

Financial market development and financial stability

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Abstract

This paper analyses the financial stability implication of financial market development in emerging markets. On the one hand, financial market development has enhanced resilience and improved domestic financial stability by providing new tools to raise funds and manage risks. On the other hand, high foreign participation in local currency government bond markets, growing private sector foreign currency debt levels and the growing role of non-bank financial institutions have increased external vulnerabilities. These trade-offs raise several policy challenges such as developing hedging markets, improving monitoring of FX flows and implementing macroprudential tools and FX intervention. The paper concludes with some financial stability implications of fintech.

JEL classification: D47, G23, G28, G38, O3.

Keywords: financial market development, financial stability risks, capital markets, fintech.

Introduction

Financial market development (FMD) has improved overall financial resilience in emerging market economies (EMEs) over the last two decades, according to many of the central bank contributions for this meeting. But FMD has also meant a greater role for market dynamics, bringing “new” risks to the fore, in particular as EMEs become increasingly integrated into the global financial system.

This paper analyses the financial stability implications of FMD over the last 20 years. It begins with a brief overview of how FMD has interacted with domestic financial stability. Concentrating on the areas where FMD has had the greatest impact in recent decades, it then turns to the main focus of this paper: the financial stability implications of greater global integration of EMEs’ government and corporate bond markets as well as their FX markets. The subsequent section evaluates the measures EME central banks have introduced to monitor and mitigate these risks. The note concludes with a forward-looking section that explores the financial stability issues that are raised by fintech companies which provide credit.

FMD and domestic financial stability risks

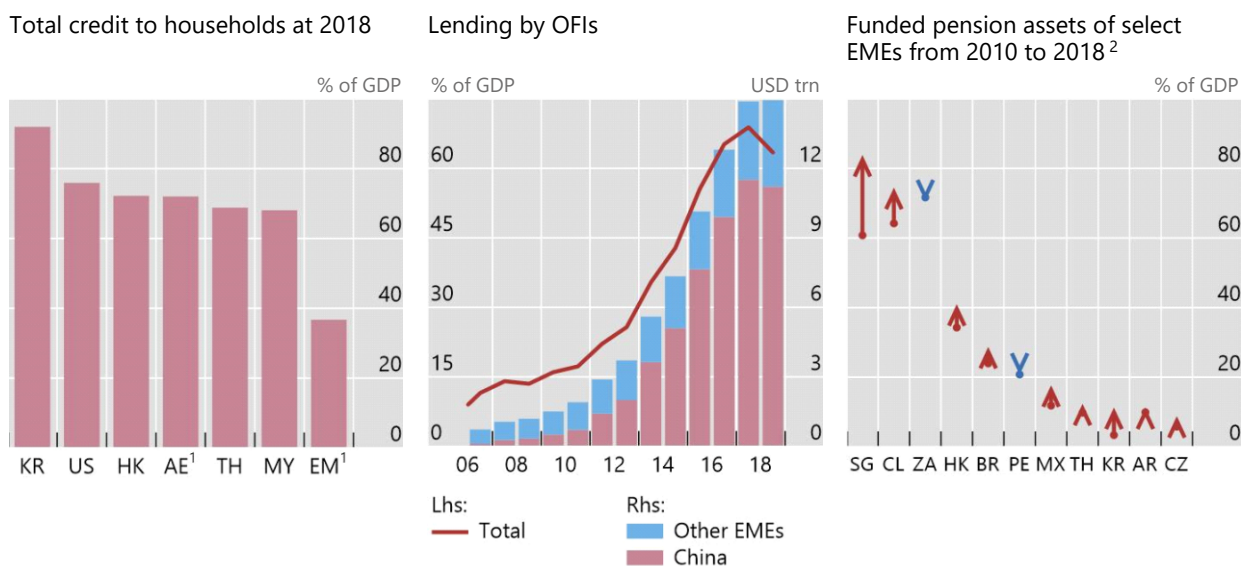
In the aftermath of the crises in the 1990s, many EMEs sought to encourage FMD. As a result, capital markets have deepened, becoming more liquid and resilient. On some measures, equity and government bond markets in some EMEs are now comparable in size with those in small open AEs. That said, financial intermediation remains heavily bank-based, in particular for household lending.¹

As markets have developed, the private non-financial sector has become more indebted. Corporate borrowing has been rising rapidly. And total credit to EME households has almost doubled over the past decade. In several Asian EMEs, household credit relative to GDP has now reached levels similar to, or even higher than, those in the United States and some other advanced economies (AEs) (Graph 1, left-hand panel).

Although banks maintain their dominance, lending by non-bank financial intermediaries (NBFIs) has increased quickly, their financial assets almost tripling from 2007 to reach 86% of GDP in 2018.² Expansion was especially rapid in China, where the assets of other financial intermediaries (OFIs), a sector dominated by investment funds, soared from \$270 billion in 2007 to \$11 trillion in 2018 (Graph 1, centre panel). Assets of pension funds have also grown in many EMEs, reflecting the strengthening of existing voluntary pension systems or the launching of new mandatory schemes (Graph 1, right-hand panel). But, except in a few jurisdictions, their size remains relatively small.

¹ See accompanying chartpack for details.

² See FSB (2020).



¹ Aggregates of all jurisdictions. ² Red arrow: an increase from 2010 to 2018; blue arrow: a decrease from 2010 to 2018.

Sources: FSB; IMF, *World Economic Outlook database*; BIS survey; BIS.

On balance, these developments have enhanced resilience and reduced domestic financial stability risks, as judged by several contributions to this meeting. Deeper financial markets should improve efficiency, by providing new tools to raise funds and manage risks. At the same time, a more diverse investor base can improve risk-sharing. And, despite rapid credit growth, key indicators generally suggest the banking sectors of many EMEs are healthy.

But growing private sector debt levels and the growing role of NBFIs may also mean increased vulnerabilities. High and rising private debt levels have been at the centre of many financial crises, including in EMEs. And shadow banking lay at the heart of the Great Financial Crisis. That said, other than in China, India and Korea, the size of the NBFIs sector is still very small. Several country contributions do not consider shadow banking a significant source of systemic risk.³

FMD and cross-border vulnerabilities

Cross-border capital flows have long been a major driver of financial stability risks in EMEs. FMD over the past two decades has changed the currency composition of EMEs' assets and liabilities as well as the investor universe. These changes have important implications for EMEs' external vulnerabilities.

