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LOCAL CURRENCY BOND MARKETS, FOREIGN INVESTOR PARTICIPATION AND CAPITAL FLOW VOLATILITY IN EMERGING ASIA

JOHN BEIRNE*
Asian Development Bank Institute, Japan
jbeirne@adbi.org

NUOBU RENZHI
Capital University of Economics and Business, P. R. China
Asian Development Bank Institute, Japan
nrenzhi@adbi.org

ULRICH VOLZ
SOAS, University of London, UK
uv1@soas.ac.uk

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This paper examines the role of local currency bond markets (LCBMs) and foreign investor participation in these markets in capital flow volatility in emerging Asian economies over the period 1999 to 2020. Using a panel analysis and impulse response functions generated from a panel structural vector autoregression, we show that greater development of LCBMs across 10 Asian emerging economies in terms of capitalization helps to mitigate against the capital flow volatility, while foreign investor participation has the opposite effect, particularly for less developed LCBMs. Our findings have policy implications from a financial stability perspective, whereby continued efforts to enhance LCBMs while reducing reliance on foreign investors should be encouraged. Strengthening the local investor base and mobilizing domestic resources through LCBMs ought to be a priority for raising long-term capital that will enable the financing of sustainable investment and development. Our findings also suggest that greater efforts are needed to enhance foreign exchange hedging arrangements for foreign investors in LCBMs, particularly in times of heightened financial stress.

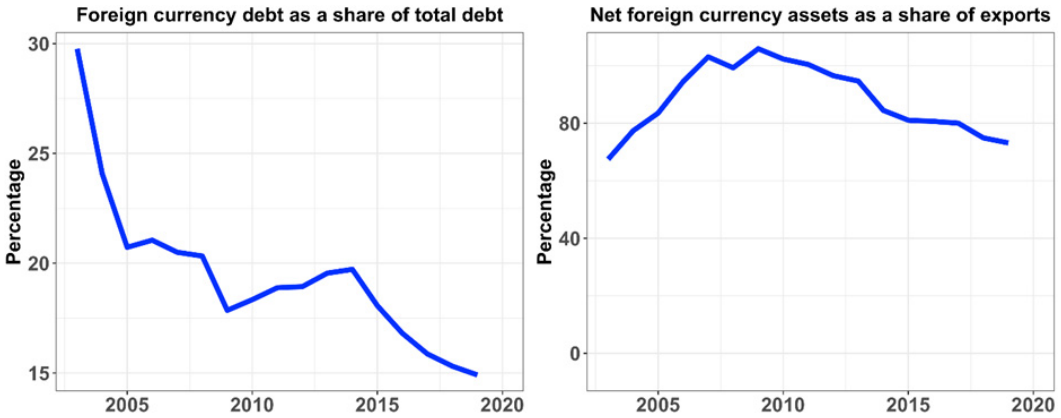
Keywords: Capital flow volatility; local currency bond markets.

JEL Classifications: F32, F41, F62

1. Introduction

Local currency bond markets (LCBMs) have continued to develop in emerging Asian economies since the early 2000s in order to safeguard against currency and maturity

*Corresponding author.



Notes: Emerging Asia comprises the People's Republic of China (PRC); Hong Kong, China; India; Indonesia; the Republic of Korea; Malaysia; the Philippines; Singapore; Thailand; and Viet Nam. The data is computed as GDP-weighted averages for the 10 countries in the sample.
Source: Authors' calculations with data from International Monetary Fund (IMF), Bank for International Settlements (BIS), Institute for International Finance (IIF), and China Economic Database (CEIC).

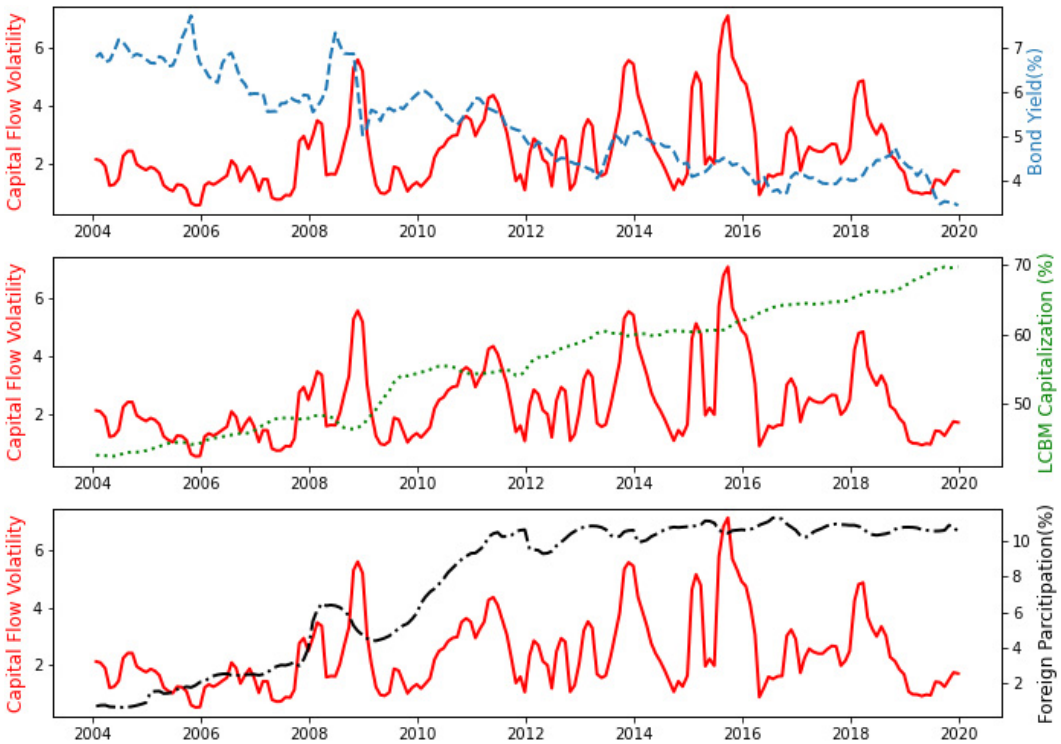
Figure 1. Foreign Currency Debt and Currency Mismatches in Emerging Asia

mismatches. Reliance on foreign currency debt, while still pervasive, has declined as a result (Figure 1).

