff is the one that also minimizes the residual sum of squares.

B. Baseline Results

The results suggest that the reaction of EM sovereign bond yields to global financial shocks depends on the extent of foreign participation. As before, while we do not find an impact on the level of foreign-currency yields, we find that the transmission of shocks to the level of the local-currency yields is amplified at higher levels of foreign participation. In particular, the results suggest that foreign participation above 30–35 percent increases the transmission of global financial shocks in a significant way (Figure 2 and Table 5). Figure 2 shows the value of the interaction coefficient θ_3 multiplied by the given financial shocks (in basis points or in standard deviation) at various levels of foreign participation or investor base concentration. As this level of foreign participation has mostly been reached by a number of EMs (Peru, Indonesia, Latvia, Hungary and Poland) after the global financial crisis, our econometric results suggest that the post-crisis period has therefore seen an intensification of financial spillovers into these EMs.

- When foreign holdings of local currency bonds lie above 35 percent, the transmission of a shock to the U.S. 10 year yield is amplified by an additional 100 bps. Past the 35 percent threshold, a 100 bps increase in the U.S. yields results in a rise in EM yields of around 140 bps (compared with an increase of only 40 bps below the 35 percent threshold).
- The transmission of shocks from the U.S. 3 month yield also depends on the degree of foreign participation, especially when it exceeds 30 percent. Past this threshold, a 100 bps increase in U.S. short-term interest rates increases EM yields by 140 bps (compared with no significant impact below the threshold).
- In periods of global risk aversion (captured by a rising VIX), EMs in which foreign holdings reach around 32 percent of outstanding local currency-denominated bonds experience a larger impact from a shock to the VIX. A two-standard deviation shock in the VIX translates to a 130 bps increase in yields in EMs with foreign participation past the threshold (compared to no significant impact below the threshold).

The concentration of the investor base also matters for the transmission of global financial shocks. Our estimates suggest that a threshold of investor base concentration exists around the median of the Herfindahl index in the sample (around the value of 0.2). A high

concentration of the investor base (above the 0.2 threshold) makes EM local-currency sovereign yields more sensitive to global financial shocks. A 100 bps increase in the 10-year U.S. yield increases local-currency sovereign bond yields by 70 bps when the investor base is significantly concentrated (i.e., above the 0.2 threshold) compared to 30 basis points when it is more diversified (below the threshold). These findings suggest that efforts to broaden the investor base and promote asset diversification could improve resilience.[13]

Macroeconomic fundamentals can help dampen the adverse spillovers arising from high foreign participation and a concentrated investor base. As demonstrated in Ebeke and L (2014), stronger macroeconomic fundamentals (especially lower public debt and higher international reserves) help dampen the destabilizing effects of a higher reliance on foreign investors in EM sovereign local-currency bond markets. Thus, countries that choose to rely more on foreign investors may have a stronger case for preserving a good macroeconomic environment to help insulate themselves against external shocks.

These results should be interpreted with caution. First, the absence of data on the profile of foreign investors (i.e., whether these are retail or institutional investors) holding EM local-currency government bonds makes it difficult to generalize this threshold. Second, most countries reached this threshold after the global financial crisis (when global liquidity strengthened), which makes threshold results heavily dependent on the post-crisis period.

C. Robustness Checks: Evidence from Panel Smooth Transition Regressions (PSTR)

The model

A PSTR model is used to assess the robustness of results. These models are regime-switching models in which the transition from one state to the other is smooth rather than discrete (González et al., 2005).Thus it allows the regression coefficients to change gradually when moving from one group (e.g., low foreign participation) to another (high participation). Thus far the non-linearities identified assume sharp transitions across the threshold. The advantage of using a PSTR model is that it does not pre-judge the form and the smoothness of the non-linearity. Rather, it endogenously determines the thresholds as well as the degree of smoothness characterizing the transition (non-linear) function.