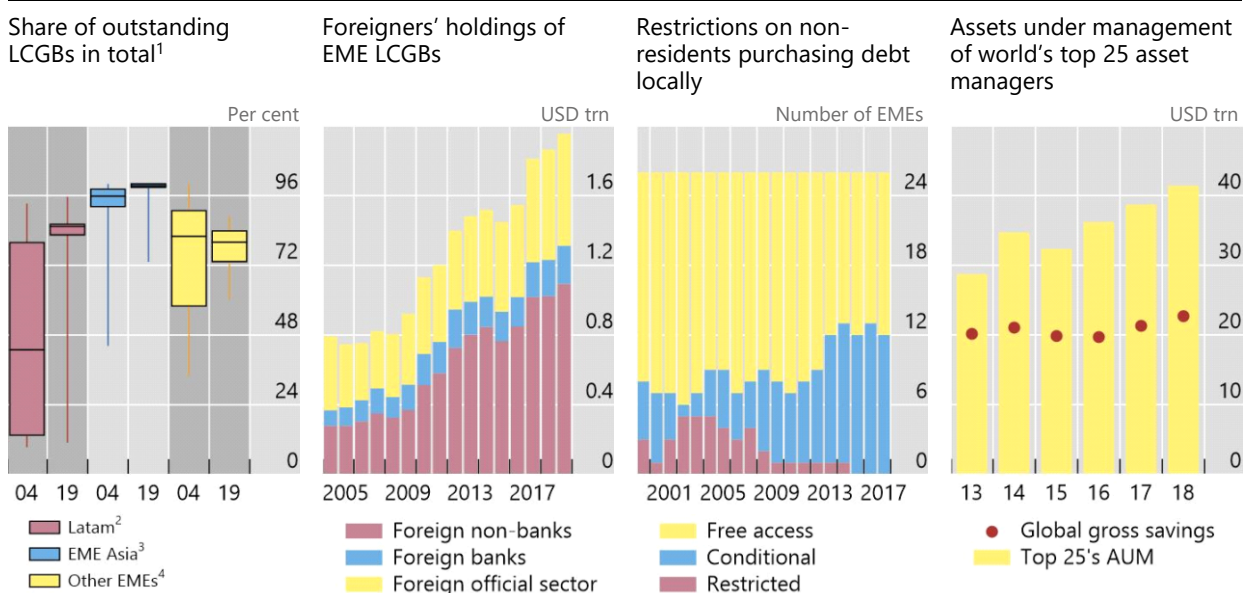
³ Furthermore, to reduce regulatory arbitrage between NBFIs and banks, some jurisdictions subject NBFIs to the same regulatory provisions as banks or "right-size" regulatory measures based on the scale and risks posed by the activities (eg Russia, Saudi Arabia or Singapore).

High foreign participation in local currency government bond markets

The deepening of local currency government bond (LCGB) markets has been one of the most successful aspects of FMD in many EMEs. This has been particularly so in Latin America, where the median share of government bonds denominated in domestic currency rose from 43% at end-2004 to 85% at end-2019 (Graph 2, first panel).

Foreign participation drove the development of LCGB markets

Graph 2



¹ Box and whisker plots show median, interquartile range and range. ² Argentina, Brazil, Chile, Colombia, Mexico and Peru. ³ China, Hong Kong SAR, India, Indonesia, Korea, Malaysia, the Philippines, Singapore and Thailand. ⁴ The Czech Republic, Hungary, Israel, Poland, Russia, Saudi Arabia, South Africa and Turkey.

Sources: Thomson Reuters Refinitiv; IMF, *AREAER, Sovereign Debt and World Economic Outlook* databases; IPE.

Policies to encourage foreign participation, coupled with the search for yield amid global low interest rates, have been important drivers. Non-resident holdings of EME LCGBs rose steadily from \$800 billion in 2004 to almost \$2 trillion in 2019 (Graph 2, second panel). Several FMD developments helped: first, as part of the efforts to diversify the investor base, many EMEs relaxed capital account restrictions on foreign participation in local bond markets (Graph 2, third panel).⁴ Second, as the size and liquidity of these markets grew, EME local government bonds emerged as a global asset class, stoking demand from institutional investors. For example, both the Bank of Mexico and the Central Bank of Colombia papers note that the inclusion of LCGBs into a global index was supportive for the domestic bond market development.

⁴ Since 2010, an increasing number of EMEs have introduced conditional requirements to allow foreign participation, coinciding with the start of what the World Bank termed the fourth wave of debt accumulation (Kose et al (2019)).

These changes have benefited EMEs in many ways. Most importantly, by borrowing in local currency governments have overcome the “original sin” problem, ie the inability to borrow internationally in domestic currency.⁵ Doing so can shield EME governments from the debilitating effects of large domestic currency depreciations, which at times has led to crises historically.

However, several central bank notes see the growing share of foreign participation in LCGB markets, especially by large global asset managers, as a risk.⁶ The top 25 asset managers, almost all based in the United States and in Europe, manage some \$40 trillion of assets, almost double the value of the world’s gross savings (Graph 2, fourth panel). Even small changes in the asset allocation of one asset manager could lead to large capital flows for small EMEs.

Destabilising price dynamics could also arise from the institutional and governance features that may impinge on asset manager behaviour. For example, tightened value-at-risk constraints during stressed periods could lead to forced asset sales or increased hedging activity, further amplifying volatility in the system. Moreover, the reliance on peer comparisons or benchmark indices to monitor fund performance could lead to herd behaviour by fund managers or too much risk taking in efforts to beat the benchmark (Morris et al (2017)). Finally, there is run risk.⁷ In times of stress, this may force asset managers into fire sales, which can lead to destabilising price spirals for less liquid assets such as corporate bonds.

In addition, increased foreign participation in LCGB markets may not completely shield EMEs from the risks of currency mismatches and sudden stops, or as coined by Carstens and Shin (2019), “original sin redux”. In effect, the currency mismatch is no longer borne by EME governments but by foreign investors, whenever they are unhedged.⁸ This can give rise to unwelcome feedback spirals. As large increases in domestic-currency bond yields often coincide with currency depreciation, this “double whammy” can trigger risk limits, leading to asset sales or more hedging.