The development of LCBMs in Asia has its foundations in lessons learned from the Asian financial crisis of 1997–1998, and is aimed at reducing reliance on cross-border bank-based finance through a more advanced local capital market (e.g., Park *et al.*, 2018). LCBM development should also help to reduce exposure to global shocks, given the lower reliance on foreign currency borrowing.[1] While the development of LCBMs has helped to address the currency mismatch issue for domestic markets, the increasing presence of foreign investors in these markets may amplify the risk of capital flow reversal in periods of heightened financial tension. Indeed, as noted by Carstens and Shin (2019), foreign participation in LCBMs equates to a shift in the currency mismatch to foreign investors, the so-called "original sin redux". Therefore, the development of LCBMs can help local economies to borrow abroad in domestic currency to address the currency mismatch from the domestic perspective, having important financial stability implications as a result. However, an increasing presence of unhedged foreign investors in these markets implies that local economies may be subject to financial stability risks during periods of heightened financial tension. In particular, such episodes have been characterized as being subject to abrupt capital flow reversals.

Conceptually, LCBM development could either increase or decrease the capital flow volatility. To the extent that LCBM development would attract greater capital inflows and hence increase integration into the global financial system, an economy may face a higher

[1] Other benefits of LCBMs include the ability to better manage capital flow volatility, reduced global imbalances, alleviation of the need to hold large foreign reserves, and facilitating smoother balance sheet adjustment (thereby enabling macroeconomic policy to adjust to shocks more smoothly). See IMF (2016) for further details.



Notes: The red solid line in the three panels represents capital flow volatility. The blue dashed line (top panel) represents the local bond yield in percentage. The green dashed line (middle panel) represents LCBM capitalization relative to GDP. The black dashed line (bottom panel) represents foreign participation in LCBMs (foreign holdings relative to total outstanding). Capital flow volatility is defined as the ratio of the standard deviation to the absolute value of the mean of the total gross capital flows relative to GDP, i.e., the sum of total inflows and outflows of FDI, portfolio flows, banking and other flows relative to GDP. Variable definitions are provided in Table A.2 in the Appendix.

Figure 2. Capital Flow Volatility versus Bond Yield, LCBM Capitalization, and Foreign Participation

risk of a sudden reversal of capital flows and become more vulnerable to volatile capital flows. On the other hand, LCBM development should facilitate domestic resource mobilization and make an economy less dependent on foreign lending (including from foreign banks) and reduce gross borrowing from abroad.[2] Moreover, LCBM development should reduce both currency mismatch (i.e., reducing foreign currency exposure) and maturity mismatch (i.e., lengthening the maturity of the stock of debt) problems, making economies less reliant on short-term or foreign debt.

This paper assesses the role on capital flow volatility played by LCBMs in 10 Asian emerging economies over the period 1999 to 2020, including foreign investor participation in these markets. Figure 2 illustrates the Asian capital flow volatility dynamics over time relative to LCBM yields, LCBM capitalization, and foreign investor participation in LCBMs.

[2] Net capital flows will of course depend on the current account balance.

Our empirical analysis in this paper indicates that LCBM yields do not appear to have any statistically significant bearing on capital flow volatility. Rather, significant roles are played by both LCBM capitalization and foreign investor participation in LCBMs. Across all country groups, higher LCBM capitalization reduces capital flow volatility, while higher foreign investor participation in LCBMs increases the capital flow volatility. The magnitudes of the effects are much higher for economies with less developed LCBMs. This is intuitive from an economic standpoint. Less developed LCBMs are more susceptible to financial stability risks related to capital flow reversals in times of heightened financial tension. As LCBMs become more developed, the effect of foreign investor participation on capital flow volatility diminishes — i.e., as LCBMs mature, they are less vulnerable to the external shocks that may emanate from foreign ownership.

The remainder of the paper is organized as follows. Section 2 reviews the related literature on the factors underpinning the development of LCBMs both theoretically and empirically. Section 3 presents the data and empirical methodology. Section 4 presents the empirical results. Section 5 concludes.

2. Related Literature

The literature on LCBMs has tended to focus on the benefits of developing these markets from a theoretical perspective and the factors driving the development of these markets empirically, including the implications from a financial stability perspective. Our paper contributes to the strand of the literature that falls into the latter field. Studies on the determinants of LCBMs are closely related to those carried out on the drivers of capital flows to emerging market economies (EMEs), including studies on capital flow volatility (e.g., Byrne and Fiess, 2016). These studies have argued that global factors tend to be more important during periods of heightened financial market stress, while domestic macroeconomic fundamentals drive capital flows to EMEs during more tranquil times (European Central Bank ECB (2016)). Recent work by Eller *et al.* (2020) shows that global factors capturing macro-financial common components explain around three-quarters of capital flow volatility regardless of the type of capital flow or economic region. Csonto (2014) indicates that countries with stronger domestic fundamentals, such as fiscal sustainability, can be more resilient in the face of external shocks. As EMEs in Asia continued to develop their LCBMs in conjunction with solid macroeconomic performance, the region attracted substantial flows of foreign capital (Burger *et al.*, 2012). This flow of foreign capital into Asia helped the region to address currency and maturity mismatches (Burger and Warnock, 2007).

Miyajima *et al.* (2015) showed that domestic factors have become increasingly important for anchoring local currency government bond yields. While local bond yields appear to have become more resilient to swings in global risk aversion, the trajectory of US bond yields continues to be an important global factor underpinning local bond yields (Belke *et al.*, 2018; Belke and Volz, 2019)). There is no consensus, however, on whether domestic or global factors are more important. Piljak (2013) makes the point that domestic monetary policy and inflation are the dominant drivers, while Kumar and Okimoto (2011) note that global factors have become more important as EMEs have become more

financially developed and interconnected with the global financial system. The dominance of global factors can be traced back to the "original sin" argument of Eichengreen and Hausmann (2009), wherein EMEs' inability to borrow in their own currency, while international transactions typically take place in US dollars, implies that local currency bonds will be underpinned primarily by global factors.

Claessens *et al.* (2007) highlight that the depth and currency composition of government bond markets are related to domestic institutional and macroeconomic factors. More recent studies, including those by Berensmann *et al.* (2015), Presbitero *et al.* (2016), and Dafe *et al.* (2018), show that LCBM development is related to country size, level of economic development, the size of banking systems, greater trade openness, the quality of regulatory frameworks and the rule of law, and financial system structure.

A wide number of studies have been carried out on the emergence of local currency bonds in EMEs as a viable asset class for investors given the strong economic growth outlook, higher risk-adjusted returns, and portfolio diversification opportunities (e.g., Claessens *et al.* (2007); IMF (2011). Indeed, foreign investor participation in LCBMs has increased sharply over the past decade. Other studies have questioned the diversification benefits of LCBMs in EMEs in the presence of high exchange rate volatility (e.g., Turner (2012). Moreover, Ebeke and Lu (2015) show that while foreign investor participation in LCBMs can help to lower yields, the volatility of yields tends to increase. The authors also show that LCBMs tend to be more susceptible to global financial shocks when foreign participation in LCBMs exceeds a given threshold.

