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Working Paper

Local currency bond market development and currency stability amid market turmoil

ADB Economics Working Paper Series, No. 688

Provided in Cooperation with:

Asian Development Bank (ADB), Manila

Suggested Citation: Kim, Cheonkoo; Park, Donghyun; Park, Jungsoo; Tian, Shu (2023) : Local currency bond market development and currency stability amid market turmoil, ADB Economics Working Paper Series, No. 688, Asian Development Bank (ADB), Manila, <https://doi.org/10.22617/WPS230228-2>

This Version is available at:

<https://hdl.handle.net/10419/298134>

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LOCAL CURRENCY BOND MARKET DEVELOPMENT AND CURRENCY STABILITY AMID MARKET TURMOIL

Cheonkoo Kim, Donghyun Park, Jungsoo Park, and Shu Tian

NO. 688

July 2023

**ADB ECONOMICS
WORKING PAPER SERIES**

ADB Economics Working Paper Series

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No. 688 | July 2023

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ISSN 2313-6537 (print), 2313-6545 (electronic)
Publication Stock No. WPS230228-2
DOI: <http://dx.doi.org/10.22617/WPS230228-2>

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ABSTRACT

This study investigates how development of the local currency (LCY) bond market brings stability in the financial market. The analysis is based on annual economy panel data set for 1989–2020. The main findings are as follows. First, exchange rate volatility is lower during crisis periods if an economy has a more developed LCY bond market. Second, a greater share of LCY bonds and a greater share of bonds with long-term maturities have a stabilizing effect on exchange rate volatility during normal times. Lastly, a developed LCY bond market can serve as a buffer against monetary policy shocks emanating from the United States. The empirical evidence in this study implies that emerging economies need to consider designing policies to bolster development of LCY bond markets.

Keywords: local currency bond market, exchange rate volatility, currency mismatch, maturity mismatch, financial crisis

JEL codes: E22, G31

1. Introduction

In 2022, accelerated monetary tightening in the United States (US) led to currency depreciation and capital outflows in emerging markets. This again highlights emerging markets' vulnerability to global shocks: market liquidity is negatively affected as investors sell risky assets and shift funds to safe and liquid assets, which is known as flight-to-quality and flight-to-liquidity.

A liquidity shortage, combined with structural issues in the market, could lead to a systemic financial crisis. For example, in the late 1990s, maturity and currency mismatches were widely documented as a key structural issue in financial markets that contributed to the 1997/98 Asian financial crisis. Eichengreen and Hausman (1999) claimed that emerging markets become vulnerable to shocks because these economies have difficulty borrowing from abroad in their domestic currency and borrowing longer term. To mitigate financial fragility arising from these weaknesses, many Asian economies have put efforts into developing local currency (LCY) bond markets to channel LCY funding, especially longer-term tenors, to borrowers (Park et al. 2019).

This study aims to evaluate how much development of LCY bond markets can contribute to stronger financial stability. The specific research question is to find out whether the exchange rate volatility responses to global shocks are significantly smaller for economies with more developed local currency bond markets.

As mentioned, maturity and currency mismatches were identified as critical factors that led several East Asian economies to experience capital flight, strong currency depreciation, and the depletion of foreign reserve during the 1997/98 Asian financial crisis. Asian firms and non-bank financial companies borrowed short-term loans from foreign banks while investing in long-term assets and/or providing long-term loans. Therefore, their balance sheets had short-term liabilities and long-term assets. During the crisis when foreign banks refused to roll over short-term loans, local companies ran into liquidity shortage due to the “maturity mismatch” problem. In addition, most of these liabilities were denominated in foreign currency, as these economies lacked a developed LCY bond market. This led to the “currency mismatch” problem.

Recent studies suggest that capital flight and currency crises in Asian economies are strongly correlated with foreign-currency-denominated liabilities (Eichengreen and Hausman 1999). Eichengreen et al. (2005) pointed to the fact that due to underdeveloped bond markets, LCY-denominated bonds provide little liquidity when these economies experience high inflation and volatility in currency value. Due to this problem, these economies have to issue short-term bonds in a foreign currency with a stable value. Therefore, if the LCY bond market is further developed to increase liquidity, these economies may be able to escape from the so-called “original sin.” The term “original sin” refers to the inability of some economies to borrow abroad in their own currency.

Learning from the experience of the 1997/98 Asian financial crisis, ASEAN+3 economies—comprising the People’s Republic of China (PRC), Japan, and the Republic of Korea—put efforts to develop LCY bond markets to promote financial stability (Park et al. 2019). In promoting LCY bond markets, they aimed to establish a friendly environment for foreign investors and to enhance macroeconomic stability. ASEAN+3 economies supplied long-term bonds with various maturities to the market and tried to reduce the dependency on short-term foreign borrowing to curb the original sin problem. The intent was to better absorb external shock and avoid hikes in exchange rates due to sudden stops and short-term reversals of international capital flows.

Due to their efforts, the size of LCY bond market increased significantly in some Asian economies after the 1997/98 Asian financial crisis. The aggregate size of LCY bond markets in ASEAN economies Malaysia, Singapore, and Thailand grew from \$218.2 billion in 2000 to \$1,812.1 billion in 2021 based on data from AsianBondsOnline, an emerging East Asian bond market information portal supported by the Asian Development Bank (ADB). The size of the LCY bond market in the PRC grew from \$203.3 billion in 2000 to \$15,536.9 billion in 2021, while that of the Republic of Korea’s increased from \$355.0 billion to \$2,423.6 billion during the same period.

There are theoretical studies linking the development of LCY bond markets with financial stability. The development of an LCY bond market may contribute to the financial stability

of an economy by lowering the amount of foreign borrowing and increasing the variety of bonds with different maturities (IMF 2016; Jeanneau and Tovar 2008; Caballero, Farhi, and Gourinchas 2008; Park et al. 2019). If developing economies hold most of their liabilities in LCY denominated bonds, the fall in the LCY value may not increase the probability of foreigners' capital outflows. As local bond market develops, the bank liquidity will improve. Furthermore, supplies of bonds with different maturities and long-term maturity will solve the maturity mismatch problem and eventually contribute to financial stability (Tian, Park, and Cagas 2021). Park et al. (2019) found that Asian economies rely heavily on bank financing. They claimed that LCY bond markets contribute to the deepening of capital markets and balanced financial systems by reducing reliance on bank-based financing.

On the contrary, there are views suggesting that the development of an LCY bond market can lead to increased uncertainty due to more foreign investors trading in an emerging bond market (Ebeke and Lu 2015, Ebeke and Kyobe 2015, Carstens and Shin 2019). Ebeke and Lu (2015) revealed that the impact of a global shock on LCY bond market is amplified when the share of foreign holdings exceeds a certain threshold. Hofmann et al. (2020) pointed out that increased supplies of LCY bonds in an emerging economy may lead to a currency mismatch among foreign investors. They claimed that a fall in LCY bond values will harm foreign investors' balance sheets, which leads to fire sales to protect their wealth before greater losses are realized due to further currency depreciation.