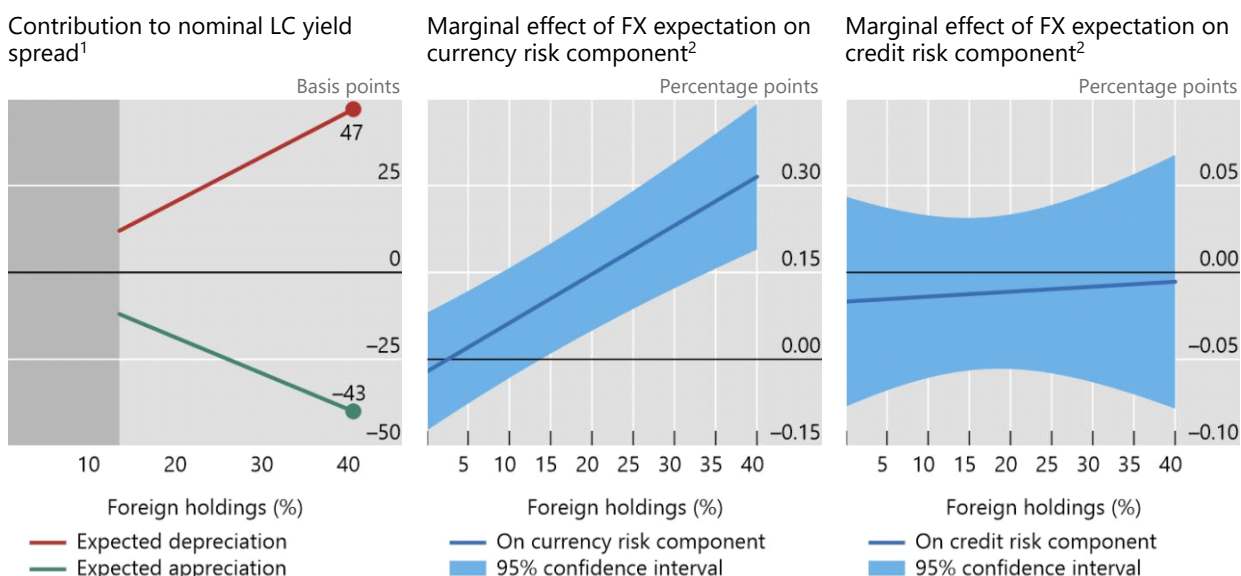
The Hong Kong Monetary Authority (HKMA) note finds empirical support for this mechanism. For a start, low foreign investor participation has no impact on the dynamics of nominal yield spreads in Asian EMEs. Yet, once a critical threshold – estimated to be 13% – is breached, increases in participation widen yields when the local currency is expected to depreciate in line with the “original sin redux” hypothesis (red line Graph 3, left-hand panel). By decomposing the yield spread into its credit and currency risk components, the paper finds that the overall effect is only driven by currency risk (Graph 3, centre and right-hand panel).

⁵ Eichengreen et al (2003) coined the phrase “original sin” to describe the tendency for foreign investors to lend to EMEs only in foreign currencies due to EMEs’ structural weaknesses and lack of market credibility.

⁶ Argentina, Colombia, Hungary, Indonesia, Malaysia, Mexico and the Philippines.

⁷ At times of stress, an investor has the incentive to redeem from a fund earlier than others as the liquidation value of fund shares declines when there are large withdrawals.

⁸ The survey for this meeting shows that about half of the central banks do not know whether foreign investors have hedged their LCGB FX exposures or not. Those who do have information believe that foreign investors have hedged only partially (Graph 6).



¹ Shaded area denotes insignificant impact of changes in foreign holdings on LC yield spread. Expected appreciation and depreciation are represented by the cross-economy historical 1st and 99th percentile, respectively, of changes in risk reversal. ² Marginal effect of changes in lagged FX expectation on LCGB yield spread when the share of foreign holdings exceeds 13%.

Source: HKMA (2019).

Some model-based simulations suggest that “original sin redux” is a welfare improvement over “original sin” when there are global shocks (Annex A). For instance, after an increase in global interest rates, the decline of output in a small EME is sharpest in the case of “original sin” as the currency mismatch on EME balance sheets triggers financial constraints, negatively affecting output. In comparison, “original sin redux” helps mitigate the impact on EME output and investment, as the currency mismatches are on foreign balance sheets. But as EME borrowers still rely on foreign banks, they are not fully shielded from the tightening in global financial conditions. Accordingly, the decline in output can be further mitigated if the EME lender has a larger domestic investor base to draw on.

Non-financial corporate bond markets: surge in foreign currency debt

Despite the progress in the LCGB segment, most EME local currency non-financial corporate bond markets have lagged behind those of AEs in terms of volume and liquidity (see chartpack). Between 2009 and 2017, the median share of EME non-financial corporates’ local currency issuance was only 35% (Graph 4, left-hand panel), some 15 percentage points below the median in AEs. The exceptions are some large Asian EMEs, where the share exceeds 70%.⁹ One reason for their subdued development could be the lack of foreign participation. The survey for this meeting reveals that foreign participation is generally below 5% (Graph 4, centre panel), much

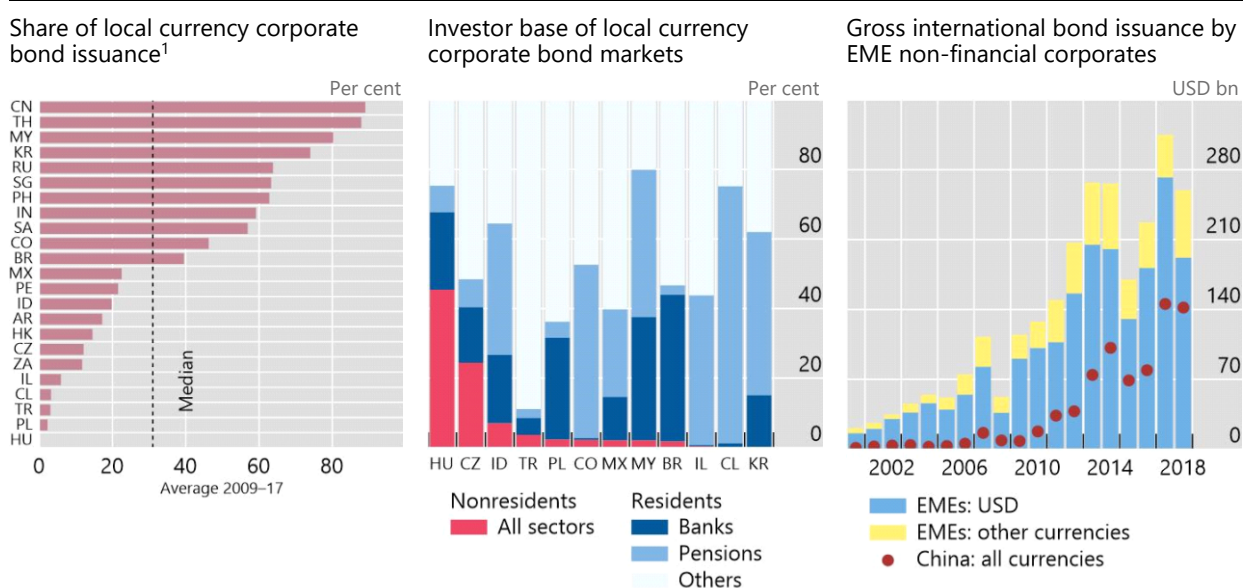
⁹ The note submitted by Brazil points out that the decline in longer-term yields associated with fiscal adjustment has spurred local capital markets by encouraging domestically based corporations to prepay their foreign currency liabilities and raise funds in local currency.

lower than the “threshold” level suggested in the HKMA note when foreign participation could lead to negative feedback spirals.