Studies on Asia have tended to focus on the extent of integration of LCBMs at the regional and global levels. For example, Tsukuda *et al.* (2017) find that East Asian economies that are major financial centers (Singapore and Hong Kong, China) are more interconnected with the US than with other economies in East Asia. Other studies that focus on Asia have tended to examine the rationale for the development of LCBMs in the region in the aftermath of the Asian financial crisis of 1997–1998 (e.g., Kawai, 2007; Felman *et al.*, 2011; Spiegel, 2012).

3. Data and Empirical Methodology

Using monthly data frequency, we estimate a fixed effects panel model over the period 1999M01 to 2020M05 across 10 Asian emerging economies, including the People's Republic of China (PRC); Hong Kong, China; India; Indonesia; the Republic of Korea; Malaysia; the Philippines; Singapore; Thailand; and Viet Nam. We also separate the sample into two sub-panels based on the level of LCBM development (the share of LCBM capitalization in GDP), the well developed and the less developed.[3] We first examine the

[3] See Table A.1 in the Appendix for details of groups, including definitions. In terms of preliminary analysis, the fixed effects model is justified on the basis of results from a Hausman test, while panel unit root tests (with correction for cross-sectional dependence) reject the null hypothesis of non-stationarity for the variables in our analysis. Tables A.2–A.4 in the Appendix provide details on the variables used, as well as results from the preliminary analysis undertaken. We use the quadratic interpolation procedure to convert the time series into a monthly frequency. The interpolated variables include: LCBM capitalization, foreign participation, real GDP growth, current account balance, public debt, and financial openness.

role of local currency bond markets in affecting capital flow volatility, controlling for both domestic fundamentals and global factors. Drawing on the capital flows literature, domestic macroeconomic controls include current account balance, exchange rate volatility, real GDP growth, public debt/GDP, inflation rate, financial openness, and a dummy variable representing crisis (defined as 1 where exchange rate volatility is in the top quartile and zero otherwise). Capital flow volatility is defined as the ratio of the standard deviation to the absolute value of the mean of the flows. This is based on total gross capital flows, comprising the sum of inflows and outflows of FDI, portfolio investment, as well as banking and other flows (relative to GDP). For push factors, we include US bond yields and the VIX. Our estimation also controls for the COVID-19 pandemic using a period dummy. The data has been attained from Bloomberg, BIS, IMF International Financial Statistics, China Economic Database (CEIC), and the World Health Organization (WHO). More specifically, the following baseline equation is estimated:

$$y_{i,t} = \beta_1 x_{i,t-1} + \gamma_1 s_{j,t-1} + \chi_1 VIX_{t-1} + \tau_1 USY_{t-1} + \delta_{1i} + \varepsilon_{1i,t} \quad i = 1,\ldots,N, \quad t = 1,\ldots,T, \tag{1}$$

where $y_{i,t}$ represents the capital flow volatility; $x_{i,t}$ represents a set of domestic fundamentals and other controls; $s_{j,t}$ denotes the regional LCBM yields, LCBM capitalization/GDP, and foreign investor participation in LCBMs; *VIX* is the Chicago Board Options Exchange (CBOE) Volatility Index, a measure of global risk aversion; *USY* are US long-term government bond yields; δ_i are the country-specific effects; and $\varepsilon_{i,t}$ is the error term. The variables are lagged by one period to mitigate against endogeneity concerns. This equation is also estimated in country-specific terms. In order to get at the issue of the currency exposure of foreign investors in LCBMs, we augment the baseline model with a number of interaction terms. Specifically, we test the sensitivity of capital flow volatility to foreign investor participation in markets in times of high exchange rate volatility (defined as a "crisis" variable for exchange rate volatility in the top quartile). With appropriate foreign exchange hedging, our prior would be that there should be no statistically different impact of foreign investor participation in LCBMs on capital flow volatility in periods of excessive exchange rate volatility.

Second, a structural panel vector autoregressive (VAR) model is used to examine the response of capital flow volatility to shocks imposed on LCBM yields, LCBM capitalization, foreign investor participation in LCBMs, and the VIX. Crucially, these shocks control for a range of macroeconomic fundamentals. The panel structural VAR (SVAR) is implemented in a balanced set-up across the same 10 countries as in the fixed effects panel analysis. The panel SVAR can be denoted as follows in its general specification, with structural shocks identified by a recursive restriction:

$$A(L)Y_{i,t} = \mu_{i,t}, \tag{2}$$

where $A(L)$ is the matrix of the lag polynomial; $Y_{i,t}$ refers to the demeaned value of endogenous variables of country i to accommodate country-specific fixed effects; and $\mu_{i,t}$ is a vector of structural disturbances. Our identification strategy is based on a block recursive restriction (Christiano *et al.*, 1999), which results in the following matrix A to fit

a just-identified model

$$A = \begin{bmatrix} a_{1,1} & 0 & \dots & 0 \\ a_{2,1} & \ddots & \ddots & \vdots \\ \vdots & \ddots & \ddots & 0 \\ a_{11,1} & \dots & a_{11,10} & a_{11,11} \end{bmatrix}. \tag{3}$$

Having already identified the drivers of capital flow volatility, our objective with the SVAR is to examine how, while controlling for the determinants, capital flow volatility responds to shocks imposed on the LCBM factors and the VIX. The ordering of the variables imposed in the recursive form implies that the variables at the top (such as $a_{1,1}$) will not be affected by contemporaneous shocks to the lower variables (such as $a_{2,1}, a_{11,1}, \dots$), while the lower variables will be affected by contemporaneous shocks to the upper variables. Usually, it is preferable for slower moving variables to be ordered before fast moving variables (Bruno and Shin, 2015). It follows therefore that we place the global factors — VIX and US bond yields — at the top in the ordering, which implies that it will only be affected by contemporaneous shock to itself. Following the global factors, we place domestic fundamentals — real GDP growth, current account balance, public debt, inflation rate, financial openness, exchange rate volatility, crisis dummy, and the COVID-19 dummy — in the ordering, which implies that these factors will only be affected by contemporaneous shocks to global factors and themselves. We place LCBM variables — LCBM yield, LCBM capitalization factors, and foreign participation — after domestic fundamentals, which indicates that these factors will only be affected by contemporaneous shocks to global factors, domestic fundamentals, and themselves, but not by contemporaneous shocks to capital flow volatility. Importantly, we put the capital flow volatility in last place in the ordering, which is not only based on the assumption that global factors and domestic factors will affect capital flow volatility, but also on the consideration of our first-stage empirical results that imply that the push and pull factors are driving capital flow volatility. The lag selection of the panel SVAR model is based on the Akaike Information Criterion (AIC), which suggests that our model should have two lags.

