HONG KONG MONETARY AUTHORITY

Research Memorandum 05/2022

15 September 2022

DOMESTIC INVESTORS AS A MARKET STABILISER IN EMERGING MARKET ECONOMIES? A SOVEREIGN DEBT MARKET PERSPECTIVE

Key Points:

- *While domestic investors are recognised as a potential stabiliser of domestic debt markets in the case of market distress, the behaviours of domestic investors from different sectors (i.e. banks, long term institutional investors (LTIIs) and central banks (CBs)) in emerging market economies (EMEs) are less studied. Given their different investment objectives and regulatory requirements, this paper studies the question: Do all domestic investors in EMEs stabilise the domestic sovereign debt market in the case of market distress?*

- *Our results suggest that, in the case of foreign capital flight, domestic LTIIs would absorb about two-thirds of foreign investors' sell-off of sovereign debt, while domestic banks would absorb the remaining one-third. In addition, domestic LTIIs would act less pro-cyclically (or even counter-cyclically) than domestic banks in response to various market risks. We also demonstrate that the development of EMEs' domestic LTIIs since the 2000s has significantly boosted LTIIs' share of holdings in sovereign debt. In contrast, the effect of the domestic banking sector's development to their holdings in sovereign debt is less significant.*

- *As such, our findings have important policy implications. To better stabilise the sovereign debt market, policymakers in EMEs should continue to broaden the domestic investor base. In particular, the participation of domestic LTIIs in the sovereign debt market should be encouraged, since they tend to alleviate the shock of foreign capital flight to local sovereign debt market.*

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The views and analysis expressed in this paper are those of the authors, and do not necessarily represent the views of the Hong Kong Monetary Authority.

*The authors would like to thank Michael Cheng and Chi-Sang Tam for their valuable comments and suggestions.

1. INTRODUCTION

Foreign participation is important for emerging markets' financial development since they reduce the problem of "original sin" in emerging market economies (EMEs) and provide liquidity to their debt markets (Peiris, 2010). However, it is also well documented in the literature that foreign investors tend to flee EMEs when their currencies are expected to depreciate (Ho, 2022) or in case of rising global risk aversion (Calvo et al., 2006). This implies that EMEs should strike a better balance by expanding the domestic investor base, as domestic investors are less sensitive to the shock of local currency depreciation and tend to "stay home" when facing global shocks[1].

While domestic investors are recognised as a "stabiliser" in the domestic debt market under market distress, the behaviours of domestic investors from different sectors are less studied. Domestic investors in the sovereign debt market can be categorised into three sectors: (i) banks, (ii) non-banks , primarily represented by long-term institutional investors (LTIIs)[2] and (iii) central banks (CBs). Given that they have different investment objectives and are subjected to different regulatory requirements, the investment decisions of each of these three sectors could be very different under the same market circumstances. In fact, the development of these three domestic sectors has been quite different since the 2000s. Chart 1 shows the asset size of the three domestic sectors in major EMEs since 2005. As shown, the banking sector was the largest investor over this 15-year horizon, with its asset size growing steadily. Starting from a smaller asset size, LTIIs also grew steadily during the 2000s.In contrast, CBs' asset size has dwindled since the global financial crisis (GFC) of 2008–2009, and edged up during the coronavirus disease (COVID-19) pandemic.

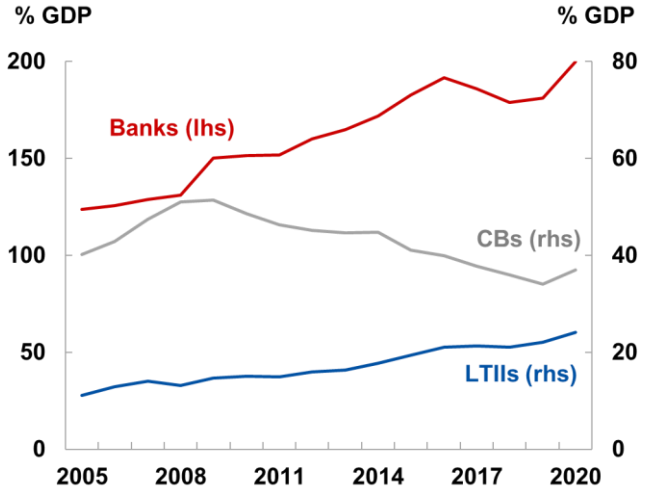
In this regard, this paper studies the question: Do all domestic investors from different sectors stabilise the domestic debt market in the case of market distress? Specifically, we answer three research questions in this paper: (1) Which domestic

[1] Please refer to Fidora et al. (2007) for the details on home bias.