As an alternative to raising funds from banks, non-financial corporates have relied on international issuance in dollars. Aided by the search for yield in AEs and driven by Asian corporates – Chinese firms in particular – their annual new external dollar bond issuance more than doubled, from \$52 billion in 2008 to almost \$259 billion in 2018 (Graph 4, right-hand panel). Similar to the LCGBs, the growing inclusion of EME hard currency corporate bonds in global investors’ benchmarks has supported this trend.

EME corporates’ international debt issuance rose sharply

Graph 4



¹ By nationality. Average 2009–17.

Sources: CGFS (2019); BIS survey; BIS international debt securities statistics.

The latest surge of corporate external foreign currency debt issuance is likely to have increased EME vulnerabilities.

First, corporates’ leverage and foreign currency debt service burdens have increased, raising financial stability risks and potentially limiting policy space.¹⁰ High leverage makes EME corporates vulnerable to increases in borrowing costs. But even a moderately levered firm may not be able to cover its interest expense, however low that may be, if it is not profitable. For EME firms, a broad decline in earnings since 2010 has weakened their debt-servicing capacity (Beltran et al 2017). That said, the maturity of bonds has lengthened. The share of bonds with a maturity of less than five years has fallen from 40% in 2010 to 25% in 2018. This significantly reduces rollover risks.

¹⁰ The note from the Bank of Russia stresses that high levels of foreign currency-denominated corporate debt severely limited policy space during the 2008 and 2014 crises.

Second, amid the continued search for yield, credit quality has deteriorated. Issuance by lower-rated firms has been rising and there are signs that debt proceeds have been used less productively. The private capital stocks of many EMEs grew less than non-financial corporate debt over the last decade, suggesting the increased take-up of debt by EME non-financial corporates might not have been used for a corresponding increase in long-term investments (UNCTAD (2019)).

Finally, half of total EME hard currency corporate debt is owed by state-owned enterprises (SOEs), whose credit quality and profitability have been deteriorating in several cases. Further losses or downgrades could in some cases translate into elevated sovereign risks (Annex B).

FX markets: rise in derivatives turnover and offshore trading

FMD has also contributed to a strong growth in FX markets for EME currencies in recent years.¹¹ The average daily turnover of EME currencies, in both spot and derivative transactions, rose by almost 60% between 2016 and 2019, to \$1.6 trillion, representing almost 25% of global FX turnover. Apart from the gradual internationalisation of the Chinese renminbi, other general global macro and financial developments, FMD played a role here. The broadening of FX trading systems and their electronification have encouraged the participation of new players such as hedge funds, proprietary trading firms and algorithmic traders in a market traditionally dominated by inter-dealer trading among large banks (Patel and Xia (2019)).

FX derivatives have expanded strongly. The latest data show that the volume of trading in derivatives, on average, was twice that of spot transactions in April 2019. The robust growth of non-deliverable forwards (NDFs) stood out.

The impact of higher turnover in FX markets on financial stability is not clear-cut. On the one hand, higher turnover boosts market liquidity, and it can smooth price adjustments, enhancing markets' capacity to absorb shocks. On the other hand, it can also amplify global market spillovers and increase exchange rate volatility. Some central banks also worry that NDFs are not only used for hedging but for speculative purposes when the domestic currency is not fully convertible, with potentially destabilising effects.

Led by the robust growth in NDFs, offshore markets have grown in importance. Offshore turnover is larger than onshore turnover for emerging Asia currencies as a group and the ratio is above 3 for Latin America and some other EME currencies.

Views differ on the cost/benefit balance of the growing role of offshore markets. In a textbook world, this should not matter as the location of trading is immaterial.¹² In practice, though, offshore trading can have benefits. It can increase liquidity, which in turn reduces transaction costs, triggering a welcome feedback spiral. Overlapping time zones can also allow agents to trade around the clock, helping them manage

¹¹ There are exceptions. For example, the Central Bank of Israel note states that the recent increase in the turnover of foreign institutions in the FX market has not been matched by an increase in their involvement in domestic capital markets.

¹² For currencies with deep and liquid markets, this may even be so in practice most of the time. But in some instances, the location and time zone of trading matters, even for the most liquid currencies as illustrated by the role of early Asian trading during the sterling and yen flash events in recent years.

risks flexibly. Yet, offshore trading can contribute to exchange rate misalignments and adverse exchange rate dynamics for EME currencies with less liquid markets. For example, the Bank of Thailand's research shows how trading outside Asian trading hours has tended to have a very large price impact in recent years due to their one-way nature and subdued counter flows (Graph 5, left-hand and centre panels). The Central Bank of Malaysia notes a negative spillover impact from the offshore ringgit market on onshore spot after the US presidential election. The spike in the Turkish lira spot rate in September 2018 also coincided with a sharp increase in the offshore NDF rates in a few EME currencies (Graph 5, right-hand panel).