4. Empirical Results

Table 1 outlines the impact of local currency bond markets on capital flow volatility. Our findings show that LCBM yields do not appear to have any bearing on capital flow volatility. Rather, significant roles are played by both LCBM capitalization and foreign investor participation in LCBMs. Across all country groups, higher LCBM capitalization reduces capital flow volatility, while higher foreign investor participation in LCBMs increases capital flow volatility.

The magnitudes of the effects are much higher for economies with less developed LCBMs. This is intuitive from an economic standpoint. Less developed LCBMs are more

Table 1. Local Currency Bond Markets And Capital Flow Volatility: Panel Estimates

	(1) All	(2) Well Developed	(3) Less Developed
	Local currency bond markets		
LCBM yield (%)	−0.033	−0.017	−0.207
	(0.119)	(0.097)	(0.263)
LCBM capitalization (%)	−0.045***	0.005	−0.358***
	(0.016)	(0.007)	(0.066)
Foreign participation (%)	0.153***	0.016**	0.202*
	(0.020)	(0.008)	(0.110)
	Domestic factors		
Real GDP growth (%)	−0.064	−0.007	−0.548**
	(0.044)	(0.016)	(0.231)
Current account balance (% GDP)	−0.022	0.033**	−0.482***
	(0.035)	(0.014)	(0.151)
Public debt (% GDP)	0.061**	0.001	0.391***
	(0.024)	(0.013)	(0.100)
Inflation rate (%)	−0.005	0.029	0.076
	(0.052)	(0.025)	(0.131)
Financial openness	0.289**	0.059***	1.985*
	(0.141)	(0.011)	(1.021)
Exchange rate volatility	0.078**	0.052***	0.098*
	(0.038)	(0.013)	(0.053)
Crisis	0.984***	0.629***	1.215
	(0.375)	(0.162)	(0.903)
COVID-19	0.947**	1.398***	−4.221**
	(0.446)	(0.367)	(2.006)
	Global factors		
US bond yield (%)	−0.620***	−0.0317	−0.252
	(0.192)	(0.100)	(0.495)
VIX (log)	0.013	0.020***	0.064
	(0.015)	(0.006)	(0.043)
Constant	4.840***	0.0641	4.601
	(1.389)	(0.857)	(5.246)
Observations	1,604	986	618
R-squared	0.031	0.090	0.106
Number of countries	10	5	5
Country fixed effects	YES	YES	YES

Note: Standard errors in parentheses; *** $p < 0.01$, **$p < 0.05$, * $p < 0.1$.

susceptible to financial stability risks related to capital flow reversals in times of heightened financial tension. As LCBMs mature, the effect of foreign investor participation on capital flow volatility remains positive and significant, but it is much smaller than for

economies with less developed markets. That is, as LCBMs become more developed, they are less vulnerable to the external shocks that may emanate from foreign ownership.

Importantly, our results control for a range of domestic and global factors, the signs of which accord with our expected priors. For example, lower real GDP growth, higher public debt, and greater financial openness increase capital flow volatility. A strong role is found for fiscal sustainability, with worsening conditions leading to higher capital flow volatility, particularly for less developed markets.

The empirical findings suggest that LCBM development via foreign investors needs to be undertaken cautiously. Even though the development of these markets is beneficial from a financial stability perspective in terms of addressing currency mismatch problems, less developed markets are particularly exposed to potentially abrupt capital flow reversals. The "taper tantrum" in May 2013 — where foreign investors withdrew large amounts of capital from EMEs because of the announcement of the Chairman of the US Federal Reserve of future tapering of its purchases of US Treasury bonds and a subsequent rise in US bond yields — illustrated the vulnerability of EMEs with large foreign investor base (Berensmann *et al.*, 2015). Susceptibility to sharp capital outflows during periods of heightened financial market uncertainty can be related to the lower degree of financial development in these economies, and lower levels of financial intermediation efficiency.[4] As regards the impact on capital flow volatility of foreign participation in LCBMs, we find that this is more pronounced (and statistically significant) during crisis periods with greater exchange rate volatility (see Table A.5). In the presence of full currency hedging, one would not expect such an outcome. The implication is therefore that more effort is needed to develop foreign exchange hedging mechanisms.

In order to delve deeper, we also estimate country-specific regressions for each of the Asian economies. These results are provided in Table 2. Overall, the results indicate a particularly strong effect of LCBM size on dampening capital flow volatility in the PRC, and to a lesser extent in Indonesia; Hong Kong, China; the Philippines; and Singapore. Foreign investor participation is also an important factor that accentuates capital flow volatility in the PRC, India, the Republic of Korea, the Philippines, and Thailand. In relation to the foreign currency exposure of foreign investors, we proxy this effect by augmenting our baseline regression with an interaction term that gauges the role of foreign participation in capital flows' volatility in periods of extreme exchange rate volatility. Table A.6 in the Appendix reveals pronounced capital flow volatility effects in the cases of India, the Philippines, and Thailand. These markets therefore seem to be subject to amplified bouts of capital flow volatility during this period. This may point to a lack of sufficiently developed financial hedging instruments and capabilities, particularly in the foreign exchange market.

Turning to the impulse response analysis, the impulse response graphs are shown in Figure 3. In line with our panel and country-specific regression models, we find that the response of capital flow volatility to bond yield shocks is largely not statistically

[4] These results are also robust to an estimation of the baseline model up to the end of 2019 — i.e., prior to the outbreak of the COVID-19 pandemic (see Tables A.7 and A.8).

Table 2. Local Currency Bond Markets and Capital Flow Volatility: Country-Specific Estimates