The PSTR methodology provides a parametric approach to capture both cross-country heterogeneity and time variability of the impact of global financial shocks (U.S. bond yields, VIX) contingent on the level of foreign participation in the local currency government bond market and the concentration of the investor base.

The PSTR approach allows for smooth changes in country specific correlations depending on the level of these variables. The model takes the form:

$$r_{it} = \phi_0 S_t + \phi_1 S_t g\left(IF_{it-1}; \gamma; \delta\right) + X'_{it}\,\beta + u_i + \varepsilon_{it} \qquad (3)$$

[13] We do not have data on the holders of local currency debt for a comprehensive number of EMs to investigate the impact of a more diversified investor base on local currency asset markets.

The transition function is given by a logistic function:

$$g(IF_{it-1};\gamma;\delta) = \left[1+\exp\left(-\gamma\left(IF_{it-1}-\delta\right)\right)\right]^{-1}, \quad \gamma > 0 \quad (4),$$

This function *g* is continuous and bounded between [0, 1]. It depends on the transition variable which is either the degree of foreign participation or the concentration of the investor base, IF_{it-1}, a threshold or location parameter δ and a smooth parameter γ. If the parameter γ tends to infinity, the transition function $g(IF_{it-1}, \gamma, \delta)$ tends to the indicator function, the transition is sharp and the model reverts to that estimated in the previous section. When γ tends to zero the transition function $g(IF_{it-1}, \gamma, \delta)$ is constant and the model corresponds to a standard linear model with individual effects (so-called within model), that is with constant and homogeneous elasticities.[14]

Assuming one transition function and one threshold, the impact of global financial shocks on the yields is given by:

$$\frac{\partial r_{it}}{\partial S_t} = \phi_0 + \phi_1 g(IF_{it-1};\gamma;\delta).$$

It is worth noting that this impact is country-specific and varies over time.

Results

Results indicate that the null of linearity is rejected in favor of the PSTR specification. The transition function appears smooth when the model focuses on the effect of the U.S. 10-year bond yield at various levels of foreign participation (upper-left chart, Figure 3). In contrast, when other types of shocks and non-linearities are examined (U.S. 3-month rate, VIX shocks, the diversity of the investor base), the PSTR estimates suggest sharp transition functions with slope parameters that are larger.

Figure 3 shows the estimated marginal effects of global financial shocks on EM local currency yields at various levels of the conditional variables. In all cases, the estimated threshold levels of the conditional variables are not very different from those obtained using the rolling-threshold technique. For example, the PSTR estimates suggest a threshold level of foreign participation in EM local currency bond markets close to 40 percent, slightly higher than the 35 percent estimated using the rolling-threshold. The diversity of the investor base threshold is also similar at 0.2. As in the rolling-threshold model, the result that global financial spillovers into EMs are exacerbated by the large dependency on foreign investors and by the lack of diversification of the investor base is not rejected. While the values of thresholds estimated in the paper are indicative, the consistency of the range of estimates using various empirical techniques is reassuring.

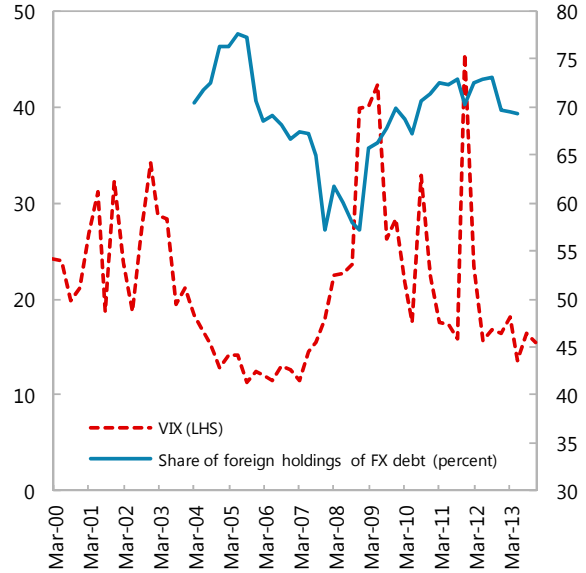
[14] We rely on methodology in González et al. (2005). First we test for homogeneity against the PSTR alternative, and choose (i) between the logistic and logistic quadratic specification for the transition function, and (ii) the transition variable. Second, we use nonlinear least squares to obtain parameter estimates, once the data have been demeaned (Hansen, 1999; González et al., 2005). Third, misspecification tests are applied to check the validity of the model and determine the number of regimes.