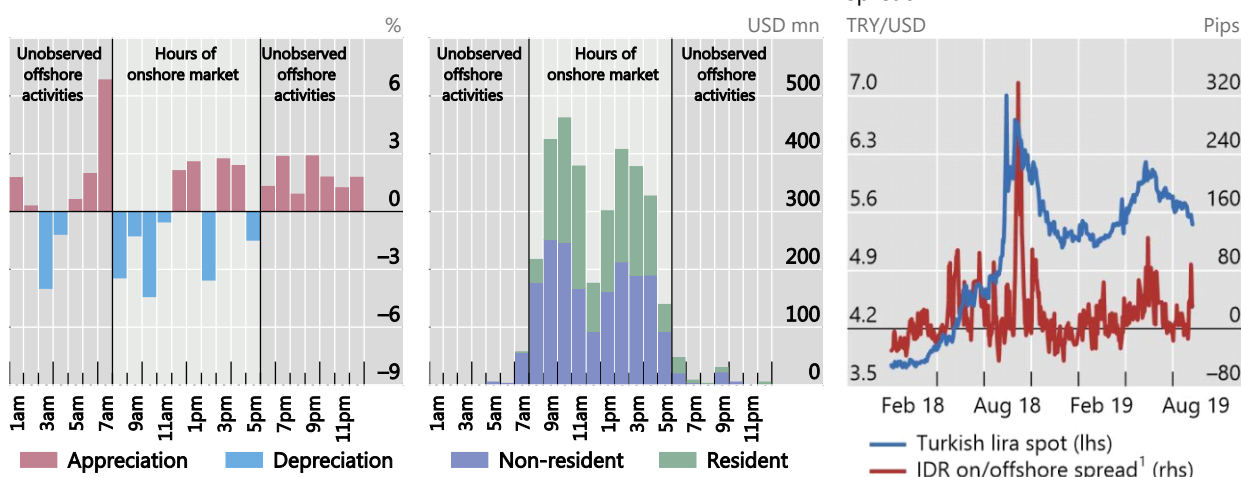
Non-residents' operating outside of the Asian session amplify market reaction

Graph 5

Change in baht exchange rate vis-à-vis the US dollar¹

Trading volume in onshore market²

Turkish lira spot and Indonesian rupee onshore-offshore forward spread³



¹ Calculated from sum of hourly changes of THB since 2017. ² Trading volume is proxied by the average hourly volume of spot and forward transactions of the onshore market since 2019 (data inception). ³ Asia movement: change in the THB/USD during onshore market trading hours. London movement: change in THB/USD during the subsequent London trading hours.

Sources: Bank of Thailand; JPMorgan Chase.

Policy implications

FMD has changed the external financial stability risks in the past two decades, raising several policy challenges.

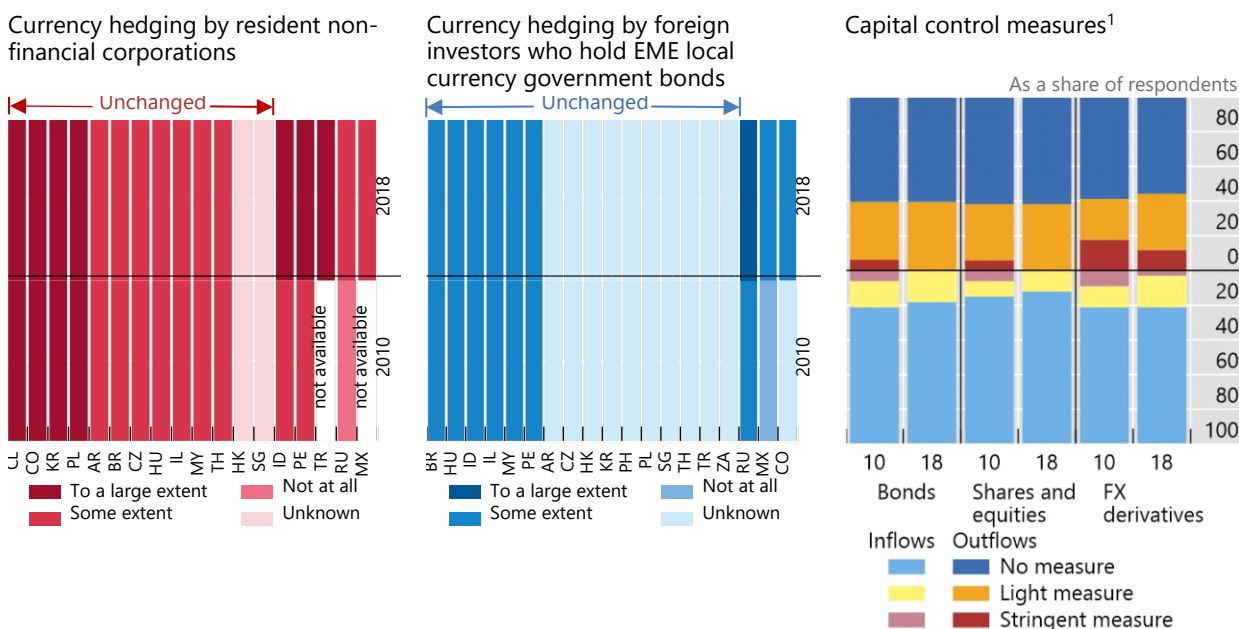
Developing hedging markets. The survey reveals that it is rather common for non-bank financials and non-financial firms in EMEs to hedge only a small portion of their FX exposures. And that has not changed much over the past decade (Graph 6, left-hand and centre panels). An often cited obstacle is the high hedging cost due to underdeveloped derivatives markets.

Various central banks have employed different strategies to promote these markets. For example, the Central Bank of Malaysia has launched a dynamic hedging programme to allow foreign investors to enter into NDF contracts onshore. Bank Indonesia has introduced mandatory corporate hedging requirements. A few central banks (eg those of Indonesia, Mexico and Turkey) have started to conduct FX interventions using NDFs settled in local currency to encourage a private sector

hedging culture. Annex C shows that allowing domestic institutional investors to purchase foreign securities and foreign investors to hold local currency bonds can help promote derivatives markets.

Qualitative hedging surveys by central banks

Graph 6



¹ For inflows, corresponds to restrictions on purchases locally by non-residents and restrictions on sales or issued abroad by residents. For outflows, corresponds to sales or issued locally by non-residents and purchased abroad by residents.

Source: BIS survey.

Improving monitoring of FX flows. The broader investor base in EME debt and FX markets has contributed to market depth and liquidity. But it could also generate destabilising price dynamics, especially when transactions are speculative in nature. In the current low global interest rate environment, FX carry trades involving EME currencies have become increasingly popular. This raises the risk of sudden capital outflows.¹³

It is important for EME central banks to continue monitoring flows in the FX market, including their size, composition and underlying drivers. But the increase in non-bank activities raises data challenges. Bank Indonesia and the Bank of Israel have recently introduced new reporting regulations, requiring market participants with a daily turnover above a certain threshold to report transactions. Yet it remains difficult to track data on offshore transactions, in particular when liquidity pools are fragmented. In this context, sharing of market intelligence between central banks could be an important way forward.

¹³ Some global investors have chosen to fund EME-focused carry trades with another highly correlated EME currency to reduce risk. For example, investors may fund long positions of the Brazilian real with the Mexican peso as both are perceived to be economies with commodity exposure. And this could lead to further increase in short-term capital flows to EMEs.