This study investigates whether the development of an LCY bond market contributes to exchange rate stability based on economy-level panel data from a Bank for International Settlements dataset covering 1989–2020. First, we examine whether the presence of an LCY bond market has a stabilizing effect on exchange rate volatility and how much these effects differ across normal phases and crisis periods such as the 1997/98 Asian financial crisis, global financial crisis, and the coronavirus disease (COVID-19) pandemic. Second, we examine whether exchange rate volatility depends on the composition of bonds with different characteristics. Specifically, we examine whether a greater proportion of LCY bonds in the overall bond market and/or a greater share of long-term maturity bonds have

an additional stabilizing effect on exchange rate stability. Lastly, we analyze whether the development of an LCY bond market mitigates the impact of US monetary policy shocks. We measure exchange rate volatility based on the standard deviation of exchange rate changes.

This study is organized as follows. In section II, we review existing literature regarding LCY bond market and exchange rate volatility. Section III examines trends and characteristics of LCY bond market size in Asian economies and correlation of LCY bond market size and exchange rate volatility. Section IV presents the data description and empirical models. Section V provides empirical findings. Section VI concludes.

2. Literature Review

2.1 Determinants of Local Currency Bond Market Development

Studies have analyzed the factors that are essential for the development of an LCY bond market. Burger and Warnock (2007) suggested that development of a local bond market depends on the rule of law and sound macroeconomic policy. They found that economies with stable inflation and strong protection of creditor rights tend to have more developed LCY markets and rely less on foreign-currency-denominated bonds. They suggested that improving the macroeconomic performance and system to protect creditors will enable development of an LCY bond market and reduce the chances of potential crisis. Dafe et al. (2018) analyzed necessary conditions to establish an LCY bond market to promote long-term financial stability in Sub-Saharan African countries. They found that LCY bond markets need support from politico-institutional factors, overall financial development, and sound financial system structure. Boukhatem (2021) found that macroeconomic and financial factors are more important than institutional factors for an LCY bond market's development in the short-run. However, he found that having a large economy, relatively more government spending, low inflation, a broader and deeper banking system, and higher bureaucratic quality are important. Berensmann et al. (2015) showed that the development of an LCY bond market is related to economy size, role of the banking system, trade openness, and an effective regulatory system.

2.2 Local Currency Bond Market, Foreign Investment, and Financial Instability

Studies show that an LCY bond market may attract more foreign investment, which can harm financial stability. Beirne et al. (2021) analyzed how LCY bond market and foreign investors influence the volatility of capital flows. They suggested that development of an LCY bond market lowers the volatility of capital flows, but this volatility rises with the greater participation of foreign investors. This effect is greater in less developed LCY bond markets.

LCY bond markets can emerging markets address the currency and maturity mismatch problems but may lead to an increase in the share of foreign investors. The presence of foreign investors may incur greater uncertainty in periods when capital flow reversal occurs due to financial stress. Berensmann et al. (2015) indicated that foreign investor participation may help LCY bond market development, but may also increase international capital flow volatility. Ebeke and Kyobe (2015) showed that when foreign investor participation rises above a certain threshold, it may amplify the impact of a global financial shock on the domestic market. Carstens and Shin (2019) claimed that foreign investor participation may lead to a so-called “original sin redux” due to a currency mismatch on foreign investors’ balance sheets. Thus, an increase in unhedged foreign investors may harm financial stability in times of high financial stress and potentially cause sudden capital flow reversals.

2.3 Local Currency Bond Market Development and Financial Stability

LCY bond markets are especially helpful to emerging economies as they allow them to diversify financing sources. One of the main reasons behind the 1997/98 Asian financial crisis was the heavy reliance on bank loans for local financing. Companies in the region were not able to diversify financing sources because the local bond markets were too small and underdeveloped. Burger et al. (2012) indicated that the LCY bond markets in these economies helped to attract foreign capital, while Burger and Warnock (2007) suggested that these foreign capital inflows helped to solve the maturity mismatch problem. Jeanneau and Tovar (2008) pointed to underdeveloped LCY bonds as one of

the factors behind the financial crises that Latin America faced in the 1990s and early 2000s. Latin American countries improved in terms of financial stability and resilience to external shocks as they made efforts to develop their LCY bond markets in the 2000s.

Existing literature suggests that the economies with a developed LCY bond market benefit from greater financial market stability, as bond-issuing economies can effectively respond to capital flow variability. The International Monetary Fund (2016) claimed that LCY bond market development can prevent excessive cross-border capital flows, reduce excessive reliance on foreign capital, lessen the need to accumulate foreign reserves to be able to respond to risks arising from foreign-currency-denominated bonds, and reduce the currency mismatch problem on balance sheets. The Bank for International Settlements (BIS) (2007) pointed out that the development of LCY bond markets helped Asian economies reduce crisis risk and enhance financial stability as they address the currency mismatch problem and extend liability maturity. Foreign financial institution funds invested in the LCY bond market enable companies to borrow in LCY term and thereby solve the original sin problem. Byrne and Fiess (2016) suggested that LCY bond markets contribute to capital inflows in emerging economies.

Studies find that an LCY bond market improves liquidity and the diversity of assets. Park et al. (2019) suggested that LCY bond market development will improve the soundness of the financial sector by lengthening the average maturity of LCY bonds. Tian, Park, and Cagas (2021) found that bank liquidity is expanded, and portfolio risk is lowered as an LCY bond market increases in size—based on empirical analysis based on 26 emerging markets' bank data. Kapingura (2015) showed that an LCY bond market increases the liquidity of long-term bonds and helps to achieve low inflation and less volatility in financial asset prices.

Studies suggest that LCY bond market development leads to a deepening of the financial system. Prasad (2011) suggested financial system development helps firm activity and promotes growth by effectively allocating funds to productive projects and enabling efficient risk diversification. Caballero, Farhi, and Gourinchas (2008) claimed that an LCY

bond market with bonds of diverse maturities may help solve global imbalances arising from chronic excess demand for US assets. It will increase local asset supply to meet local asset demand, and channel local savings to local investments. Bhattacharyay (2013) suggested that LCY bond markets will enhance the flexibility of local financial markets to better respond to foreign shocks and improve the intermediation of funds to productive investments.

2.4 Local Currency Bond Market Development and Financial Crises

LCY bond market development improves financial stability in times of economic crisis as it reduces currency and maturity mismatches. The development of an LCY bond market also reduces exposure to global shocks by lowering reliance on foreign borrowing. With an increased supply of bonds with diverse maturities contributing to added liquidity, the impact of a crisis is lessened. Goyenko et al. (2011) documented that in times of crisis, short- and long-term interest spreads widen and a flight-to-liquidity occurs in a recession as investors move their funds to more liquid short-term bonds.