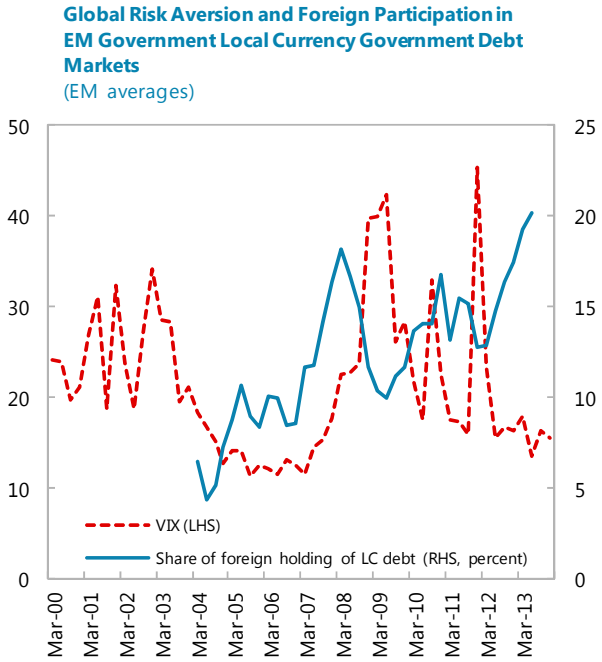
IV. CONCLUSION

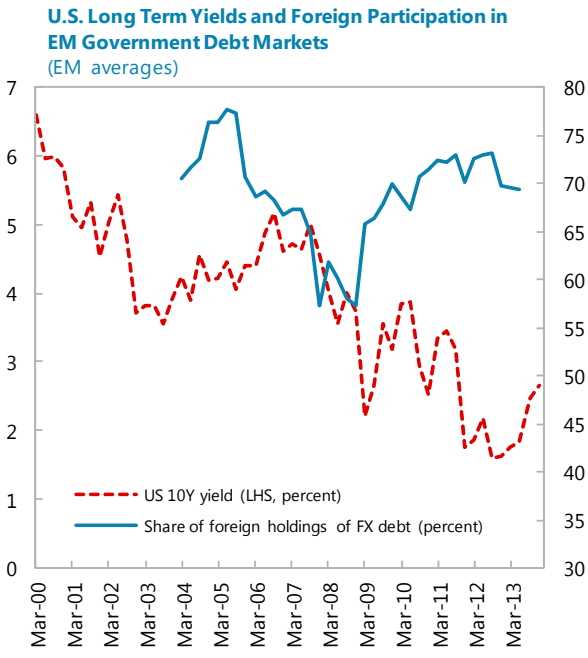
This paper shows that foreign investors tend to behave differently in EM local-currency *versus* foreign-currency sovereign bond markets. Higher foreign participation provides additional financing and decreases the level of the yields, but also increases yield volatility. This finding, however, only holds for foreign holdings of local-currency denominated EM government bond markets and not for foreign holdings of foreign-currency denominated (e.g., Eurobond) bond markets.