[2] LTIIs comprise pension funds and insurance companies. See Fong et al. (2022) for details.

sector in EMEs absorbs most foreign investors' sell-off? (2) Which domestic sector contributes more counter-cyclical buffer upon various types of risks under normal and distress periods? And (3) Has the development of domestic sectors increased their participation in the domestic sovereign debt market over time? We focus on the sovereign debt market as detailed data of domestic participation in EMEs are only available for the sovereign debt market; moreover, we believe that the results could shed light on other asset classes.

Chart 1: Domestic Investors' Asset Size in Major EMEs



Note: Economies cover Argentina, Brazil, Chile, China, India, Indonesia, Mexico, Russia, Saudi Arabia, South Africa and Turkey.

Source: Financial Stability Board (FSB) Global Monitoring Report on Non-Bank Financial Intermediation 2021.

The rest of the paper is organised as follows. Section 2 elaborates on the cyclicality and stabilising effect of domestic investors. Sections 3 and 4 discuss the methodology and data respectively. Section 5 presents the empirical findings to our research questions. Section 6 discusses the policy implications and concludes the study.

2. STABILISATION EFFECT IN TERMS OF CYCLICALITY

This study examines the investment cyclicality of domestic banks, LTIIs and CBs in sovereign bond markets. According to Haldane et al. (2014), in the short term, pro-cyclicality is the tendency to trade that would exacerbate market movement, contribute to asset price volatility and lead to asset price feedback loops. In the medium term, pro-cyclicality is the tendency to buy and sell based on asset price and economic cycles. In contrast, the counter-cyclicality is considered as the opposite of pro-cyclicality, which is the tendency to neutralise volatilities and stabilise the markets. In this view, we define pro-cyclicality as the trading behaviour that *reduces* domestic sovereign debt holdings in response to intensifying risk factors. Likewise, we define counter-cyclicality as the trading behaviour that *increases* domestic sovereign debt holdings in response to intensifying risk factors.

Among the three domestic sectors, banks appeared to have the strongest incentive to engage in flight-to-quality trading, and hence are likely to trade pro-cyclically (Martynova et al., 2015). The liabilities of banks are primarily comprised of deposits and interbank borrowing. Among multiple types of liabilities held by banks, the relatively short-term liabilities (e.g. interbank borrowing) are more sensitive to changes in monetary conditions and market sentiments. Once risk factors trigger a systematic liquidity squeeze, banks may be forced to sell their securities below the fundamental value (i.e. a fire sale) to satisfy capital requirements (Papaioannou et al., 2013; Timmer, 2018).

Compared with banks, LTIIs tend to trade less pro-cyclically or even counter-cyclically. This is because their sources of funding are more dependent on entrusted funds and long-term financial instruments. Such predictable payout schemes and long-term liability structure allow LTIIs to exercise greater autonomy in portfolio management and engage in value trading during normal scenarios (Impavido et al., 2009; Timmer, 2018). Nonetheless, their cyclicality may also reverse during market distress. Their risk-bearing capabilities are confined by regulatory requirements or investment mandates, which prevent them from taking excessive risks (Aramonte et al., 2021; OECD, 2019; Papaioannou et al., 2013).

Among the three domestic sectors, CBs tend to be the most counter-cyclical because they play an essential role in mitigating systemic risk in their economies, according to their mandate. When making investment decisions, CBs are more likely to prioritise achieving their pre-defined monetary policy stance, maintaining a stable financial system, stabilising inflation and supporting growth (Ehrmann & Fratzscher, 2005; Fischer, 2015; Macklem, 2011). In many cases, CBs are less concerned with investment return.

3. METHODOLOGY

a. Baseline model

In this study, we estimate the share of sovereign debt held by domestic sector k (i.e. banks, LTIIs and CBs) in economy i in quarter t, $Domestic_{it}^{k}$, by the following fixed-effect panel regression model:

$$Domestic_{i,t}^{k} = \alpha_i^k + \beta_1^k Foreign_{i,t-1} + \beta_2^k Risk_{i,t-1} + \gamma^k Control_{i,t-1} + e_{i,t}^k \quad (1)$$

Where α_i^k is the fixed effect, $Foreign_{it-1}$ is the share of sovereign debt held by foreign investors, $Risk_{i,t-1}$ is a list of risk factors, $Control_{i,t-1}$ is a list of control factors and $e_{i,t}^k$ is the error term. Following Timmer (2018), all independent variables are lagged by one quarter to circumvent the concern of endogeneity and reverse causality. From the above regression model, β_1^k captures the impact of one unit change in foreign share to the share of domestic sector k; β_2^k reflects the impact of an increase in risk factors to the share of domestic investors of sector k, representing their cyclicalities towards different risk factors.