	(1) PRC	(2) HKG	(3) IDN	(4) IND	(5) KOR	(6) MYS	(7) PHL	(8) SGP	(9) THA	(10) VNM
					Local currency bond markets					
LCBM yield	−0.248	0.0801	−0.0198	−0.490	0.434	−0.107	−0.103	0.437**	0.030	−0.048***
	(2.420)	(0.552)	(0.048)	(0.578)	(0.329)	(0.068)	(0.104)	(0.195)	(0.159)	(0.015)
LCBM capitalization	−0.769***	−0.094***	−0.013	−0.193*	0.073	0.007	−0.085***	−0.032*	−0.038	−0.023
	(0.249)	(0.026)	(0.036)	(0.111)	(0.048)	(0.006)	(0.031)	(0.017)	(0.027)	(0.017)
Foreign participation	7.774***	n/a	0.045***	−0.343	0.224**	0.005	0.195***	n/a	0.094***	−0.060
	(1.486)		(0.015)	(0.395)	(0.110)	(0.005)	(0.059)		(0.035)	(0.039)
					Domestic factors					
Real GDP growth	−1.439*	0.107*	0.024	0.056	−0.173**	−0.011	−0.133**	−0.038***	0.014	−0.021
	(0.803)	(0.057)	(0.058)	(0.151)	(0.079)	(0.010)	(0.066)	(0.013)	(0.019)	(0.022)
Current account balance	0.546	−0.105*	−0.019	1.555***	0.119	0.008	0.071	0.050**	0.045	0.006
	(0.847)	(0.062)	(0.049)	(0.401)	(0.110)	(0.007)	(0.054)	(0.022)	(0.027)	(0.008)
Public debt	3.110***	−0.772**	0.0452**	0.363	0.173**	−0.005	−0.066	−0.007	−0.026	0.016
	(0.693)	(0.364)	(0.022)	(0.239)	(0.085)	(0.011)	(0.056)	(0.012)	(0.028)	(0.017)
Inflation rate	−0.394	0.032	0.010	0.019	0.692***	−0.023	−0.038	0.054	−0.039	0.010*
	(0.652)	(0.091)	(0.022)	(0.127)	(0.209)	(0.018)	(0.059)	(0.033)	(0.037)	(0.006)
Financial openness	n/a	n/a	0.450*	n/a	1.064**	0.035	n/a	n/a	0.479**	n/a
			(0.228)		(0.449)	(0.045)			(0.226)	
Exchange rate volatility	0.366	0.279***	0.020**	0.127*	−0.034	−0.001	0.009	0.042	−0.021	0.006
	(0.280)	(0.062)	(0.010)	(0.074)	(0.035)	(0.011)	(0.025)	(0.042)	(0.026)	(0.007)
Crisis	4.876***	1.406***	0.117	−0.382	0.373**	−0.104	−0.082	−0.065	0.011	−0.068
	(1.019)	(0.513)	(0.148)	(0.514)	(0.181)	(0.097)	(0.136)	(0.239)	(0.195)	(0.041)
COVID-19	−10.59	4.546***	3.767***	2.669**	−0.0195	2.106***	0.156	0.291	1.508***	0.186**
	(8.407)	(1.361)	(0.647)	(1.138)	(1.002)	(0.200)	(0.305)	(0.370)	(0.431)	(0.075)

Table 2. (*Continued*)

	(1) PRC	(2) HKG	(3) IDN	(4) IND	(5) KOR	(6) MYS	(7) PHL	(8) SGP	(9) THA	(10) VNM
					Global factors					
US bond yield	9.271***	−0.411	0.295***	1.800***	−0.205	0.049	0.525***	0.051	−0.113	−0.050
	(1.983)	(0.658)	(0.112)	(0.494)	(0.353)	(0.056)	(0.141)	(0.124)	(0.127)	(0.031)
VIX	0.053	0.047**	0.038***	0.085**	0.036*	0.009**	−0.002	0.002	0.014	0.006**
	(0.126)	(0.023)	(0.009)	(0.035)	(0.021)	(0.004)	(0.010)	(0.007)	(0.009)	(0.003)
Constant	−47.62**	8.518***	−3.130***	−12.03	−10.30***	0.111	5.203**	−3.032	3.772	0.292
	(21.35)	(2.410)	(0.848)	(20.39)	(2.956)	(0.740)	(2.405)	(1.891)	(2.313)	(0.480)
Observations	172	218	197	77	209	230	74	156	173	98
R-squared	0.368	0.270	0.383	0.350	0.248	0.484	0.389	0.241	0.295	0.563

Note: Standard errors in parentheses; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

significant. This is not the case, however, for LCBM capitalization. We find that a positive shock to LCBM capitalization has a statistically significant and dampening effect on capital flow volatility across our sample of Asian economies. Overall, a one percentage point rise in LCBM capitalization is associated with a fall in capital flow volatility of around 0.3

Notes: Median responses with 95% confidence bands in dashed lines are reported. The unit of shock is one percentage point, and the unit of the horizon axes refers to one month.

Figure 3. Response of Capital Flow Volatility to LCBM Yields, LCBM Capitalization, Foreign Participation, and Global Shocks

percentage points at peak after around 4 months. The magnitude of the effect recedes, and becomes insignificant at around 6 months. While we find no significant effect for the sub-panel of well-developed LCBMs, the impact of capitalization on capital flow volatility is highly statistically significant and negative across the full duration horizon for the less developed markets, with a one percentage point rise in LCBM capitalization associated with a permanent 0.2 percentage point decline in capital flow volatility. A positive one percentage point shock to foreign investor participation in LCBMs is associated with a rise in capital flow volatility of around 0.6 percentage points at peak at around 4 months, with the effect becoming statistically insignificant at around 6 months. Comparing the well developed and less developed markets reveals a much more pronounced response of capital flow volatility for the latter. A positive shock to foreign investor participation of one percentage point yields a rise in capital flow volatility in less developed markets by around 0.8 percentage points at peak. This compares to around 0.5 percentage points for well developed markets. The impulse responses remain statistically significant until around the 6-month time horizon. A similar pattern emerges with capital flow volatility responses to positive VIX shocks, with the magnitude of the response higher for less developed markets.

5. Conclusion

This paper examines the impact of LCBM development and foreign investor participation in these markets on capital flow volatility. Across a sample of 10 emerging Asian economies, we find that there are notable differences between well-developed LCBMs and those that are less developed. In particular, economies with less developed LCBMs are more susceptible to capital flow volatility due to foreign investor participation in these markets. Thus, while LCBMs may have positive effects on financial stability through reducing currency mismatch, substantial risks to financial stability prevail through the effect on capital flow volatility. These effects are also apparent for well-developed LCBMs in Asia, but with much lower magnitudes. Foreign investors in this scenario remain subject to currency mismatches, termed "original sin redux" by Carstens and Shin (2019). This phenomenon can help to explain why foreign investor participation exacerbates capital flow volatility. Moreover, foreign investors in LCBMs will be more responsive to changes in global interest rates than domestic investors. A policy implication for emerging Asian economies is to develop further their capital markets, and in particular to strengthen the local investor base and develop currency hedging capabilities. This may help foreign investors to deal more smoothly with currency fluctuations and help to dampen capital flow volatility in Asian markets. Going forward, mobilizing domestic resources through LCBMs ought to be a priority for raising long-term capital that will facilitate the financing of sustainable investment and development. Finally, given that our analysis considers total capital flow volatility, future avenues of research may consider the implications of LCBM development for capital flow volatility at a more disaggregated level, as well as the impact of foreign investor participation in LCBMs on capital flow volatility for a given composition of capital flows.