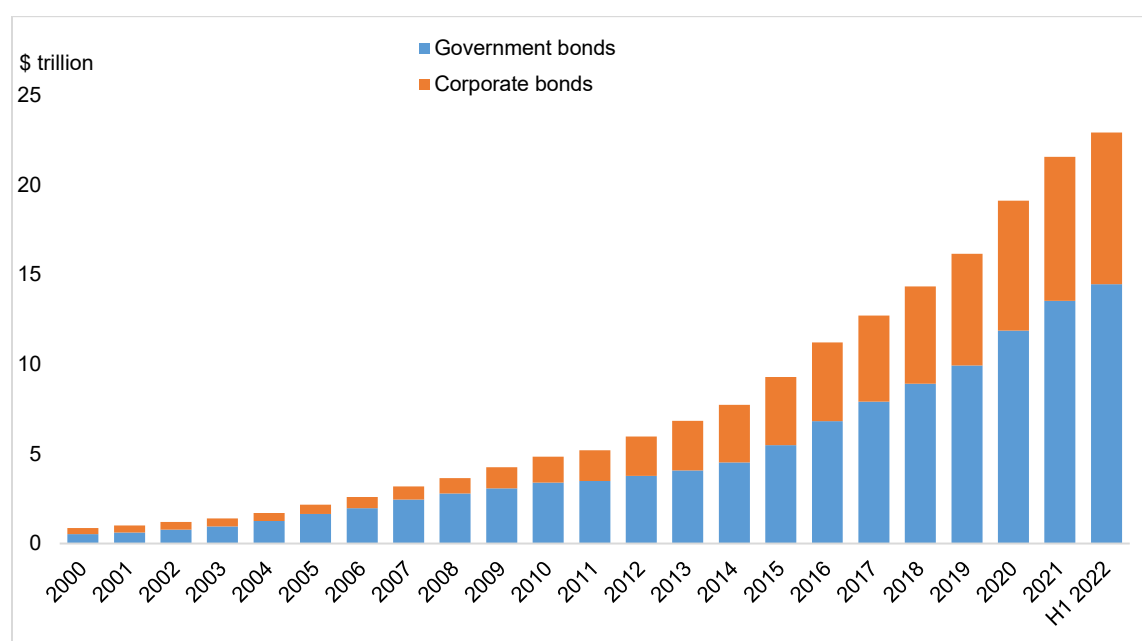
There are only a few studies empirically testing the relationship between LCY bond market development and exchange rate changes in the face of financial stress. Park et al. (2019) analyzed how developing economies' financial vulnerability responded during two episodes of financial stress—the global financial crisis and the so-called taper tantrum—and find a negative correlation between the growth of LCY bond markets and the degree of currency depreciation in emerging economies.

This study deals with a similar issue but differs in several dimensions. First, we focus on the stabilizing effect of LCY bond markets through a reduction in exchange rate volatility. We also ask how the stabilizing effects differ between the normal and crises phases. Second, we use a panel regression approach encompassing most of the crises in the last 3 decades, including the COVID-19 pandemic. This analysis hopes to provide a more comprehensive view. Lastly, we examine how LCY bond market development and the composition of an LCY bond market influence exchange rate volatility in both stable and crisis periods.

3. Local Currency Bond Market Development in Emerging East Asia

The LCY bond market in emerging East Asia underwent rapid development during the past 2 decades. The size of the region's LCY bonds outstanding reached \$22.9 trillion at the end of June 2022, almost 27 times the amount in 2000 (Figure 1). The market is dominated by government LCY bonds, which accounted for more than 60% of the region's bond market at the end of June 2022. The share of LCY bonds outstanding in the region's overall bond market averaged about 90% over the past 2 decades.

Figure 1: Size of Local Currency Bond Markets in Emerging East Asia



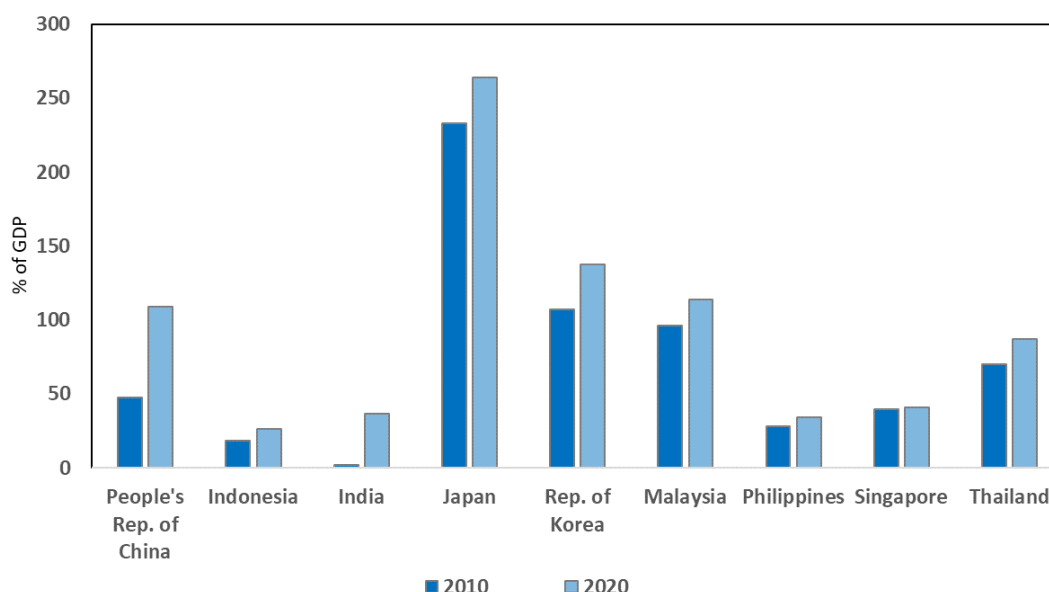
H1 = first half.

Note: Emerging East Asia includes the People's Republic of China; Hong Kong, China; Indonesia; Malaysia; the Philippines; the Republic of Korea; Singapore; Thailand; and Viet Nam.

Source: ADB. AsianBondsOnline Data Portal. <https://asianbondsonline.adb.org/data-portal/> (accessed 24 October 2022).

Figure 2 compares the ratios of LCY bond market size to gross domestic product (GDP) for select Asian economies in the years 2010 and 2020. We observe that the size of LCY bond markets, as measured by the aggregate value of bonds outstanding, increased significantly in the PRC, Japan, the Republic of Korea, and select ASEAN economies.

Figure 2: Size and Growth of Local Currency Bond Markets in Select Asian Economies



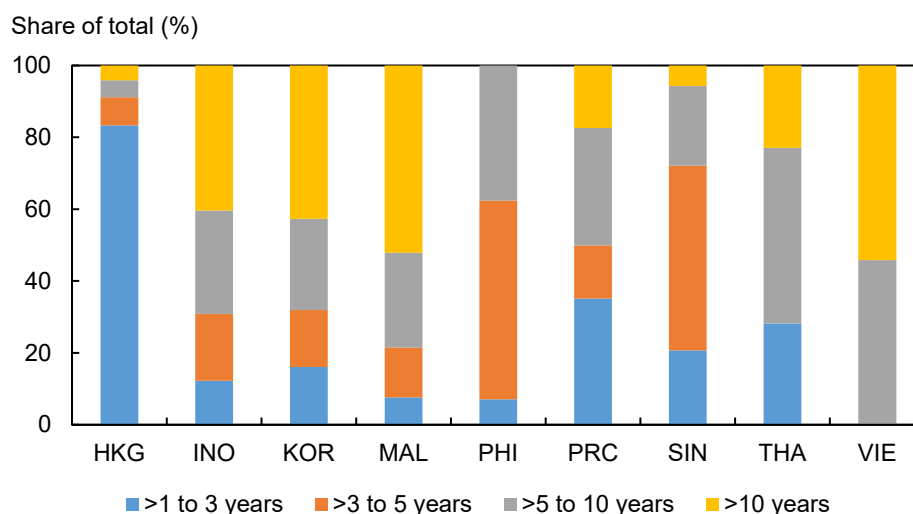
GDP = gross domestic product.