In principle, any decrease in the share of foreign investors is completely absorbed by domestic investors. Hence the following equation would largely hold:

$$\widehat{\beta_1^{Banks}} + \widehat{\beta_1^{\text{LTIIs}}} + \widehat{\beta_1^{CBs}} \approx -1 \quad (2)$$

We compare the magnitudes of the coefficients and verify which domestic investor sector would be the major absorber in response to an exodus of foreign capital.

b. Extension: Cyclicality in normal and distress periods

To examine whether the investment cyclicality of domestic investors would change from normal periods to market distress periods, we introduce an interacting term of market distress indicator and risk factors in the following extended model:

$$Domestic_{it}^{k} = \alpha_i + \beta_1^k Foreign_{i,t-1} + \delta D_t + \mathrm{B}_2^k Risk_{it-1} + \mathrm{B}_3^k D_t \times Risk_{it-1} + \sum \gamma Control_{it-1} + e_{it}^k \quad (3)$$

where D_t is a time variant dummy which equals 1 when the market is in distress period and 0 otherwise. In the above expression, B_2^k measures the impact of the risk factor to the share of domestic investors of sector k during normal periods, while $\mathrm{B}_2^k + \mathrm{B}_3^k$ measures that during distress periods. As such, if the sign of the latter is significantly different from the former, then the cyclicality of the sector changes when market conditions become stressed.

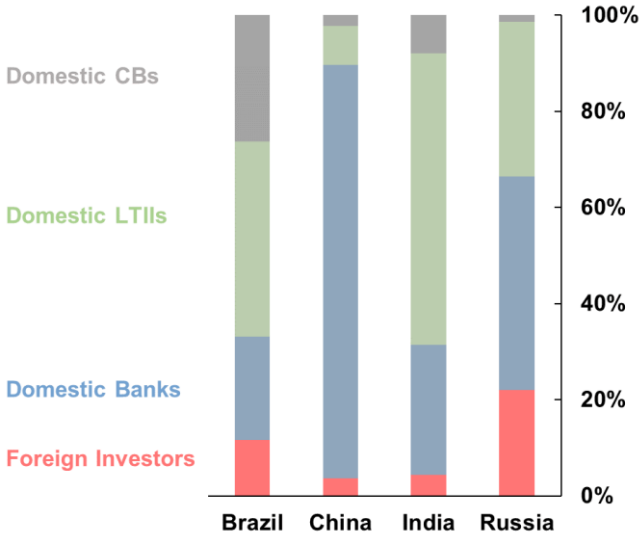
4. DATA

a. Share of sovereign debt holdings

The data of the share of sovereign debt holdings by domestic investors of different sectors in the dependent variables, and those held by foreign investors in the independent variable, are obtained from the sovereign investor base estimated by Arslanalp and Tsuda (2014).

The sovereign debt investor base varies across EMEs. Chart 2 illustrates the share of sovereign debt holdings by sector in four major EMEs (Brazil, Russia, India and China, i.e. BRIC) in the fourth quarter of 2020. Overall, the distribution of the investor base in EMEs is highly heterogeneous, which is conceivably due to the divergence in economic structures, policies and stages of development. As shown in Chart 2, Brazil has the most balanced composition of sovereign debt investors. Compared with Brazil, the domestic CB share in China is substantially lower, and domestic banks in China hold a dominant portion of sovereign debt.

Chart 2: Sovereign Debt Investor Base in Selected EMEs



Note: Data as of the fourth quarter of 2020.

Source: Arslanalp and Takahiro Tsuda (2014).

b. Risk factors and cyclicalities

In this section, we identify three types of potential risk factors in sovereign bond markets and examine the responses of each domestic sector to the risks.

The first risk factor is sovereign credit risk, which is measured by the credit default swap (CDS) spreads. A larger CDS spread reflects a deteriorating sovereign credit condition, hence a negative (positive) relationship between the CDS spread and the share of domestic holdings of the sector indicates a pro-cyclical (counter-cyclical) trading behaviour of the domestic sector.