FX intervention. The evolving FX market structure has required central banks to adapt FX intervention strategies, such as the use of instruments.¹⁴ Although spot market interventions still remain most common, in recent years EME central banks have increased the use of derivatives. This has partly been driven by the heightened participation of non-bank financial intermediaries, which rely more on FX forwards and other derivatives. But it also seems to reflect the growing importance of financial stability considerations. Derivatives may be better suited to mitigate the tail risks associated with rising FX debt levels and increased foreign asset holdings as they provide market participants with instruments to self-insure.

The greater market fragmentation and the greater role of offshore markets can also have implications for the effectiveness of interventions. For instance, if the objective is to affect the exchange rate level, intervening in a less liquid, possibly offshore, market may provide “more bang for the buck”. By contrast, if the objective is simply to build up reserves, intervening in a deep and liquid market may be more effective and less costly.

The prevalence of algorithmic trading can also influence aspects of FX intervention approaches such as transparency and the choice between rules and discretion. Transparency is indispensable if the central bank intends to provide a signal to the market and is required when central banks rely on rules and wish to anchor expectations. Yet, market participants may exploit a transparent, rules-based approach to profit from the predictability of automatic triggers.

Macprudential tools and capital flow management measures. Many EME policymakers opt to use macroprudential measures to dampen the build-up of FX-related risks and liquidity risks. This is especially relevant when derivatives markets are still underdeveloped. A common example is to impose a reserve requirement on banks for foreign currency derivative transactions (eg FX swaps) vis-à-vis non-residents. The aim is to make these trades less profitable by effectively reducing the yield on the transaction. In addition, given that correlated and procyclical trading by asset management funds could destabilise asset markets, resulting in large losses that could propagate through the financial system, some AEs and EMEs have introduced macroprudential tools to ensure domestic mutual funds to have enough liquidity to cope with sudden increased demand for redemptions (BIS (2018), Chapter IV).

Some central banks have turned to capital flow management (CFM) measures. It is generally agreed that CFMs are no substitute for warranted macroeconomic adjustment, and should only be considered a last resort measure.¹⁵ In fact, against the background of strong global appetite for EME local currency government bonds, a rising number of EMEs have adjusted their capital account regulations to dampen volatile capital inflows in recent years (Graph 6, right-hand panel).

International investment positions. FMD coupled with massive accumulation of reserves has affected EMEs’ international investment positions (IIPs). EME governments are now net foreign asset holders, while the private sector is a net international debtor. The overall IIP positions are strongly negative for many EMEs,

¹⁴ For a detailed discussion, including how goals and objectives of FX intervention have evolved see the 2019 Emerging Markets Deputy Governors meeting, BIS (2019b).

¹⁵ Question remains about whether CFMs should be applied preemptively or on an ad-hoc basis. ASEAN (2019) argues for a preemptive use of those CFMs that are aimed at ensuring financial stability.

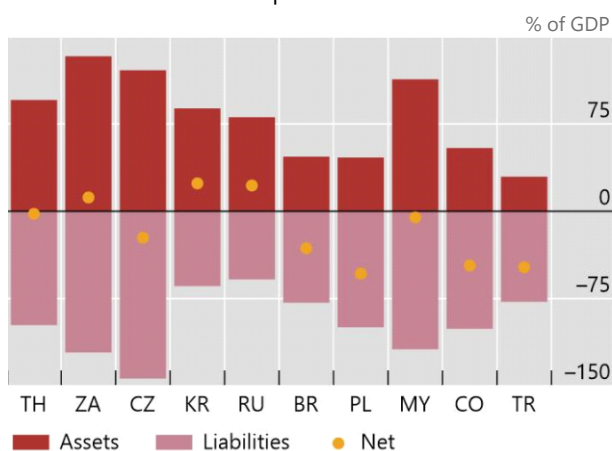
but not so once the currency composition is taken into account (Graph 7). IIP liabilities are often in domestic currency, suggesting a major role for the domestic equity holdings of foreign investors.

This suggests that, in aggregate, countries are now long or balanced in foreign currency – unobserved off-balance sheet positions aside. Yet, the distribution matters. The key current vulnerabilities are located in the private non-financial corporate sector. This puts a premium on the official sector’s ability to transfer foreign currency funding or help hedge those in need at times of stress. It also raises questions concerning the possibility that large official sector FX holdings may have encouraged unhedged positions in the private sector – a form of moral hazard.

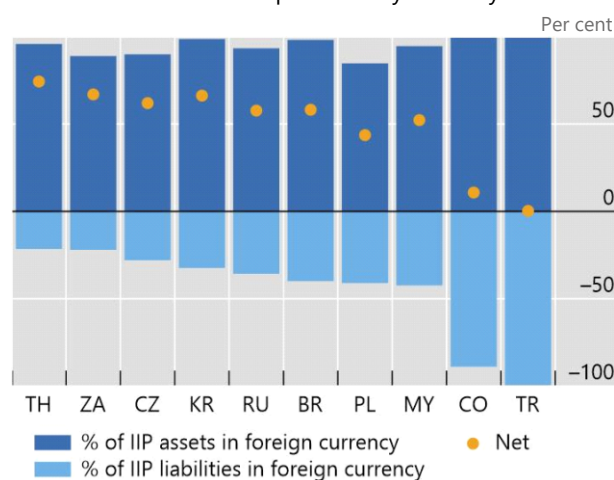
International investment positions and currency mismatches

Graph 7

International investment positions in 2018



International investment positions by currency in 2018



Sources: BIS survey; IMF, Balance of payments statistics and World Economic Outlook database.

Fintech and FMD

Going forward, fintech, big tech and other sources of innovation will be important drivers of FMD. In several EMEs, these developments have already started transforming financial services, including payments, money management, insurance and lending. While innovations can lower costs and improve financial sector efficiency, they could also erode the franchise value of existing financial institutions, leading to excessive risk-taking or regulatory arbitrage. Thus, central banks and regulators need to balance financial stability concerns and the benefits of innovation, as discussed in detail in the Monetary Authority of Singapore (MAS) note.

The role of technology firms in the provision of credit is particularly important given the core aim of FMD is to promote a financial system that enables the efficient pooling savings and foreign capital for productive long-term investment and consumption.¹⁶ Some successful examples in this area include the quick approval of

¹⁶ See chartpack for a definition of FMD. BIS (2019a), Chapter III provides a detailed discussion of Big techs’ impact on credit provision as well as many other financial services.

microloans to small and medium-sized companies or individuals (the “missing middle”) based on credit scores created with social media footprints and mobile agency banking network microfinance (for the “bottom of the pyramid”).