Note: This indicator shows the size of local currency bond obligations as a percentage of nominal gross domestic product. Sub-ratios were computed for the government bond market and corporate bond market. Government bonds include obligations of the central government, local governments, the central bank, and state-owned entities. Corporates comprise both public and private companies and include financial institutions. Bonds are defined as long-term bonds and notes, Treasury bills, commercial paper, and other short-term notes.

Source: Bank for International Settlements. BIS Statistics. <https://www.bis.org/statistics/index.htm>.

After more than 20 years of development, emerging East Asia has made significant progress in channeling long-term funding into its LCY bond markets. The share of LCY bond issuance with tenors greater than 10 years increased from 6.9% in 2000 to 20.7% in the first half of 2022 (Figure 3). Tenors ranging from 5 years to 10 years also increased from 27.6% in 2000 to 32.1% in the first half of 2022. On average, LCY bonds with tenors of 5 years or more accounted for 60.1% of the region's annual LCY bond issuance during the past 2 decades.

Figure 3: Maturity Profile of Bond Issuance in Emerging East Asian Local Currency Bond Markets in the First Half of 2022



HKG = Hong Kong, China; INO = Indonesia; KOR = Republic of Korea; MAL = Malaysia; PHI = Philippines; PRC = People's Republic of China; SIN = Singapore; THA = Thailand; VIE = Viet Nam.

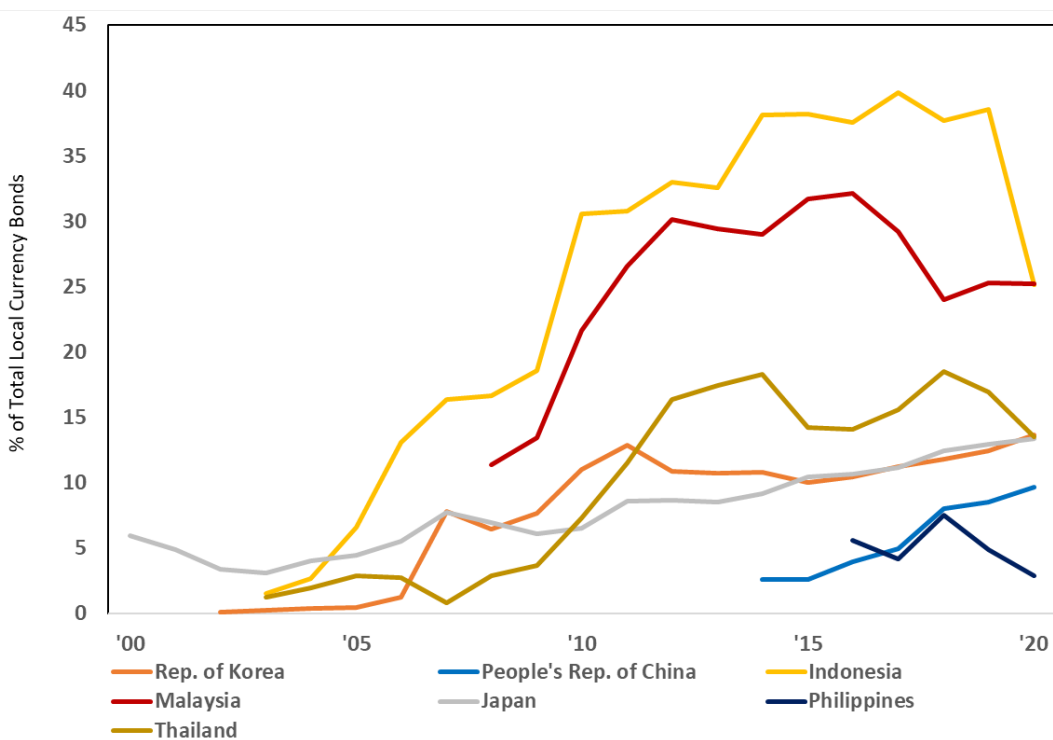
Note: Emerging East Asia includes the People's Republic of China; Hong Kong, China; Indonesia; Malaysia; the Philippines; the Republic of Korea; Singapore; Thailand; and Viet Nam.

Sources: ADB. AsianBondsOnline Data Portal. <https://asianbondsonline.adb.org/data-portal/> (accessed 17 May 2023).

Studies suggest that a larger foreign investor share in an LCY bond market can increase financial instability in times of high financial stress. Figure 4 provides the share of foreign holdings in LCY government bonds for select Asian economies. We observe that foreign holdings increased in most Asian economies during the review period. Indonesia and Malaysia had the highest foreign holding shares in 2020. Increases in foreign holdings imply that LCY bond market development in these regions may weaken financial stability. (Carstens and Shin 2019; Beirne et al. 2021).

Figure 5 illustrates the relationship between the degree of LCY bond market development and exchange rate volatility based on the average values of 1989–2020 for each economy. The figure presents the scatterplot of the LCY bond market size relative to GDP and exchange rate volatility. The graph indicates that there is a potential negative correlation.

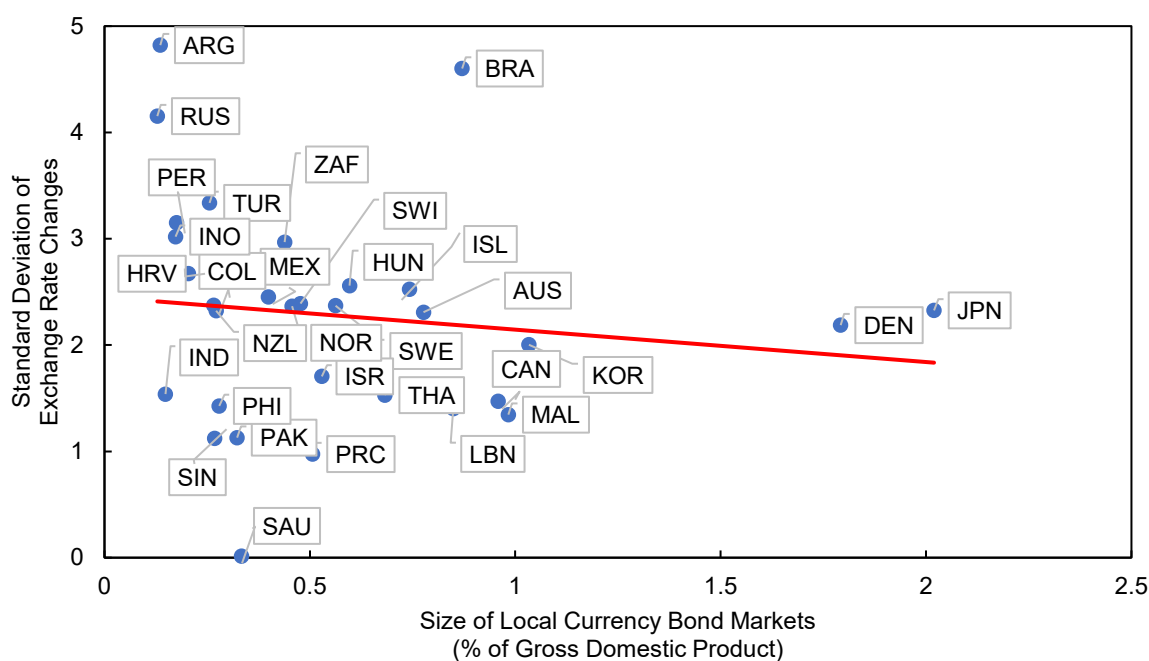
Figure 4: Foreign Holdings in Local Currency Government Bonds



Note: This indicator shows the percentage in local currency (LCY) government bonds held by foreign investors relative to the amount of LCY government bonds outstanding in a specific market. A high percentage indicates the greater participation of foreign investors in buying LCY bonds in a particular market.