The second risk factor is local currency depreciation. This is measured by the log difference of the real effective exchange rate (REER). A negative value indicates a depreciation of local currency against a basket of other currencies. Therefore, a positive (negative) relationship between the foreign exchange (FX) return and the share of domestic holdings of the sector indicates a pro-cyclical (counter-cyclical) trading behaviour of the domestic sector.[3]

The third risk factor is US monetary tightening, which is captured by the Wu-Xia Shadow Federal Funds Rate (in short, the Wu-Xia Rate). The Wu-Xia Rate quantifies the holistic stance of US monetary policy at the zero lower bound. Similar to the traditional federal funds rate, the higher Wu-Xia Rate reflects a less accommodative US monetary policy stance, and hence a tighter US dollar liquidity condition in the international market. Therefore, a negative (positive) relationship between the Wu-Xia Rate and the share of domestic holdings of the sector indicates a pro-cyclical (counter-cyclical) trading behaviour of the domestic sector.

[3] Alternatively, we have tested using the DXY index as the currency factor, as the literature suggests that a weaker dollar would cause large capital inflows to EMEs (e.g. Hofmann et al., 2022). The results are however less significant than those using the REER.

Table 1 summarises the description of these risk factors and the meaning of the signs of estimated coefficients.

Table 1: Risk Factors in Equations (1) and (3)

Risk	Variable	Coefficient sign for pro-cyclical behaviour
Sovereign credit risk	CDS spread	Negative
Local currency depreciation	Return of REER	Positive
US monetary tightening	Wu-Xia Rate	Negative

c. Dummy for distress periods

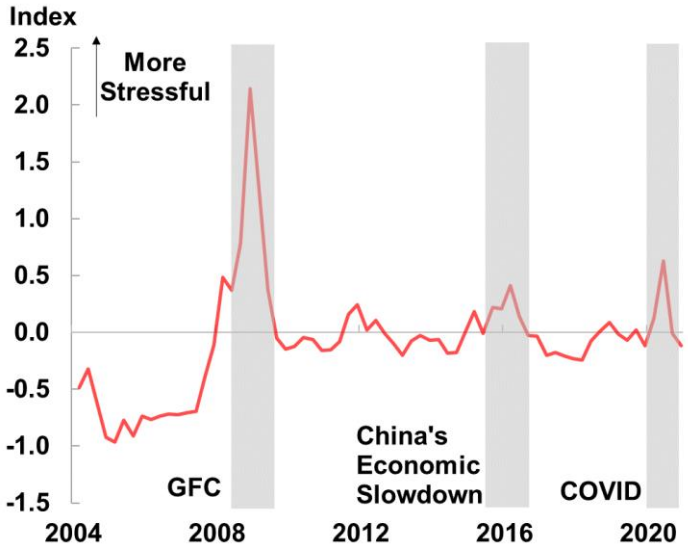
We use the Financial Stress Index (FSI) for emerging market constructed by the US Office of Financial Research (OFR) to capture the distress periods. The FSI comprises various types of financial variables, including credit, equity valuation, safe assets and volatility. The value of the FSI is positive when stress levels are above average, and negative when stress levels are below average. Chart 3 shows the FSI from 2004 to 2020. The index spiked during the GFC in 2008 and swung up in several distress episodes, including the unfolding of the European sovereign debt crisis in 2011, fears of a hard landing for the Chinese economy in 2015 and the COVID-19 outbreak in 2020.

With the FSI, we use the method of Fong et al. (2021) to define the distress period: A distress period is defined as any period when the value of the FSI is greater than the 75th percentile of its sample.[4] This definition could be represented by Equation 4:

$$D_t = \begin{cases} 1, & FSI_t \geq 75th\ \ pct \\ 0, & Otherwise \end{cases} \qquad (4)$$

[4] To check the robustness of the findings, we also re-estimate the results using different percentiles (65th, 70th and 80th) and an alternative definition (a positive FSI). These results are largely consistent with the main results.

Chart 3: Financial Stress Index for Emerging Markets



Source: OFR.

d. Other variables

The market development of domestic sectors is captured by each sector's annual change in asset size as a share of gross domestic product (GDP). A positive coefficient indicates that an acceleration of market development in that domestic sector can boost that sector's participation in the sovereign debt market.

For other control variables, we follow Beirne et al. (2021) and Ho (2019) to include domestic stock index returns (in terms of log difference), consumer price inflation and the government debt-to-GDP ratio in the regression model.

e. Data sample and frequencies

We selected the sample EMEs according to the following criteria: (i) the economy is classified as an "emerging market and developing" economy by the International Monetary Authority (IMF), and (ii) data on a breakdown of the domestic investor base is available. The following 21 EMEs are in the sample: Argentina, Brazil, Bulgaria, Chile, China, Colombia, Egypt, Hungary, India, Indonesia, Latvia, Lithuania, Malaysia, Mexico, Peru, the Philippines, Poland, Romania, South Africa, Thailand and Turkey. The sample period is from 2004 to

2020, subject to the availability of a breakdown of the domestic investor base.