As yet, fintech and big tech credit constitutes only a small part of total supply, but financial stability risks could emerge, in particular given the rapid pace of developments in other areas such as payments.¹⁷ For example, if these firms become significant suppliers asset backed securities or other structured products to fund their lending, that could transmit the risks to the broader financial system, in particular in times of stress.¹⁸ And even if fintech-based lending platforms evolve to start using their own balance sheet to intermediate funds, maturity mismatches could arise and opening up the possibility of runs without the protection of the standard safety net for banks. Finally, as highlighted by the MAS note, P2P lending is susceptible to swings in investor sentiment and risk appetite. This could result in more procyclical credit provision.

¹⁷ At the first instance, these firms’ growth could pose risks to consumer and investor protection.

¹⁸ Take China as an example, a large tech firm has used securitisation to finance its microlending business. The outstanding amount of these microloan-backed securities has grown from a negligible amount in 2015 to a peak of CNY 470 billion in 2017.

References

- ASEAN (2019): "Capital account safeguard measures in the ASEAN context", February 2019.
- Banerjee, R, M B Devereux, and G Lombardo (2016): "Self-oriented monetary policy, global financial markets and excess volatility of international capital flows", *Journal of International Money and Finance*, vol 68, pp 275–97.
- Bank for International Settlements (2018): *Annual economic report*, 2018.
- (2019a): *Annual economic report*, 2019.
- (2019b): "Reserve management and FX intervention", *BIS Papers* no 104.
- Beltran, D, G Keshav and A Rosenblum (2017): "Emerging market nonfinancial corporate debt: How concerned should we be?", *Board of Governors of the Federal Reserve System IFDP Notes*, June 2017.
- Carstens, A and H S Shin (2019): "Emerging markets aren't out of the woods yet", *Foreign Affairs*, 15 March.
- Chui, M, I Fender and V Sushko (2014): "Risks related to EME corporate balance sheets: the role of leverage and currency mismatch", *BIS Quarterly Review*, September.
- Committee on the Global Financial System (2009): "Capital flows and emerging market economies", *CGFS Papers*, no 33.
- (2019): "Establishing viable capital markets", *CGFS Papers*, no 62.
- Eichengreen B, R Hausmann and U Panizza (2003): "The pain of original sin", in B Eichengreen and R Hausmann (eds), *Other people's money – Debt denomination and financial instability in emerging market economies*, University of Chicago Press.
- Financial Stability Board (2020): *Global Monitoring Report on Non-Bank Financial Intermediation 2019*, January.
- Fukao, M (1991): "Exchange rate movements and capital-asset ratio of banks: on the concept of structural positions", *Bank of Japan Monetary and economic studies*, Vol.9, No.2
- Gertler, M, and P Karadi (2011): "A model of unconventional monetary policy." *Journal of Monetary Economics*, vol 58, no 1, pp 17–34.
- Hofmann, B, N Patel and S Wu (forthcoming): "Original sin redux: a model-based evaluation", BIS memo.
- IMF (2019): "Lower for longer", *Global Financial Stability Report*, October.
- Kose, M, P Nagle, F Ohnsorge and N Sugawara (2019): *Global waves of debt: Causes and consequences*, *World Bank Group*, December.
- Morris, S, I Shim and H S Shin (2017): "Redemption risk and cash hoarding by asset managers," *BIS Working Papers*, no 608.
- Patel, N and D Xia (2019): "Offshore markets drive trading of emerging market currencies", *BIS Quarterly Review*, December.
- United Nations Conference on Trade and Development (2019): "Financing a global green new deal", *Trade and Development Report*, September.

Annex A: The original sin redux - a model-based evaluation

On the back of rapid growth in local currency debt markets over the last two decades, EMEs have reduced their reliance on external foreign currency borrowing – the so-called original sin. But this has not eliminated their financial vulnerability entirely. EMEs still rely heavily on foreign sources of funding, albeit in local currency, as their bond markets have a less developed base of domestic institutional investors. Carstens and Shin (2019) have termed this the “original sin redux”. They argue that this still leaves EMEs vulnerable to capital flow reversals on account of currency mismatches on the balance sheets of global lenders.

This annex discusses a model-based evaluation of the original sin redux and the vulnerability of EMEs to foreign shocks. It finds that, while the original sin redux reduces the vulnerability compared with original sin, it falls short of matching the benefits that ensue from a large domestic investor base.

The model is a two-country new Keynesian DSGE setup featuring a small open EME (the home country) and a large global economy (the United States). For ease of modelling, the currency mismatches are assumed on banks’ balance sheets but results would be similar if the mismatch affects other domestic balance sheets such as those of firms or governments and banks are hedged. In particular, EME firms borrow from domestic banks to finance investment. EME banks in turn obtain their funding from global banks and deposits from domestic households. Both domestic and foreign banks face a funding constraint that is governed by their net worth.¹⁹ This gives rise to a financial channel via the exchange rate. For instance, if the EME currency depreciates, the value of loans, which are in local currency, declines relative to the value of the liabilities, which are in foreign currency. This leads to a drop in net worth for the EME bank in the case of the original sin, and for the global bank in the case of the original sin redux.²⁰ In either case, there is a tightening in lending conditions that affects the real economy.

Graph A shows the impulse responses of EME variables to a 100 basis point increase in the US interest rate. The first panel shows that the shock leads to a depreciation of the exchange rate, which triggers the financial channel. As a result, GDP declines (second panel).

The decline is sharpest in the case of the original sin, where the currency mismatch is on the balance sheet of EME banks. In comparison, the original sin redux helps mitigate the impact on EME output and investment. In particular, while the exchange rate still depreciates, there is no direct impact on the balance sheet of domestic banks. As a result, net worth of domestic banks declines by less (Graph A, third panel), tightening in credit spreads is lower, and lending to EME firms declines by less than in the original sin scenario.²¹ Finally, the impact on the real economy is further mitigated in the presence of domestic sources of funding, as EME banks can

¹⁹ In this framework, banks could also be interpreted as asset managers more broadly.

²⁰ The drop in net worth could be mitigated if the global bank also has liabilities denominated in the EME currency. In the case where the EME currency liabilities and assets of the global bank are perfectly matched initially, the shock would lead to an increase in its capital to asset ratio (see for instance Fukao, 1991). In this model however, all liabilities of global banks are in dollars.