Source: ADB. AsianBondsOnline Data Portal. <https://asianbondsonline.adb.org/data-portal/> (accessed 31 August 2022).

Figure 5: Local Currency Bond Markets and Exchange Rate Volatility



ARG = Argentina, AUS = Australia, BRA = Brazil, CAN = Canada, COL = Colombia, DEN = Denmark, HRV = Croatia, HUN = Hungary, IND = India, INO = Indonesia, ISL = Iceland, ISR = Israel, JPN = Japan, KOR = Republic of Korea, LBN = Lebanon, MAL = Malaysia, MEX = Mexico, NOR = Norway, NZL = New Zealand, PAK = Pakistan, PER = Peru, PHI = Philippines, PRC = People's Republic of China, RUS = Russian Federation, SAU = Saudi Arabia, SIN = Singapore, SWE = Sweden, SWI = Switzerland, THA = Thailand, TUR = Türkiye, ZAF = South Africa.

Note: Average size of local currency bond markets as a fraction of gross domestic product (GDP) during 1989–2020 is on the horizontal axis. The vertical axis is the average standard deviation of exchange rate changes.

Source: Authors' calculations.

4. Data and Research Method

This study aims to examine whether LCY bond market development can contribute to financial stability during periods of market turmoil. In particular, the study focuses on the impact of the LCY bond market's development in stabilizing exchange rate volatility during stress periods. Specifically, it examines whether a greater share of LCY bonds in the overall bond market and a greater share of long-term maturities have an additional stabilizing effect on exchange rate volatility during different types of global shocks, including financial crises, the COVID-19 pandemic, and periods of US monetary tightening.

The econometric analyses are performed based on an annual-economy panel data set constructed with data from the BIS and the ADB. The study covers 28 global economies with a total of 482 observations from 1989 to 2020.¹ Our sample is limited by the availability of LCY bond market data in the BIS database.

4.1 Model Specification

The model is developed to measure the effect of an LCY bond market on exchange rate volatility based on economy-fixed-effects panel regressions as shown in equation (1). The dependent variable is the volatility of exchange rate changes (*xrsd*), which is defined as the standard deviation of monthly exchange rate changes (against the US dollar) during a year.

$$xrsd_{i,t} = \beta_1 lcbm_{i,t} + \beta_3 Z_{i,t} + \eta_i + \epsilon_{i,t} \quad , \quad (1)$$

Independent variables include size of LCY bond market as a share of GDP (*lcbm*), current account balance to GDP ratio (*ca*), domestic credit to private sector as measured by bank loan to GDP ratio (*bankloan*), broad money to total reserves ratio (*reserve*), market capitalization to GDP ratio (*mktcap*), Consumer Price Index rate (*inflation*), capital inflows to GDP ratio (*capinflow*), and portfolio liabilities (*portfolio*).

Following Park et al. (2019), the analysis controls for common exchange rate volatility drivers, such as inflation; the ratios of the current account balance to GDP, foreign reserves to GDP, capital inflows to GDP, and portfolio flows to GDP; financial market development (including bank loans and stock market capitalization as shares of GDP); as well as market fixed effects to account for time-invariant market characteristics (η_i). To gauge the impact of LCY bond market development on exchange rate volatility during crisis, the study includes indicators for financial crises—including the 1997/98 Asian financial crisis, global financial crisis, and COVID-19 pandemic—as well as an interaction

¹ The 28 global economies included in the sample are Australia, Brazil, Canada, the People's Republic of China, Colombia, Croatia, Denmark, Hungary, India, Indonesia, Israel, Japan, Malaysia, Mexico, New Zealand, Norway, Pakistan, Peru, the Philippines, the Republic of Korea, the Russian Federation, Saudi Arabia, Singapore, South Africa, Sweden, Switzerland, Thailand, and Türkiye.

term between LCY bond market development variables and the crisis indicators in model specifications.

Compositional characteristics of bond markets may affect financial stability. Given the size of bond markets, a greater proportion of LCY bonds (sh_lcy) in the overall bond market, which includes foreign currency bonds, may strengthen stability. Furthermore, several existing studies indicate a greater proportion of long-term bonds can contribute to financial stability. To consider these possibilities, we additionally include the share of LCY bonds (sh_lcy) and the share of long-term bonds (sh_long) into the base model.

More developed LCY bond markets may serve as a buffer against global monetary policy shocks. In the past, sudden changes in US monetary policy have triggered financial crises in some emerging economies. Changes in monetary policy are subject to a “central bank information effect,” which suggests that central bank announcements usually reveal information about the economy that is not public. The private sector reacts to this revealed information by revising their forecasts for output and employment. Bu et al. (2021) developed a method to measure US monetary policy shock data—for events that were unpredictable and therefore did not include the central bank information effect—using a two-step procedure to identify unobserved monetary policy shock. We aggregate monthly frequency monetary policy shock data for each year to derive an annual series to match our annual economy dataset. The idea is to capture the cumulative amount of monetary policy shocks within a year. We then derive an indicator variable (mps), which takes a value of one for the tight monetary policy period and zero otherwise. This monetary shock variable (mps) is additionally considered to see whether the LCY bond market effect on exchange rate volatility is present under an unexpected US monetary shock.

4.2 Sample Construction

This study uses an economy-level unbalanced panel data composed from BIS and ADB databases. Specifically, LCY bond market data are collected from the BIS database. The main variable in question is the size of the LCY bond market as a share of GDP ($lcbm$). The size of the LCY bond market is defined as the sum of domestic debt securities and

international debt securities denominated in the domestic currency. This conforms to the LCY bond market definition used in Park et al. (2019).² As the financial and foreign exchange market are strongly influenced by the onset of financial and real global shocks, we have added a global shock dummy (*cris*) to reflect recent episodes of global shocks, including the 1997/98 Asian financial crisis, global financial crisis, and COVID-19 pandemic crisis. Summary statistics for all variables are provided in Table 1.