Data are available at different frequencies, ranging from daily to yearly. To align them with the quarterly dependent variables, all variables are transformed to quarterly frequency. Variables with higher frequency are transformed by taking the quarterly average, while those with lower frequency are repeated by the previous observation between two data points. Details of data and their descriptive statistics are reported in the Appendix, in Table A1 and Table A2 respectively.

5. KEY FINDINGS

i. Which domestic sector absorbs the most foreign sell-off?

Columns (1) to (3) in Table 2 show the baseline estimation results of Equation (1). The sum of the estimated coefficients of foreign share across three domestic sectors is –0.94, which is largely consistent with Equation (2) (i.e. the sum of the coefficients equals –1). Chart 4 depicts the contribution of the foreign sell-off absorbed by domestic investor sectors based on these estimated coefficients. As shown, for each unit of sovereign debt sold by foreign investors, domestic banks will absorb about one-third of the debt and LTIIs will absorb two-thirds. However, CBs are less responsive to foreign sell-off. Hence, in the case of large-scale foreign capital flight, LTIIs would act as a major stabiliser, followed by banks.

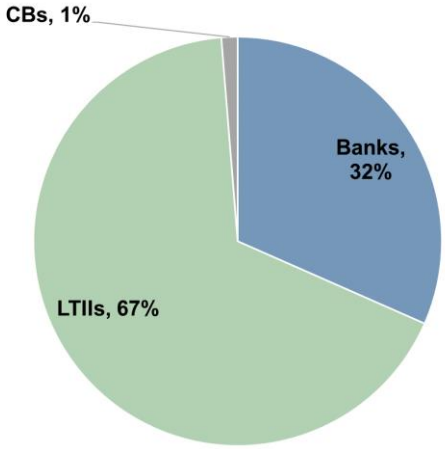
Table 2: Estimation Results on Equation (1) and (2)

	(1) Banks	(2) LTIIs	(3) CBs	(4) Banks	(5) LTIIs	(6) CBs
Foreign share (%)	–0.296** [–4.44]	–0.629** [–6.57]	–0.012 [–0.15]	–0.295** [–4.41]	–0.630** [–6.50]	–0.013 [–0.15]
CDS (%)	–0.048** [–6.33]	–0.042** [–3.90]	0.100** [7.69]	–0.047** [–4.39]	–0.004 [–0.32]	0.095** [6.84]
REER (log diff.)	0.717 [0.19]	5.75 [0.96]	–5.291* [–2.25]	2.465 [0.51]	4.021 [0.63]	–5.432^ [–1.75]
Wu-Xia Rate (%)	–0.317* [–2.25]	0.408^ [2.01]	–0.008 [–0.03]	–0.355* [–2.18]	0.443* [2.21]	–0.004 [–0.02]
Distress				0.125 [0.49]	0.264 [1.00]	–0.155 [–0.48]
Distress × CDS				–0.001 [–0.09]	–0.054** [–7.91]	0.007 [1.51]
Distress × REER				–4.303 [–0.92]	3.527 [0.82]	0.373 [0.12]
Distress × Wu-Xia				0.228 [0.85]	–0.132 [–0.62]	–0.035 [–0.24]
Stock index (log diff.)	–4.167** [–2.91]	–0.386 [–0.14]	4.347 [1.65]	–3.606* [–2.62]	–0.544 [–0.22]	4.104^ [1.84]
Inflation (% year-on-year)	–0.088 [–1.27]	0.049 [1.04]	0.028 [0.34]	–0.096 [–1.37]	0.043 [0.83]	0.032 [0.36]
Government debt (% GDP)	0.003 [0.04]	0.021 [0.29]	–0.045 [–0.52]	0.004 [0.07]	0.02 [0.26]	–0.045 [–0.52]
Constant	37.940** [15.33]	52.289** [17.74]	8.270** [3.26]	37.816** [15.17]	52.288** [17.47]	8.338** [3.15]
No. of observations	1135	1135	1135	1135	1135	1135
No. of economies	21	21	21	21	21	21
R-squared	0.198	0.463	0.067	0.200	0.465	0.067

Note: The dependent variables are the share of sovereign debt holdings by each domestic investor sector. All independent variables, except the distress dummy, are lagged by one quarter. All regressions are estimated at a quarterly frequency with economy fixed effect using the Huber-White robust standard error. T-values are in parentheses. **, * and ^ denote significance at the 1%, 5% and 10% levels respectively.