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Appendix A

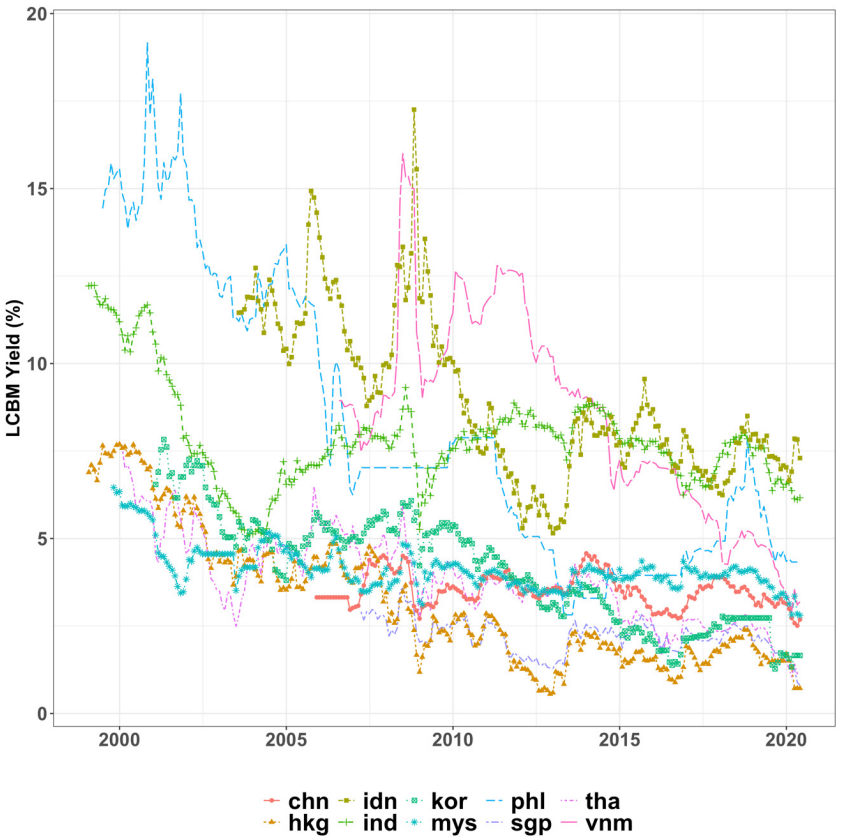

Figure A.1. LCBM Yields

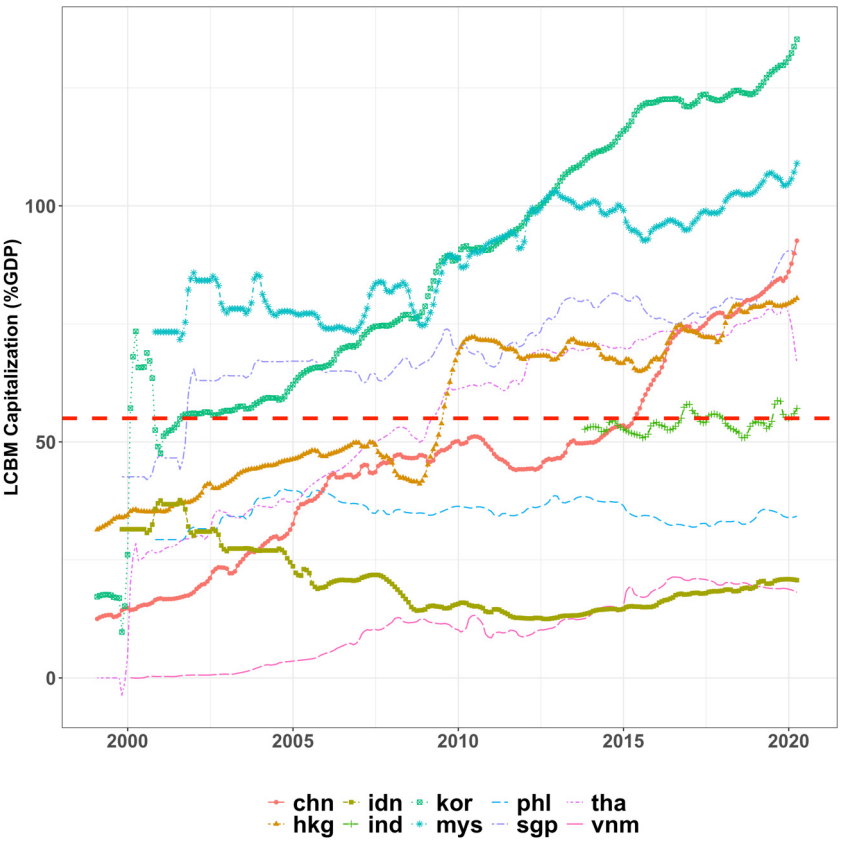

Figure A.2. LCBM Capitalization as a Share of GDP

Table A.1. Country Sample

Well Developed	Less Developed
Hong Kong, China	PRC
Republic of Korea	India
Malaysia	Indonesia
Singapore	Philippines
Thailand	Viet Nam

Note: Well developed refers to countries with an average LCBM capitalization/GDP larger than 55%; less developed refers to countries with an average LCBM capitalization/GDP below 55%.

Table A.2. Overview of Variables Used in the Empirical Analysis

Variable	Data source	Definition
LCBM yield	Bloomberg	10-year local currency government bond yield
GDP growth	Bloomberg and CEIC	The real GDP growth rate
Current account/GDP	Bloomberg	The current account balance to GDP ratio
Public debt/GDP	IMF International Financial Statistics	The public debt as a share of GDP, defined as general government gross debt to GDP ratio
Exchange rate	BIS and Bloomberg	Effective exchange rate index
Foreign participation	Asian Bonds Online and IIF	The percentage of local currency (LCY) government bonds held by foreign investors relative to the quantity of LCY government bonds outstanding in a specific market
LCBM capitalization	Asian Bonds Online	The share of LCBM capitalization relative to GDP
Inflation rate	Bloomberg	Year-over-year consumer price index
US bond yield	Bloomberg	US 10-year government bond yield
VIX	Bloomberg	The Chicago Board Options Exchange (CBOE) Volatility Index, a measure of global risk aversion
Capital flow volatility	IMF	The ratio of the standard deviation to the absolute value of the mean of total gross capital flows
Exchange rate volatility	IMF	The absolute value of the growth rate of the exchange rate
COVID-19	WHO	Period dummy taking a value of 1 from the first confirmed case of COVID-19 and zero otherwise
Crisis	IMF	Dummy taking a value of 1 where exchange rate volatility is in the top quartile and zero otherwise

Table A.3. Summary Statistics

Descriptive Statistics					
Capital Flow Volatility	Obs.	Mean	Std. dev.	Min.	Max.
All countries	2,550	2.41	5.45	0	53.53
Well developed	1,275	1.25	1.52	0	14.42
Less developed	1,275	3.57	7.38	0	53.53
PRC	255	14.95	10.39	0.08	53.53

Table A.3. (*Continued*)