Table 1: Descriptive Statistics

Variables	Description	Sample (N)	Mean	Std.	Min	Max
<i>xrsd</i>	Standard deviation of exchange rate changes	482	2.124	1.326	0.002	8.130
<i>lcbm</i>	LCY-bond-market-size-to-GDP ratio	482	0.577	0.469	0.009	2.650
<i>sh_lcy</i>	Share of LCY bonds	468	0.742	0.193	0.072	1.000
<i>sh_long</i>	Share of long-term bonds	468	0.288	0.157	0.000	0.964
<i>Mps</i>	US monetary policy shock	455	0.424	0.495	0.000	1.000
<i>Ca</i>	Current-account-balance-to-GDP ratio	482	1.698	6.273	-	27.143
<i>Bankloan</i>	Bank-loans-to-GDP ratio	482	79.129	40.482	13.916	187.859
<i>Reserve</i>	Reserve-to-GDP ratio	482	7.410	8.509	0.565	59.717
<i>Mktcap</i>	Market capitalization-to-GDP-ratio	482	84.470	60.383	10.287	322.711
<i>Inflation</i>	Inflation rate	482	0.037	0.033	-0.013	0.171
<i>Capinflow</i>	Capital-flows-to-GDP ratio	482	0.103	0.232	-0.452	2.179
<i>Portfolio</i>	Portfolio-flows-to-GDP ratio	482	0.400	0.312	0.020	1.775

GDP = gross domestic product, LCY = local currency.

Source: Authors' calculations.

The correlation statistics of the annual sample are provided in Table 2, which shows the correlation between the dependent and explanatory variables. We note that the volatility of exchange rate changes and the relative size of an LCY bond market (*lcbm*) are only weakly negatively correlated, and the correlation is not statistically significant.

² We have excluded economies with data only for international debt securities, which includes Hong Kong, China and Viet Nam. We have also performed the same analyses based on only domestic debt securities and found the results to be qualitatively the same.

Table 2: Correlation Matrices of Key Variables

Variables	<i>xrsd</i>	<i>lcbm</i>	<i>sh_lcy</i>	<i>sh_long</i>	<i>mps</i>	<i>ca</i>	<i>bankloan</i>
<i>xrsd</i>	1						
<i>lcbm</i>	0.0027	1					
<i>sh_lcy</i>	-0.0963*	0.3889*	1				
<i>sh_long</i>	0.0057	-0.1683*	0.2052*	1			
<i>mps</i>	-0.0313	0.0042	-0.0128	-0.0382	1		
<i>ca</i>	-0.2322*	0.0699	-0.0513	-0.2533*	-0.0332	1	
<i>bankloan</i>	-0.0789	0.4575*	0.1840*	-0.3723*	-0.0073	0.3236*	1
<i>reserve</i>	0.0692	0.3278*	0.2073*	0.0611	-0.0122	-0.2064*	0.3346*
<i>mktcap</i>	-0.0762	0.1362*	0.2136*	0.2365*	-0.0692	0.3879*	0.3562*
<i>inflation</i>	0.3180*	-0.3832*	0.0771	0.2505*	0.0174	-0.2813*	-0.4922*
<i>capinflow</i>	-0.1878*	-0.0231	-0.0588	-0.0641	-0.1506*	0.4053*	0.1876*
<i>portfolio</i>	0.024	0.2496*	-0.1802*	-0.1000*	-0.0458	0.2978*	0.6015*

	<i>reserve</i>	<i>mktcap</i>	<i>inflation</i>	<i>capinflow</i>	<i>portfolio</i>
<i>reserve</i>	1				
<i>mktcap</i>	0.1331*	1			
<i>inflation</i>	-0.0267	-0.1544*	1		
<i>capinflow</i>	-0.0791	0.4469*	-0.1888*	1	
<i>portfolio</i>	0.1915*	0.5479*	-0.4521*	0.4078*	1

Note: * indicate statistical significance at the 10% level.

Source: Authors' calculations.

5. Empirical Results

5.1 Baseline Model Results

This subsection presents regression results evaluating the influence of LCY bond market development on exchange rate volatility. The baseline models are estimated and presented in Table 3. Models (1) through (4) successively add various control variables to the baseline model. To see whether LCY bond market effects for Asian economies are different from the rest of the world, an interaction term between *lcbm* and Asian economy dummy (*as*) is included in model (5).³ In models (1) through (5), we find that the LCY bond market effects are not statistically significant. Furthermore, the Asian economy interaction term is not significant in model (5). Thus, we do not find any evidence that development of an LCY bond market has influence over exchange rate volatility in normal times.

³ Asian economies include the People's Republic of China, India, Indonesia, Japan, the Republic of Korea, Malaysia, the Philippines, Singapore, and Thailand.

Table 3: Impact of Local Currency Bond Market Development on Exchange Rate Volatility

Variables	(1)	(2)	(3)	(4)	(5)
<i>lcbm</i>	0.156 (0.423)	0.519 (1.135)	0.345 (0.759)	0.151 (0.517)	0.246 (0.711)
<i>lcbm X as</i>					-0.284 (-0.422)
<i>inflation</i>		30.258*** (2.854)	30.412*** (2.948)	13.117*** (3.871)	13.159*** (3.875)
<i>bankloan</i>		0.019*** (5.029)	0.021*** (3.109)	0.013*** (3.224)	0.014*** (2.837)
<i>mktcap</i>		0.003 (0.669)	0.003 (0.574)	0.006* (1.829)	0.006* (1.834)
<i>ca</i>			0.017 (0.750)	0.002 (0.130)	0.002 (0.143)
<i>reserve</i>			-0.023 (-1.008)	-0.003 (-0.178)	-0.003 (-0.184)
<i>capinflow</i>				-0.995** (-2.313)	-0.982** (-2.321)
<i>portfolio</i>				-0.652 (-1.140)	-0.738 (-1.182)
Observations	714	536	523	482	482
R-squared	0.000	0.334	0.336	0.125	0.125
Number of economies	31	29	29	28	28

lcbm = size of the LCY bond market as a share of gross domestic product, *inf* = inflation rate, *bankloan* = bank loans to GDP ratio, *mktcap* = market capitalization to GDP ratio, *ca* = current account balance to GDP ratio, *reserve* = reserve to GDP ratio, *capinflow* = capital flow to GDP ratio, *portfolio* = portfolio flow to GDP ratio, *as* = Asian economies dummy.

Note: * indicate statistical significance at the 10% level, ** at 5%, and *** at 1%. The numbers in parentheses represent robust t-statistics.

Source: Authors' calculations.

In Table 4, we examine whether the LCY bond market effect is different in crisis periods. A crisis dummy (*cris*) is introduced to capture the increase in risk due to crisis affecting all economies. A potential effect of LCY bond markets in crisis periods is introduced by including an interaction term of LCY bond market size and the crisis dummy (*lcbm X cris*). These potential effects are tested for different specifications of crises. We focus on following three recent crisis events: 1997/98 Asian financial crisis, global financial crisis, and COVID-19 pandemic.⁴ Additional LCY bond market effects in all crisis periods are

⁴ The actual years considered for these crisis periods were, respectively, 1997, 2008, and 2020.

considered in models (2) and (3). The 1997/98 Asian financial crisis period is considered separately in model (4), the global financial crisis period in model (5), and the COVID-19 pandemic period in model (6).