Source: Authors' estimation.

Chart 4: Contribution to Absorption of Foreign Sell-off by Domestic Sector



Note: Rebased from the coefficients of foreign share in columns (1) to (3) of Table 2.

Source: Authors' estimation.

ii. Cyclicality of domestic investor sectors towards different risk factors

Columns (1) to (3) in Table 2 also report the cyclicality of domestic sectors under different risk scenarios based on Equation (1). Columns (4) to (6) report the estimation results that include the interacting terms, with the market distress dummy based on Equation (3). The estimated cyclicality of different sectors towards different risk factors are summarised below:

Sovereign credit risk:

The significantly negative estimated coefficients of the CDS spread in columns (1) and (2) indicate that, in general, domestic banks and LTIIs tend to reduce their participation in the domestic sovereign debt market when CDS spreads increase, i.e. they act pro-cyclically when sovereign credit risk intensifies. The results shown in column (4) suggest that such pro-cyclicality of domestic banks appears to be consistent regardless of whether there is market distress or not. However, column (5) shows that LTIIs are only pro-cyclical towards the sovereign credit risk when there is market distress (i.e. LTIIs are less responsive to the sovereign credit risk during normal periods).

In contrast, column (3) shows that CBs will increase their holdings when the CDS spread increases, i.e. CBs act counter-cyclically towards sovereign

credit risk. Column (6) shows that such counter-cyclical behaviour is consistent regardless of whether there is market distress or not.

Local currency depreciation:

The insignificant estimated coefficients of FX risk in columns (1) and (2) in Table 2 indicate that both domestic banks and LTIIIs are not responsive to the local currency exchange rate, which is consistent with the results shown by Ho (2019). In contrast, the significantly negative coefficient of FX risk in column (3) shows that CBs tend to increase (decrease) their holdings when local currency depreciates (appreciates). Columns (4) to (6) confirm that these cyclicalities are not altered by the presence or absence of market distress.

US monetary tightening:

The significantly negative estimated coefficient of the Wu-Xia Rate in column (1) indicates that domestic banks will reduce their sovereign debt holdings when the US Federal Reserve tightens its monetary policy stance, i.e. domestic banks in EMEs trade pro-cyclically when US monetary policy is tightened. In contrast, the positively significant estimated coefficient of the Wu-Xia Rate in column (2) suggests that LTIIs tend to increase the holdings when the US Fed tightens its monetary policy, i.e. the domestic LTIIs tend to trade counter-cyclically in this case. Meanwhile, CBs are not sensitive to US monetary policy. Columns (4) to (6) confirm that these cyclicalities are the same in both normal and distress periods.

Table 3 summaries the cyclicalities of the three domestic sectors towards different risk factors. Overall, the results reveal that the stabilising effect offered by domestic LTIIs is larger and covers more risk factors than that offered by domestic banks.

Domestic banks generally act pro-cyclically in response to intensifying market risks, amid the regulatory requirement on capital adequacy. The regulatory requirement implies that banks should not be exposed to excessive risk. Banks' pro-cyclicality towards the tightening US monetary policy stance could also be partly explained by domestic banks' higher dependence on the funding channel through the

interbank market and short-term financial instruments, as this dependence means that they are highly sensitive to global liquidity conditions.

Table 3: Cyclicalities of Domestic Investors towards Risk Factors

	Banks	LTIIs		CBs
Sovereign credit risk	Pro	Normal: (n.s.)	Distress: Pro	Counter
Local currency depreciation	(n.s.)	(n.s.)		Counter
US monetary tightening	Pro	Counter		(n.s.)

Note: Based on the estimation in Table 2. Pro: Pro-cyclical; Counter: Counter-cyclical; (n.s.): Not significant.
Source: Authors' estimation.