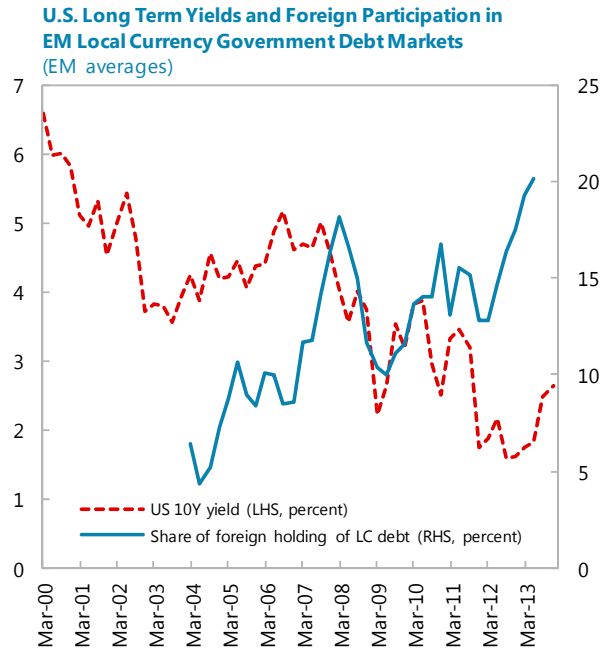
Our results also find that higher foreign participation can amplify the impact of global financial shocks, but that a more diversified investor base can ameliorate the effect of the shocks. Higher foreign participation in local-currency denominated sovereign debt markets increases the transmission of global financial shocks (such as those associated with increases in U.S. short- and long-term yields and increases in global uncertainty), but especially once a threshold level (around 30 percent foreign investor share) has been reached. However, some dampening factors exist. First, our results show that a more diversified investor base attenuates the impact of these shocks. Second, strong macroeconomic fundamentals can help insulate against global financial shocks.

Figure 1. Global Financial Conditions and Foreign Participation in EMs Government Bond Markets







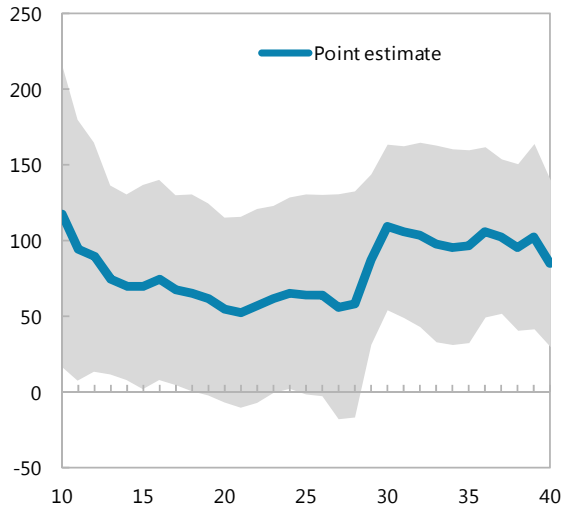


Sources: Country authorities; Datastream; Arslanalp and Tsuda (2014).

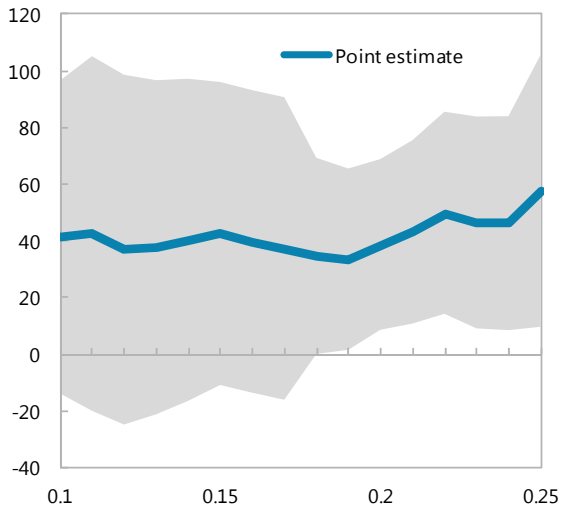
Figure 2. International Financial Spillovers into EMs

Additional increase in the yields (in bps) at various thresholds of conditional variables