The results show that LCY bond market crisis effects are significant for crisis period in general (model [2]). When we separate out the Asian economy group, we find that this LCY bond market crisis effect is present only for Asian economies (model [3]). They are also significant when confined to the COVID-19 pandemic (model [6]). However, the LCY bond market crisis effect is not found to be significant when confined to the 1997/98 Asian financial crisis (model [4]) or the global financial crisis (model [5]).

In particular, a 1% larger LCY bond market as a share of GDP reduced exchange rate volatility by 0.00649 (0.31% of sample mean) during the global financial crises and by 0.00795 (0.37% of sample mean) during the pandemic. In addition, a 1% larger LCY bond market as a share of GDP contributed to 0.0152 less exchange rate volatility (0.716% of sample mean) in Asian markets. Combining the results in Tables 3 and 4, we conclude that an LCY bond market stabilizing effect is observed during crisis periods, but not in normal periods. It was effective for Asian economies during the COVID-19 pandemic crisis period, which was the latest crisis, but not the two previous ones included in the study. This may be because LCY bond market development recently passed a certain threshold in Asian economies.

Table 4: Local Currency Bond Market Development and Exchange Rate Volatility during Periods of Financial Uncertainty

Variables	(1)	(2)	(3)	(4)	(5)	(6)
<i>lcbm</i>	-0.226 (-0.745)	-0.100 (-0.340)	-0.165 (-0.515)	0.304 (1.050)	0.080 (0.272)	-0.028 (-0.095)
<i>lcbm X cris</i>		-0.649** (-2.309)	0.781 (1.174)			
<i>lcbm X cris X as</i>			-1.520*** (-2.842)			
<i>lcbm X afc X as</i>				0.284 (0.842)		
<i>afc</i>				1.203** (2.335)		
<i>lcbm X gfc</i>					0.008 (0.024)	

Variables	(1)	(2)	(3)	(4)	(5)	(6)
<i>gfc</i>					1.754*** (5.538)	
<i>lcbm X covid</i>						-0.795* (-1.918)
<i>covid</i>						1.484*** (2.933)
<i>cris</i>	1.331*** (5.433)	1.744*** (5.048)	1.305*** (3.366)			
<i>inflation</i>	11.801*** (3.472)	11.703*** (3.446)	12.451*** (3.593)	13.454*** (4.013)	10.010*** (2.942)	13.850*** (3.931)
<i>bankloan</i>	0.010*** (2.948)	0.010*** (2.921)	0.011*** (3.247)	0.012*** (3.050)	0.014*** (3.728)	0.011** (2.759)
<i>mktcap</i>	0.007** (2.225)	0.007** (2.269)	0.006** (2.126)	0.006 (1.691)	0.006** (2.204)	0.007** (2.089)
<i>ca</i>	0.001 (0.055)	0.002 (0.160)	0.001 (0.061)	0.002 (0.136)	0.006 (0.491)	-0.002 (-0.160)
<i>reserve</i>	-0.005 (-0.341)	-0.004 (-0.254)	-0.009 (-0.613)	-0.003 (-0.166)	-0.006 (-0.501)	-0.002 (-0.091)
<i>capinflow</i>	-0.770** (-2.241)	-0.738** (-2.165)	-0.721** (-2.085)	-0.992** (-2.322)	-0.519 (-1.688)	-1.090** (-2.517)
<i>portfolio</i>	-0.412 (-0.762)	-0.408 (-0.770)	-0.459 (-0.877)	-0.587 (-1.020)	-0.484 (-0.821)	-0.590 (-1.127)
Observations	482	482	482	482	482	482
R-squared	0.257	0.265	0.287	0.140	0.230	0.157
Number of economies	28	28	28	28	28	28

lcbm = size of the local currency bond market as a share of gross domestic product, *inf* = inflation rate, *bankloan* = bank loans to GDP ratio, *mktcap* = market capitalization to GDP ratio, *ca* = current account balance to GDP ratio, *reserve* = reserve to GDP ratio, *capinflow* = capital flow to GDP ratio, *portfolio* = portfolio flow to GDP ratio, *as* = Asian economies dummy, *cris* = crisis dummy, *afc* = 1997/98 Asian financial crisis, *gfc* = global financial crisis dummy, *covid* = COVID-19 pandemic dummy.

Note: * indicate statistical significance at the 10% level, ** at 5%, and *** at 1%. The numbers in parentheses represent robust t-statistics.

Source: Authors' calculations.

5.2 Composition of Bonds and Financial Stability

Table 5 shows how LCY bond shares (*sh_lcy*) and long-term bond shares (*sh_long*) affect exchange rate volatility. Models (1) through (3) show that these shares have stabilizing effects on exchange rate volatility in normal times. Furthermore, these normal time stabilizing effects are shown to be robust in models (4) and (5), even when we take into account the identified LCY bond market effects during crisis periods as in model (2) of Table 4. Specifically, a 1% larger LCY bond market as a share of the total bond market

reduced exchange rate volatility by 0.019 (0.895% of sample mean), while 1% more long-term bonds (tenors of 10 years or above) as a share of the total bond market is associated with 0.026 less exchange rate volatility (1.224% of sample mean). During financial crises, a 1% larger LCY bond market as a share of the total bond market is associated with 0.006 less exchange rate volatility, as shown in model (4).

Table 5: Bond Market Currency and Maturity Profile and Exchange Rate Volatility

Variables	(1)	(2)	(3)	(4)	(5)
<i>lcbm</i>	-0.050 (-0.150)	-0.033 (-0.155)	0.147 (0.655)	0.070 (0.220)	0.251 (1.137)
<i>sh_lcy</i>	-1.942** (-2.317)		-1.737* (-1.873)	-1.948** (-2.317)	-1.747* (-1.929)
<i>sh_long</i>		-2.607** (-2.558)	-2.534** (-2.597)		-2.481** (-2.543)
<i>lcbm X cris</i>				-0.608** (-2.232)	-0.554* (-1.994)
<i>cris</i>	1.335*** (5.353)	1.305*** (5.313)	1.319*** (5.450)	1.724*** (5.162)	1.674*** (5.011)
<i>inflation</i>	10.639** (2.234)	11.966*** (2.884)	11.829*** (2.996)	10.431** (2.166)	11.614*** (2.892)
<i>bankloan</i>	0.011*** (2.884)	0.010*** (3.296)	0.010*** (3.131)	0.011*** (2.864)	0.010*** (3.117)
<i>mktcap</i>	0.004** (2.513)	0.003** (2.115)	0.005** (2.770)	0.004** (2.658)	0.005*** (2.894)
<i>ca</i>	0.002 (0.099)	-0.001 (-0.052)	-0.003 (-0.188)	0.002 (0.162)	-0.002 (-0.132)
<i>reserve</i>	-0.015 (-0.665)	-0.011 (-0.730)	-0.010 (-0.670)	-0.014 (-0.614)	-0.009 (-0.602)
<i>capinflow</i>	-0.493* (-1.847)	-0.555** (-2.193)	-0.482* (-1.913)	-0.468* (-1.737)	-0.460* (-1.805)
<i>portfolio</i>	-1.104 (-1.578)	-0.264 (-0.499)	-1.090 (-1.584)	-1.110 (-1.637)	-1.096 (-1.630)
Observations	468	468	468	468	468
R-squared	0.287	0.313	0.321	0.295	0.328
Number of economies	28	28	28	28	28

lcbm = size of the local currency bond market as a share of gross domestic product (GDP), *sh_lcy* = share of local currency bond, *sh_long* = share of long-term bond, *inf* = inflation rate, *bankloan* = bank loans to GDP ratio, *mktcap* = market capitalization to GDP ratio, *ca* = current account balance to GDP ratio, *reserve* = reserve to GDP ratio, *capinflow* = capital flow to GDP ratio, *portfolio* = portfolio flow to GDP ratio, *as* = Asian economies dummy.