On the contrary, our results about domestic LTIIs may be explained by the sector's balance sheet structure and investment mandate. As discussed, LTIIs tend to have longer-term liabilities and a more predictable payout structure. These balance sheet characteristics allow them to have more autonomy in portfolio management during normal periods, and allow them to view periods of market volatility as potential investment opportunities. These results are also consistent with those of Fischer (2015) and Timmer et al. (2018). Also, the results of pro-cyclicality towards sovereign credit risk during distress periods are in line with the previous literature (e.g. Papaioannou et al., 2013). This could be explained by the regulatory requirements, accounting changes, and investment mandates of pension funds and insurance companies. The regulations on mark-to-market accounting and strict solvency regimes are some of the common causes leading to pro-cyclical asset sales in response to rising systematic risk. For example, with certain requirements on investment grade, pension funds might be forced to sell their holdings if the rating of a security is downgraded.[5] Meanwhile, this pro-cyclicality can also be explained by

[5] The OECD Annual Survey of Investment Regulation of Pension Funds 2019 suggested that the asset allocation of pension funds is regulated by a set of rules (e.g. weighting of asset allocation, investment grade and executive order) in a considerable number of economies.

the knock-on effects triggered by the haircuts or fire sales of other market participants (e.g. domestic banks or foreign investors) during distress periods, which might trim the risk-bearing capability that LTIIs can take normally (Aramonte et al., 2021).

Meanwhile, CBs tend to act to stabilise the market when potential shocks threaten financial stability and economic growth (e.g. sovereign credit risk and exchange rate risk), and are less sensitive to any non-systematic risks (e.g. US monetary policy). These results can be supported by the arguments of Macklem et al. (2011) that the main legal frameworks of CBs aim at mitigating systematic risk and stabilising the financial market.

iii. Impact of domestic sectors' development on their domestic participation

To study whether the development of domestic sectors can increase their participation in the sovereign debt market, we augment equation (1) by including the development factor – measured by the asset size of each domestic sector – as an independent variable.

Table 4 reports the results of the impact of domestic sector developments on each sector's share of sovereign debt holdings. Our results show that the asset size of the banking sector has no significant effect on banks' holding of domestic sovereign debt, while the larger asset sizes of LTIIs and CBs appeared to boost their domestic sovereign debt holding. As such, an expansion (contraction) in domestic LTIIs' and CBs' assets tends to increase (decrease) their shares of sovereign debt holdings. Overall, based on these results, it is feasible to broaden the domestic investor base of the sovereign debt market by promoting the development of LTIIs.

Table 4: Estimation Results on Market Development

	(1) Banks	(2) LTIIs	(3) CBs
Banks' assets (change in % GDP)	0.002 [0.51]		
LTIIs' assets (change in % GDP)		0.010** [3.62]	
CBs' assets (change in % GDP)			0.019** [4.07]
Foreign share (%)	–0.303** [–4.56]	–0.622** [–6.67]	–0.02 [–0.34]
CDS (%)	–0.047** [–6.63]	–0.039** [–4.01]	0.079** [6.72]
REER (log diff.)	1.772 [0.42]	3.045 [0.50]	–4.064^ [–1.89]
Wu-Xia Rate (%)	–0.308* [–2.30]	0.387^ [2.05]	–0.066 [–0.34]
Stock index (log diff.)	–3.645* [–2.39]	–2.39 [–0.89]	4.538* [2.14]
Inflation (% year-on-year)	–0.094 [–1.44]	0.061 [1.31]	0.107 [1.20]
Government debt (% GDP)	0.009 [0.16]	0.022 [0.29]	–0.035 [–0.53]
Constant	37.779** [17.16]	50.305** [17.07]	5.172** [2.85]
No. of observations	1,113	1,113	1,113
No. of economies	21	21	21
R-squared	0.208	0.480	0.256

Note: The dependent variables are the share of sovereign debt holdings by each domestic investor sector. All independent variables are lagged by one quarter. All regressions are estimated at a quarterly frequency with economy fixed effect using the Huber-White robust standard error. T-values are in parentheses. **, * and ^ denote significance at the 1%, 5% and 10% levels respectively.

Source: Authors' estimation.

6. CONCLUSION AND POLICY IMPLICATIONS

To conclude, our study shows that different domestic sectors in EMEs provide different stabilising effects to domestic sovereign debt markets. In the case of foreign capital flight, domestic LTIIs absorb about two-thirds of foreign investors'

sell-off of sovereign debt, while domestic banks would absorb the remaining one-third. Domestic LTIIs would act less pro-cyclically (or even counter-cyclically) than domestic banks in response to various market risks. That said, during periods of market distress, domestic LTIIs would trade pro-cyclically, which could be explained by the investment mandates or regulatory requirements they are subjected to. These results suggest that domestic LTIIs overall can exert more of a stabilising effect than domestic banks on the sovereign debt markets in EMEs. On the other hand, we also provide evidence that CBs would act counter-cyclically when potential shocks threaten financial stability and economic growth.

We also demonstrate that the development of EMEs' domestic LTIIs since the 2000s has significantly boosted their share of holdings in domestic sovereign debt. In contrast, the effect of the domestic banking sector's development on the sector's sovereign debt holdings is less significant.