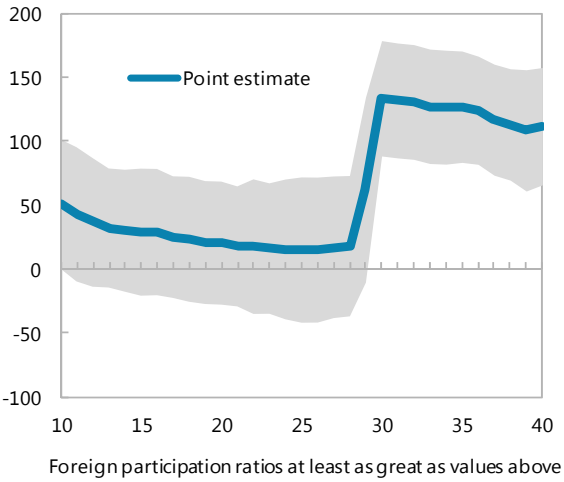
Transmission of U.S. 10y Yield Shock into EM LC Yields: Non-linear Estimates
(Coefficient of the interaction term; in basis points)



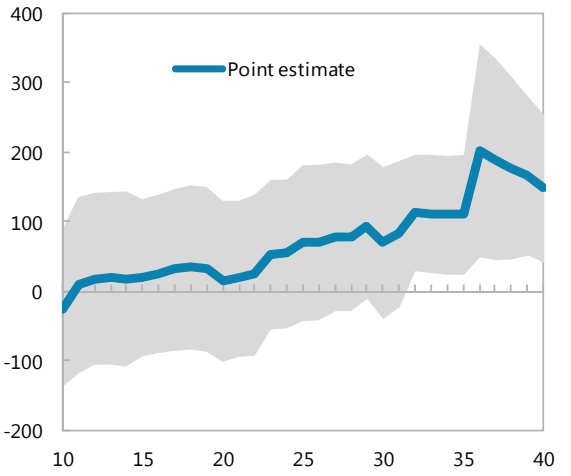
Transmission of U.S. 10y Yield Shock into EM Benchmark Yields: Non-linear Estimates
(Coefficient of the interaction term; in basis points)



Transmission of U.S. Short Term rate (3-month) Shock into LC Yields: Non-linear Estimates
(Coefficient associated with the interaction term; in basis points)



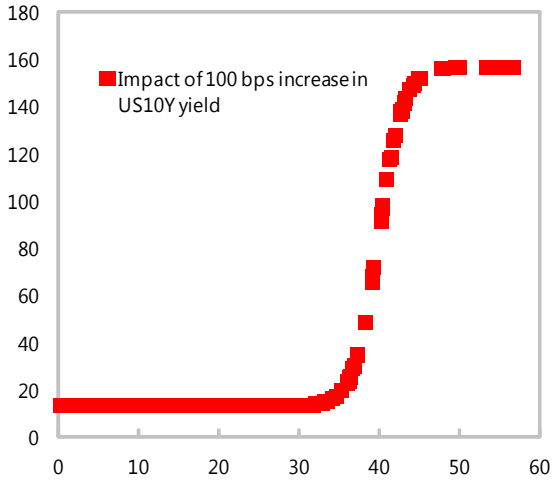
Transmission of VIX Shock into LC Yields: Non-linear Estimates
(Coefficient associated with the interaction term; in basis points)



Source: IMF Staff calculations.

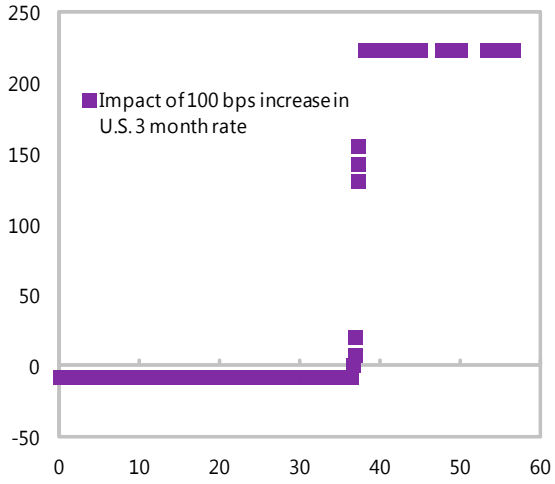
Figure 3. PSTR Estimates of Global Financial Spillovers into EMs