Note: * indicate statistical significance at the 10% level, ** at 5%, and *** at 1%. The numbers in parentheses represent robust t-statistics.

Source: Authors' calculations.

5.3 Global Monetary Policy Shock and Financial Stability

This subsection examines whether the development of an LCY bond market contributes to exchange rate stability when US monetary policy shocks occur. As an important source of global shocks, US monetary policy has a significant impact on global exchange rates. Therefore, we examine the impact of LCY bond market development on exchange rate stability during periods of US monetary policy tightening. Following Bu et al. (2021) in measuring US monetary policy shock series data, the monthly frequency of monetary policy shocks for each year is aggregated to derive an annual series to match the dataset. The variable (*US monetary tightening*) takes a value of one for a period with tightening US monetary policy and zero otherwise.

The results in Table 6 show that LCY bond market development reduces exchange rate volatility during periods of US monetary policy tightening. We include a monetary shock variable (*mps*) to see whether the development of an LCY bond market mitigates the negative impact from US monetary policy shocks. In the face of US monetary policy shocks, exchange rate volatility is found to be more stable for economies with a more developed LCY bond market in all models considered. On average, exchange rate volatility is 0.002 (0.09% of sample mean) lower in economies with larger LCY bond markets during periods of US monetary tightening relative to smaller LCY bond markets. Such a currency stabilizing effect is general for all markets and is not only relevant in Asian and emerging markets, as shown in models (2) and (3), respectively.

Table 6: Local Currency Bond Market Development and Exchange Rate Volatility in Response to United States Monetary Policy Shocks

Variables	(1)	(2)	(3)	(4)
<i>lcbm</i>	0.383 (1.239)	0.406 (1.309)	0.424 (1.319)	0.431 (1.353)
<i>mps</i>	-0.026 (-0.220)	-0.006 (-0.052)	0.033 (0.265)	0.034 (0.275)
<i>lcbm X mps</i>	-0.231* (-1.875)	-0.202* (-1.832)	-0.225* (-1.942)	-0.207* (-1.875)
<i>lcbm X mps X as</i>		-0.227 (-1.167)		-0.158 (-0.946)
<i>lcbm X mps X em</i>			-0.257 (-1.087)	-0.200 (-0.911)

Variables	(1)	(2)	(3)	(4)
<i>inflation</i>	15.906*** (3.831)	16.027*** (3.866)	15.847*** (3.830)	15.944*** (3.850)
<i>bankloan</i>	0.013*** (3.231)	0.014*** (3.330)	0.014*** (3.289)	0.014*** (3.345)
<i>mktcap</i>	0.000 (0.052)	0.000 (0.016)	0.000 (0.059)	0.000 (0.032)
<i>ca</i>	0.010 (0.614)	0.010 (0.589)	0.009 (0.589)	0.009 (0.577)
<i>reserve</i>	-0.009 (-0.480)	-0.009 (-0.484)	-0.009 (-0.485)	-0.009 (-0.486)
<i>capinflow</i>	-0.751** (-2.246)	-0.738** (-2.205)	-0.739** (-2.208)	-0.733** (-2.191)
<i>portfolio</i>	-0.637 (-1.202)	-0.662 (-1.270)	-0.662 (-1.258)	-0.674 (-1.296)
Observations	455	455	455	455
R-squared	0.158	0.159	0.159	0.160
Number of economies	28	28	28	28

lcbm = size of the local currency bond market as a share of gross domestic product, mps = monetary policy shock, inf = inflation rate, bankloan = bank loans to GDP ratio, mktcap = market capitalization to GDP ratio, ca = current account balance to GDP ratio, reserve = reserve to GDP ratio, capinflow = capital flow to GDP ratio, portfolio = portfolio flow to GDP ratio, as = Asian economies dummy, em = emerging economies dummy.

Note: * indicate statistical significance at the 10% level, ** at 5%, and *** at 1%. The numbers in parentheses represent robust t-statistics.

Source: Authors' calculations.

6. Conclusion

This study provides empirical evidence to show that LCY bond market development contributes to financial stability during periods of global market turmoil. A larger LCY bond market was associated with less exchange rate volatility during recent financial crises, the COVID-19 pandemic, and US monetary policy shocks. A higher share of LCY bonds in the total bond market and a higher share of long-term bonds in the bond market are also generally related to less exchange rate volatility, with an extra stabilizing impact during financial crises. This evidence joins existing literature to show that LCY bond markets help stabilize the domestic currency during stress periods. LCY bond markets deliver such benefits by addressing the well-known “original sin” in emerging market borrowing, as discussed by Eichengreen and Hausman (1999), with LCY funding and longer-tenor borrowing that cushion against liquidity drains caused by investors selling risky assets amid a flight-to-safety and flight-to-liquidity.

The findings in this study provide empirical evidence that LCY bond market development can indeed help stabilize financial markets through several channels. Emerging economies benefit from having larger LCY bond markets, a greater share of LCY bonds in the overall bond market, and a greater share of long-term bonds. This study implies that emerging economies should consider designing policies to develop LCY bond markets to promote financial stability during crisis periods arising from external shocks.

An LCY bond market is only one of the factors that contributes to financial stability by fixing structural issues in the financial market. Stronger economic fundamentals also play an important role, including sufficient foreign reserves, a strong current account performance, a sound fiscal balance, and modest inflation and domestic interest rates. Emerging markets should continue to broaden the investor base in their bond markets to diversify demand for different bond maturities and risk appetite, and to enhance transparency and institutional quality in financial markets to make them more accessible to global investors. Improved liquidity and enhanced hedging tools are also important factors to attract a well-diversified investor base.

There are some important remaining issues, such as the effect of foreigners' participation in the LCY bond market. As a more developed bond market may naturally attract foreign investors, we need to further analyze the effect of greater participation of foreign investors. Carstens and Shin (2019) claimed that a greater share of foreign-owned holdings may bring about financial instability in the crisis period due to the "original sin redux." However, this effect needs to be carefully examined as the recent development of hedging instruments in the market may alleviate the problem. We leave this issue to future research.

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Local Currency Bond Market Development and Currency Stability amid Market Turmoil

This study examines the association between local currency (LCY) bond market development and currency stability. Using data from global economies, this study finds that in economies with more developed LCY bond markets, exchange rate volatility is lower during market turmoil. Currency volatility is lowered in bond markets with a greater share of LCY bonds and long-term bonds, even during normal times. The findings suggest that LCY bond market development contributes to financial stability especially during stress times.

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