As such, our findings have important policy implications. To better stabilise the sovereign debt market, policymakers in EMEs should continue to broaden the domestic investor base. In particular, the participation of domestic LTIIs in the sovereign debt market should be encouraged, since they tend to alleviate the shock of foreign capital flight to local sovereign debt market.

To reinforce the participation of LTIIs in sovereign debt markets, policymakers could foster their growth and development. For instance, authorities in EMEs can encourage members of the rising middle class to increase their investment proportion in local pension funds for their future retirement plans, or expand the scope and product diversity of the retail sovereign bond market (e.g. inflation-linked bonds and silver bonds) to satisfy the different investment mandates of domestic LTIIs.

Appendix

Table A1: Data Description and Source

Variable	Description	Source
Dependent variable		
Share of sovereign debt held by domestic investors (Domestic)	Share of sovereign debt held by domestic banks, long-term institutional investors and central banks (CBs). In percentage.	Arslanalp and Tsuda (2014)
Independent variables		
Foreign share (Foreign)	Share of sovereign debt held by foreign investors. In percentage.	Arslanalp and Tsuda (2014)
Credit default swap spread (CDS)	Sovereign 10-year credit default swap spread which gauges the default risk of an economy. In basis point.	Capital IQ
Wu-Xia Shadow Federal Funds Rate (Wu-Xia Rate)	An alternative US short-term interest rate, which is not bounded below by zero. It can better reflect the monetary condition during a period of zero lower bound. In percentage.	Federal Reserve Bank of Atlanta
Real effective exchange rate (REER)	The real effective exchange rate for each individual economy, where a larger value indicates an appreciation of the economy's currency against a broad basket of currencies. In first difference of logarithm.	Oxford Economics
Dummy for distress periods (D)	A measure for market distress periods which is based on the value of Financial Stress Index (FSI) for emerging market economies (EMEs). This index can act as the proxy for financial stress. The dummy equals 1 if the current value is larger than the 75th percentile of historical values of the FSI, and 0 otherwise.	US Office of Financial Research (OFR)
Deposit money banks' assets to GDP ratio	Total assets held by deposit money banks as a share of GDP. In percentage.	World Bank
LTIIs assets to GDP ratio	Represented by the ratio of assets of pension funds to GDP. In percentage.	World Bank
CB assets to GDP ratio	Ratio of central bank assets to GDP. In percentage.	World Bank
Stock index	Major stock index in each individual economy. In first difference of logarithm.	CEIC
Inflation	Consumer price index (CPI) year-on-year percentage change in each individual economy. In first difference.	Oxford Economics
Government debt to GDP ratio	Government debt to GDP ratio. In first difference.	CEIC

Table A2: Descriptive Statistics

Variable	N	Mean	SD	Min	P25	Median	P75	Max
Share held by domestic banks (%)	1,632	25.72	16.28	2.93	14.79	22.11	31.67	86.79
Share held by domestic LTIIs (%)	1,632	28.46	18.11	0.02	13.02	25.68	41.74	68.79
Share held by domestic central banks (%)	1,632	7.90	9.52	0.00	0.36	3.74	12.31	47.42
Share held by foreign investors (%)	1,632	37.92	20.75	1.40	21.25	37.10	53.50	84.79
CDS (10-year) (bps)	1,561	311.20	841.17	10.96	124.02	180.82	267.49	10,986.41
Wu-Xia Rate (%)	1,632	0.82	2.18	-2.92	-1.07	0.48	2.14	5.19
FSI (Index point)	1,632	-0.09	0.48	-0.96	-0.22	-0.07	0.05	2.14
REER (log-diff)	1,541	0.00	0.04	-0.37	-0.01	0.00	0.01	0.20
Inflation (%)	1,564	5.68	6.15	-2.77	2.58	4.14	7.09	56.28
Government debt (% GDP)	1,294	41.61	18.27	3.30	28.43	40.30	51.89	116.82
Stock index (log-diff)	1,453	0.02	0.12	-0.85	-0.03	0.03	0.08	0.51
Deposit money bank's asset to GDP ratio (%)	1,464	92.79	9.85	52.81	90.06	97.90	99.33	100.00
LTIIs assets to GDP ratio (%)	1,416	15.05	22.01	0.02	1.91	6.38	14.55	99.66
Central bank assets to GDP ratio (%)	1,464	4.70	7.01	0.00	0.39	1.91	5.29	49.16

Source: Authors' calculation.

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