Effect of U.S.10Y yield on EM yields
(Panel Smooth Transition Regression Results; in bps)



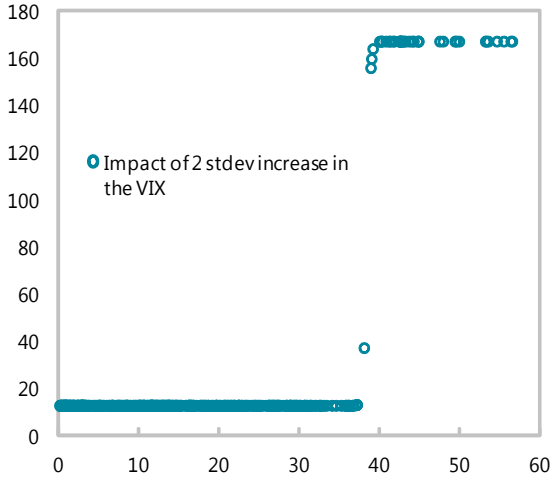
Share of foreign investors in the government local currency bond market (in percent; lagged one quarter)

Effect of U.S. 3 month rate shocks on EM yields
(Panel Smooth Transition Regression Results; in bps)



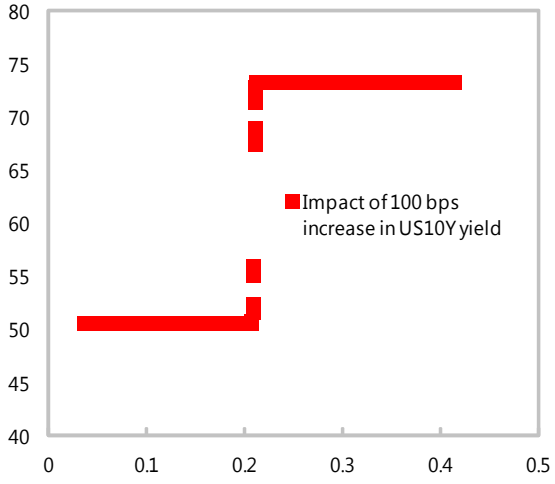
Share of foreign investors in the government local currency bond market (in percent; lagged one quarter)

Effect of VIX shocks on EM yields
(Panel Smooth Transition Regression Results; in bps)



Share of foreign investors in the government local currency bond market (in percent; lagged one quarter)

Effect of U.S.10Y yield on EM yields
(Panel Smooth Transition Regression Results; in bps)



Concentration of the overall investor base (HH index)

Source: IMF staff calculations.

Table 1. Foreign Holdings of FX Debt and Yield Volatility. Period 2004:Q1–2013:Q2

Dependent variable: FX yield volatility (in log)	(1) Naïve OLS-FE	(2) IV Remoteness	(3) IV (1st and 2nd lags)
Foreign holdings ratio	-0.00123	-0.00406	-0.00226
	(-0.501)	(-0.573)	(-1.110)
Current account balance ratio	-0.00343	-0.00241	0.00431
	(-0.827)	(-0.351)	(1.107)
Real GDP growth	-0.0245**	-0.0239***	-0.0173**
	(-2.877)	(-3.698)	(-2.441)
Forward exchange rate volatility	0.0262	0.0280	0.0373***
	(1.419)	(0.999)	(2.700)
Public debt ratio (lagged)			0.00201
			(1.300)
Intercept	0.368**		
	(2.254)		
Country fixed-effects	Yes	Yes	Yes
Quarter specific effects	No	No	Yes
Observations	349	349	277
R-squared	0.140	0.135	0.700
Hansen OID test: *P*-value	..	..	..
Number of countries	15	15	13

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2. Foreign Holdings of LC Debt and Yield Volatility. Period 2004:Q1–2013:Q2