Descriptive Statistics					
Capital Flow Volatility	Obs.	Mean	Std. dev.	Min.	Max.
Hong Kong, China	255	2.42	2.26	0	14.42
Indonesia	255	0.89	0.65	0	5.14
India	255	1.51	1.08	0.02	5.75
Republic of Korea	255	1.95	1.59	0.01	8.31
Malaysia	255	0.45	0.40	0	4.55
Philippines	255	0.34	0.28	0	1.62
Singapore	255	0.67	0.52	0	2.42
Thailand	255	0.77	0.65	0	4.34
Viet Nam	255	0.14	0.12	0	0.7

Table A.4. Preliminary Analysis

Hausman Test	
Test Statistics	*p*-value
chi2=650.59	0.000

Panel Unit Root Test		
Variables	Test Statistics	*p*-value
Capital flow volatility	$z = -8.46$	0.000
LCBM yield	$z = -4.69$	0.000
LCBM capitalization	$z = -3.77$	0.001
Foreign participation	$z = -2.74$	0.003
Real GDP growth	$z = -8.45$	0.000
Current account balance	$z = -4.14$	0.000
Public debt	$z = -3.66$	0.000
Inflation rate	$z = -8.24$	0.000
Financial openness	$z = -3.41$	0.003
Exchange rate volatility	$z = -9.33$	0.000
Crisis	$z = -12.73$	0.000
US bond yield	$z = -6.17$	0.000
VIX	$z = -9.65$	0.000

Notes: Panel unit root test is based on Choi (2001) with correction for cross-dependence. The maximum lag to be used for the variable is set as two, based on the AIC criterion.

Table A.5. Local Currency Bond Markets and Capital Flow Volatility: Panel Estimates with Foreign Investor Interaction Terms

	(1)	(2)	(3)
	All	Well Developed	Less Developed
Local currency bond markets			
LCBM yield (%)	−0.034	−0.036	−0.198
	(0.119)	(0.0973)	(0.266)
LCBM capitalization (%)	−0.042***	0.005	−0.356***
	(0.016)	(0.007)	(0.067)
Foreign participation (%)	0.035**	0.028**	0.251**
	(0.0162)	(0.013)	(0.124)
Domestic factors			
Real GDP growth (%)	−0.062	−0.005	−0.503**
	(0.044)	(0.016)	(0.234)
Current account balance (% GDP)	−0.025	0.032**	−0.513***
	(0.035)	(0.014)	(0.154)
Public debt (% GDP)	0.057**	−0.001	0.398***
	(0.024)	(0.013)	(0.102)
Inflation rate (%)	−0.009	0.021	0.067
	(0.052)	(0.025)	(0.133)
Financial openness	0.261**	0.047***	2.319*
	(0.121)	(0.011)	(1.313)
Exchange rate volatility	0.138**	0.083**	0.334**
	(0.068)	(0.039)	(0.158)
Foreign participation * Exchange rate volatility	0.025**	0.020***	0.073***
	(0.012)	(0.003)	(0.011)
Crisis	1.265***	0.937***	1.832*
	(0.474)	(0.201)	(1.053)
Foreign participation *Crisis	0.048*	0.091***	0.088**
	(0.027)	(0.031)	(0.044)
Foreign participation* Exchange rate volatility *Crisis	0.002*	0.006*	0.004***
	(0.001)	(0.003)	(0.001)
COVID-19	0.947**	1.410***	4.001**
	(0.422)	(0.365)	(2.014)
Global factors			
US bond yield (%)	−0.610***	−0.0361	−0.208
	(0.192)	(0.100)	(0.497)
VIX (log)	0.0123	0.019***	0.065
	(0.016)	(0.006)	(0.043)
Constant	4.756***	0.204	3.498
	(1.397)	(0.856)	(5.351)

Table A.5. (*Continued*)

	(1)	(2)	(3)
	All	Well Developed	Less Developed
Observations	1,604	986	618
R-squared	0.033	0.105	0.109
Number of countries	10	5	5
Country fixed effects	YES	YES	YES

Note: Standard errors in parentheses; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Table A.6. Local Currency Bond Markets and Capital Flow Volatility: Country-Specific Estimates with Foreign Investor Interaction Terms

	(1) CHN	(2) HKG	(3) IDN	(4) IND	(5) KOR	(6) MYS	(7) PHL	(8) SGP	(9) THA	(10) VNM
					Local currency bond markets					
LCBM yield	−0.523	0.080	−0.018	−0.218	0.432	−0.111	−0.107	0.437**	0.054	−0.048***
	(2.470)	(0.552)	(0.048)	(0.609)	(0.335)	(0.068)	(0.114)	(0.195)	(0.148)	(0.015)
LCBM capitalization	−0.772***	−0.094***	0.006	−0.127	0.076	0.007	−0.099***	0.032*	−0.059**	−0.025
	(0.279)	(0.026)	(0.036)	(0.122)	(0.049)	(0.007)	(0.032)	(0.017)	(0.027)	(0.017)
Foreign participation	8.787***	n/a	0.041***	−0.721	0.207*	0.006	0.207*	n/a	0.126***	0.132*
	(1.669)		(0.015)	(0.645)	(0.115)	(0.006)	(0.120)		(0.034)	(0.069)
					Domestic factors					
Real GDP growth	−1.498*	0.107*	0.038	0.085	−0.171**	−0.012	−0.123	−0.038***	0.016	−0.020
	(0.816)	(0.057)	(0.058)	(0.167)	(0.082)	(0.010)	(0.075)	(0.013)	(0.018)	(0.023)
CAB	0.690	−0.105*	−0.016	1.506***	0.118	0.009	0.091	0.050**	0.073***	0.007
	(0.937)	(0.062)	(0.050)	(0.420)	(0.111)	(0.007)	(0.056)	(0.022)	(0.027)	(0.008)
Public debt	3.068***	−0.772**	0.044**	0.426*	0.173**	−0.001	−0.072	−0.007	−0.009	0.021
	(0.787)	(0.364)	(0.022)	(0.246)	(0.086)	(0.011)	(0.059)	(0.012)	(0.026)	(0.017)
Inflation rate	−0.358	0.032	0.024	−0.032	0.715***	−0.022	−0.007	0.0537	−0.054	0.012*
	(0.697)	(0.091)	(0.024)	(0.131)	(0.216)	(0.018)	(0.065)	(0.033)	(0.035)	(0.007)
Financial openness	n/a	n/a	0.486**	n/a	1.111**	0.044	n/a	n/a	0.304*	n/a
			(0.227)		(0.456)	(0.046)			(0.159)	
Exchange rate volatility	2.024*	0.096***	−0.029	−0.120	0.027	0.011	0.083	0.042	−0.011	−0.005
	(1.165)	(0.029)	(0.035)	(0.459)	(0.083)	(0.019)	(0.169)	(0.042)	(0.034)	(0.013)
Financial stress	22.49*	1.406***	−0.019	−1.818	−0.188	−0.036	−1.173	−0.065	0.682**	−0.354
	(11.76)	(0.513)	(0.299)	(2.517)	(0.766)	(0.134)	(0.850)	(0.239)	(0.320)	(0.628)
Foreign participation * Exchange rate volatility	0.122**	n/a	0.002*	0.066	−0.007	−0.001	−0.011	n/a	0.006***	0.018
	(0.061)		(0.001)	(0.136)	(0.011)	(0.001)	(0.033)		(0.000)	(0.015)
Foreign participation * Crisis	−7.857	n/a	−0.017	0.240	0.091	−0.006	0.370*	n/a	0.232***	0.305
	(5.906)		(0.016)	(0.857)	(0.122)	(0.010)	(0.200)		(0.071)	(0.481)
Foreign participation * Crisis * Exchange rate volatility	0.065	n/a	0.003**	0.032	−0.002	0.000	0.019*	n/a	0.041***	−0.012
	(0.417)		(0.001)	(0.049)	(0.010)	(0.001)	(0.012)		(0.009)	(0.019)
COVID-19	−10.86	4.546***	3.629***	−2.552**	−0.037	2.081***	0.099	0.291	1.559***	0.187**
	(8.443)	(1.361)	(0.641)	(1.168)	(1.021)	(0.201)	(0.306)	(0.370)	(0.411)	(0.076)