Dependent variable: LC yield volatility (in log)	(1) Naïve OLS-FE	(2) IV (Remoteness)	(3) IV (1st and 2nd lags)
Foreign holdings ratio	0.00503	0.0233*	0.00779**
	(1.200)	(1.849)	(2.047)
Current account balance ratio	0.0193***	0.0175***	0.0168***
	(3.811)	(3.120)	(3.743)
Real GDP growth volatility	0.0688	0.0652*	0.0778**
	(0.991)	(1.657)	(2.009)
Forward exchange rate volatility	0.00336	-0.0378	0.00484
	(0.204)	(-1.206)	(0.319)
Inflation rate		-0.00439	
		(-0.564)	
Intercept	0.166		
	(1.231)		
Country fixed-effects	Yes	Yes	Yes
Quarter specific effects	No	No	Yes
Observations	362	362	344
R-squared	0.322	0.243	0.326
Hansen OID test: *P*-value	..	..	..
Number of countries	13	13	13

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3. Foreign Holdings of FX Debt and FX Yield Level. Period 2004:Q1–2013:Q2

Dependent variable: FX yield (in percent)	(1) Naïve OLS-FE	(2) IV (Remoteness)	(3) IV (1st and 2nd lags)
Foreign holdings ratio	0.0172	0.0427	0.0129
	(0.292)	(0.482)	(0.379)
Current account balance ratio	-0.0974	-0.106	-0.0837
	(-0.795)	(-1.240)	(-0.883)
Real GDP growth	-0.234	-0.239**	-0.240**
	(-1.498)	(-2.115)	(-2.442)
Forward exchange rate	0.00108***	0.00108***	0.00116***
	(3.113)	(3.179)	(3.538)
External public debt ratio (lagged)	0.0334	0.0331**	0.0270*
	(0.904)	(2.003)	(1.717)
Intercept	3.151		
	(0.916)		
Country fixed-effects	Yes	Yes	Yes
Quarter specific effects	No	No	Yes
Observations	335	334	320
R-squared	0.080	0.079	0.079
Hansen OID test: *P*-value	..	..	..
Number of countries	15	14	14

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4. Foreign Holdings of LC Debt and LC Yield Level. Period 2004:Q1–2013:Q2

Dependent variable: LC yield (in percent)	(1) Naïve OLS-FE	(2) IV (Remoteness)	(3) IV (1st and 2nd lags)
Foreign holdings ratio	-0.0648*	-0.0739***	-0.0810***
	(-2.143)	(-4.321)	(-2.924)
Current account balance ratio	0.00194	0.0224	0.0238
	(0.0290)	(0.441)	(0.482)
Real GDP growth	-0.144**	-0.146***	-0.184***
	(-2.649)	(-4.354)	(-4.744)
Forward exchange rate	0.00136***	0.00128***	0.00157***
	(4.187)	(3.730)	(5.854)
External public debt ratio (lagged)	-0.00279	-0.00181	0.00304
	(-0.818)	(-0.266)	(0.378)
Inflation rate	0.166**	0.160***	0.0823**
	(2.419)	(3.775)	(2.146)
Intercept	6.604***		
	(8.573)		
Country fixed-effects	Yes	Yes	Yes
Quarter specific effects	No	No	Yes
Observations	348	343	332
R-squared	0.291	0.313	0.425
Hansen OID test: *P*-value	..	..	..
Number of countries	13	13	13

Robust t-statistics in parentheses
*** p<0.01, **p<0.05, *p<0.1

Table 5. Panel Non-Linear Estimates

Dependent Variable: the Yield Associated with Local Currency Denominated Government Bonds (5-Year Maturity) (Columns 1–3) and the Country-Specific Benchmark Yield (Column 4)