Table A.6. (*Continued*)

	(1) CHN	(2) HKG	(3) IDN	(4) IND	(5) KOR	(6) MYS	(7) PHL	(8) SGP	(9) THA	(10) VNM
					Global factors					
US bond yield	8.911***	−0.411	0.267**	1.748***	−0.197	0.052	0.469***	0.051	−0.019	−0.057*
	(2.035)	(0.658)	(0.112)	(0.517)	(0.357)	(0.057)	(0.150)	(0.124)	(0.121)	(0.032)
VIX	0.060	0.047**	0.039***	0.084**	0.035*	0.009***	−0.000	0.0017	0.022**	0.005
	(0.143)	(0.023)	(0.009)	(0.035)	(0.021)	(0.004)	(0.012)	(0.007)	(0.009)	(0.003)
Constant	−41.32*	8.518***	−3.257***	−20.44	−10.72***	−0.107	5.771**	−3.032	3.480	0.191
	(23.67)	(2.410)	(0.855)	(21.43)	(3.163)	(0.760)	(2.626)	(1.891)	(2.208)	(0.500)
Observations	172	218	197	77	209	230	74	156	173	98
R-squared	0.378	0.270	0.414	0.378	0.251	0.489	0.434	0.241	0.402	0.573

Note: Standard errors in parentheses; ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Table A.7. Local Currency Bond Markets and Capital Flow Volatility: Panel Estimates Until 2019

	(1) All	(2) Well Developed	(3) Less Developed
	Local currency bond markets		
LCBM yield (%)	−0.029	−0.028	−0.261
	(0.121)	(0.098)	(0.268)
LCBM capitalization (%)	−0.041**	0.005	−0.350***
	(0.016)	(0.007)	(0.066)
Foreign participation (%)	0.117***	0.015**	0.232**
	(0.020)	(0.008)	(0.110)
	Domestic factors		
Real GDP growth (%)	−0.087*	−0.003	−0.864***
	(0.045)	(0.017)	(0.253)
Current account balance (% GDP)	−0.019	0.034**	−0.448***
	(0.035)	(0.014)	(0.152)
Public debt (% GDP)	0.069***	0.004	0.382***
	(0.024)	(0.013)	(0.101)
Inflation rate (%)	0.017	0.029	0.125
	(0.053)	(0.025)	(0.133)
Financial openness	0.124*	0.058**	2.373**
	(0.072)	(0.023)	(1.133)
Exchange rate volatility	0.038**	0.031***	0.089*
	(0.019)	(0.012)	(0.047)
Crisis	1.006***	0.643***	1.413
	(0.377)	(0.162)	(0.907)
	Global factors		
US bond yield (%)	−0.554***	−0.017	0.055
	(0.192)	(0.101)	(0.505)
VIX (log)	0.012	0.020***	0.068
	(0.016)	(0.006)	(0.044)
Constant	4.188***	−0.082	6.158
	(1.400)	(0.865)	(5.332)
Observations	1,574	971	603
R-squared	0.032	0.073	0.112
Number of countries	10	5	5
Country fixed effects	YES	YES	YES

Note: Standard errors in parentheses: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Table A.8. Local Currency Bond Markets and Capital Flow Volatility: Panel Estimates with Interaction Term Until 2019

	(1) All	(2) Well Developed	(3) Less Developed
Local currency bond markets			
LCBM yield (%)	−0.030	−0.044	−0.255
	(0.121)	(0.099)	(0.271)
LCBM capitalization (%)	−0.039**	0.005	−0.349***
	(0.016)	(0.007)	(0.067)
Foreign participation (%)	0.042*	0.032***	0.259**
	(0.024)	(0.012)	(0.119)
Domestic factors			
Real GDP growth (%)	−0.085*	−0.002	−0.826***
	(0.045)	(0.016)	(0.258)
Current account balance (% GDP)	−0.021	0.032**	−0.471***
	(0.035)	(0.014)	(0.155)
Public debt (% GDP)	0.065***	0.002	0.389***
	(0.024)	(0.013)	(0.102)
Inflation rate (%)	0.013	0.021	0.119
	(0.053)	(0.025)	(0.135)
Financial openness	0.213**	0.083**	2.559*
	(0.093)	(0.041)	(1.523)
Exchange rate volatility	0.114***	0.093***	0.153
	(0.039)	(0.017)	(0.109)
Foreign participation * Exchange rate volatility	0.0154*	0.010***	0.032**
	(0.009)	(0.003)	(0.015)
Crisis	1.296***	0.931***	2.168*
	(0.475)	(0.201)	(1.189)
Foreign participation *Crisis	0.048*	0.086***	0.100**
	(0.027)	(0.031)	(0.045)
Foreign participation* Exchange rate volatility * Crisis	0.001*	0.005*	0.004***
	(0.001)	(0.003)	(0.001)
Global factors			
US bond yield (%)	−0.546***	−0.023	0.093
	(0.193)	(0.100)	(0.507)
VIX (log)	0.012	0.019***	0.072
	(0.016)	(0.006)	(0.045)
Constant	4.126***	0.0541	5.241
	(1.408)	(0.865)	(5.457)
Observations	1,574	971	603
R-squared	0.034	0.087	0.115
Number of countries	10	5	5
Country fixed effects	YES	YES	YES

Note: Standard errors in parentheses: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

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