Interaction variable:	(1) Foreign holdings (FH)	(2) Foreign holdings (FH)	(3) Foreign holdings (FH)	(4) *Herfindahl* concentration
U.S. 10-year yield	0.418*			0.309*
	(2.086)			(1.932)
VIX		0.00797		
		(0.306)		
U.S. 3-month rate			0.0506	
			(0.337)	
U.S. 10-year yield * 1[FH>35]	0.958***			
	(3.277)			
VIX * 1[FH>32]		0.0692**		
		(2.947)		
U.S. 3-month * 1[FH>30]			1.332***	
			(6.431)	
U.S. 10-year yield * 1[*Herf*>0.2]				0.385**
				(2.896)
Relevant threshold dummy	-2.654***	-2.717***	-1.587***	-1.160**
	(-3.475)	(-3.536)	(-4.409)	(-2.308)
Current account balance-to-GDP	-0.0220	-0.0301	-0.00422	0.0261
	(-0.623)	(-0.896)	(-0.110)	(1.353)
Real GDP growth	-0.196***	-0.169**	-0.179***	-0.234***
	(-3.795)	(-2.921)	(-3.242)	(-3.450)
Forward exchange rate, log	0.00199***	0.00198***	0.00173***	
	(23.23)	(31.62)	(17.25)	
Inflation rate	0.370***	0.389**	0.330**	0.0982
	(3.902)	(2.813)	(2.873)	(1.044)
Public external debt-to-GDP, lagged				0.00691
				(0.885)
Constant	3.912***	5.110***	5.689***	5.456***
	(6.241)	(7.406)	(28.20)	(6.271)
Country fixed-effects	Yes	Yes	Yes	Yes
$\theta_2 + \theta_3$ [*P*-value]	1.4 [0.000]	0.08 [0.000]	1.4 [0.000]	0.7 [0.000]
Observations	367	367	367	317
R-squared	0.331	0.293	0.306	0.533
Number of countries	13	13	13	10

Robuts t-statistics in parentheses
*** p<0.01, **p<0.05, p<0.1

REFERENCES

Arslanalp, S. and T. Tsuda, 2014, "Tracking Global Demand for Emerging Market Sovereign Debt", IMF Working Paper No. 14/39, International Monetary Fund.

Chami, R., D. Hakura, and P. Montiel, 2009, "Remittances: An Automatic Output Stabilizer?" IMF Working Paper No. 09/91, International Monetary Fund.

Combes, J. L., and C. Ebeke, 2011, "Remittances and Household Consumption Instability in Developing Countries", *World Development* 39.7 (2011): 1076–1089.

Ebeke, C. and Y. Lu, 2014, "Emerging Market Local Currency Bond Yields and Foreign Holdings in the Post-Lehman Period—a Fortune or Misfortune?", IMF Working Paper No. 14/29, International Monetary Fund.

González, A., T. Teräsvirta, and D. Van Dijk, 2005, "Panel Smooth Transition Regression Models", Research Paper No. 165, Quantitative Finance Research Centre, University of Technology, Sydney.

Hansen, B., 1999, "Threshold Effects in Non-Dynamic Panels: Estimation, Testing, and Inference", *Journal of Econometrics*, 93 (2): 345–368.

IMF, 2014 Global Financial Stability Report, Moving from Liquidity- to Growth-Driven Markets, Chapter 2. "How Do Changes in the Investor Base and Financial Deepening Affect Emerging Market Economies?, April 2014

Lim, J. J., S. Mohapatra, and M. Stocker, 2014, "Tinker, Taper, QE, Bye? The Effect of Quantitative Easing on Financial Flows to Developing Countries", Background Paper for *Global Economic Prospects 2014*, Washington, DC: World Bank.

Masten, A., F. Coricelli, and I. Masten, 2008, "Non-Linear Growth Effects of Financial Development: Does Financial Integration Matter?" *Journal of International Money and Finance*, 27.2 (2008): 295–313.

Peiris, S. J., 2010, "Foreign Participation in Emerging Markets' Local Currency Bond Markets (EPub)", IMF Working Paper No. 10/88, International Monetary Fund.

Rose, A. K. and M. M. Spiegel, 2009, "International Financial Remoteness and Macroeconomic Volatility", *Journal of Development Economics* 89.2 (2009): 250–257.