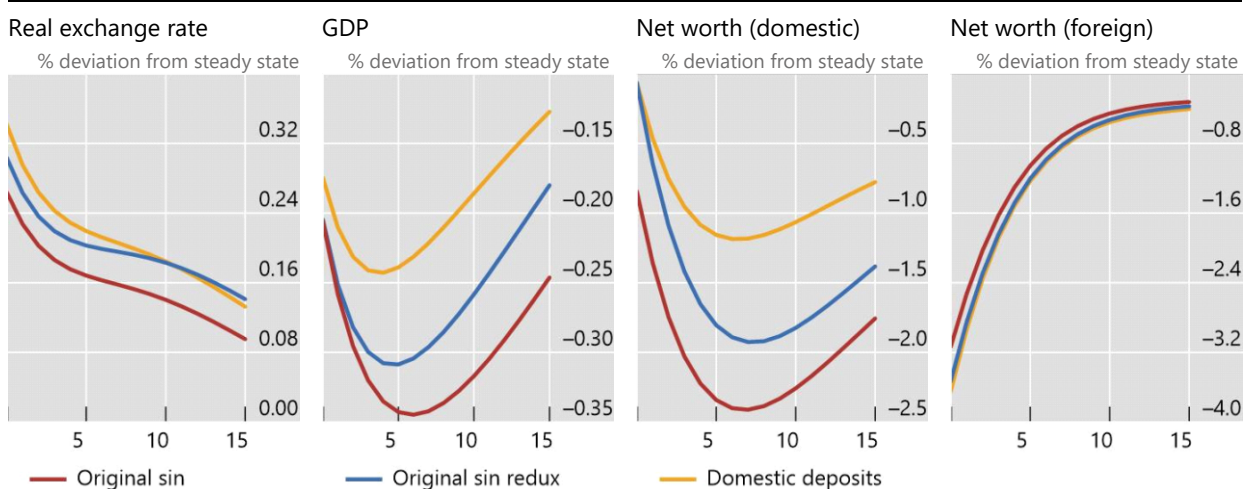
²¹ Conversely, the decline in net worth and output in the US is larger under the original sin redux scenario compared to original sin (Graph A, fourth panel).

also borrow directly from domestic households and are to some extent shielded from the tightening in lending conditions by foreign banks. These results are qualitatively similar in their response to other foreign shocks, such as a financial shock to the leverage constraint of global banks, as considered by Gertler and Karadi (2011).

However, risk-sharing across continues to be beneficial. For domestic shocks, the fall in output is higher in the presence of domestic deposits as foreign sources of funding act as a stabilising force. This suggests that having diversified sources of funding is optimal, even though it is hard to quantify where this optimum lies.

Response of EME to a US monetary policy shock of 100 basis points¹

Graph A



¹ Impulse responses are in percentage deviations from the non-stochastic steady state. The exchange rate is defined as the number of EME currency units per unit of foreign currency, so that an increase denotes an EME depreciation. "Original sin" denotes a scenario where the EME borrows entirely from abroad in foreign currency. "Original sin redux" is a scenario in which the EME borrows entirely from abroad in local (EME) currency. "Domestic" deposits denotes a scenario in which half of the EME borrowing is from domestic deposits and half is from abroad, both in local (EME) currency.

Source: BIS calculations.

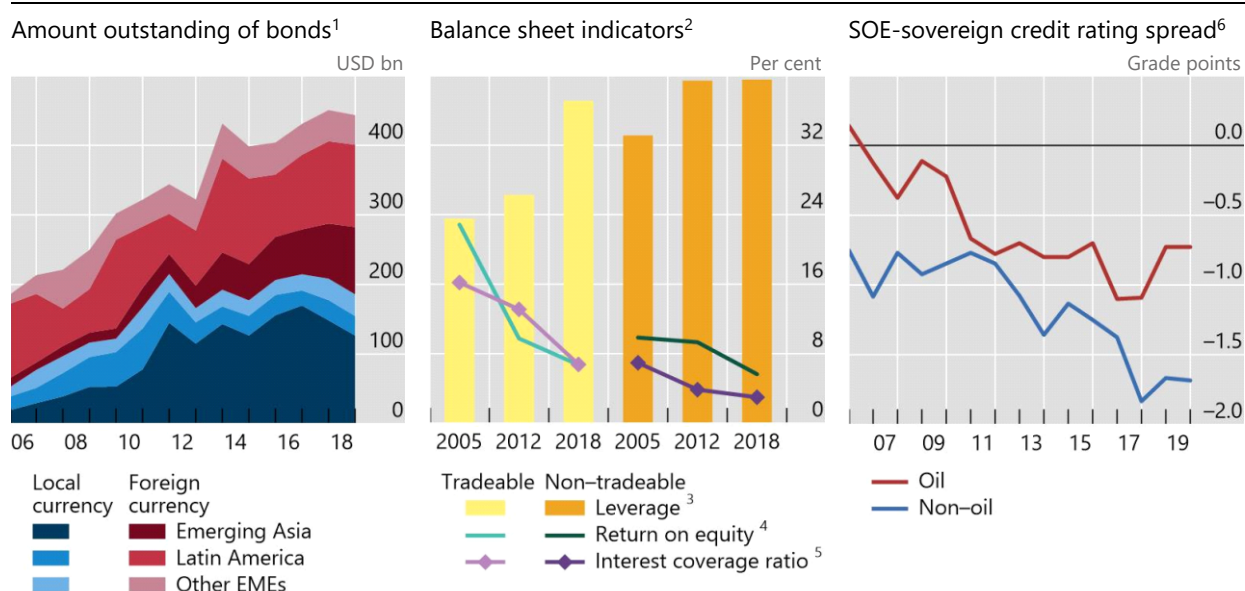
Annex B: Too-big-to-fail: state-owned enterprises

Many state-owned enterprises have been in a better position than private firms to reap the benefits of capital market development. First, their creditworthiness is often perceived as stronger, due to explicit or implicit government guarantees. For similar reasons, banks are more willing to lend to SOEs than to firms with a similar financial position. A contributing factor is that these firms tend to be big, with tangible assets that can serve as collateral. Second, funding for these large firms has benefited from growing investor demand for sovereign and corporate bonds.

These factors have enabled EME SOEs to raise significant amounts of funding in international and local bond markets (Graph B, left-hand panel). From 2005 to 2018, the value of outstanding bonds more than doubled, surging to \$450 billion. The currency composition of debt, which has remained broadly constant over time, differs substantially across regions. In 2018, the share of foreign currency bonds of Latin American SOEs was around 80%, compared with 44% for Asian SOEs.

SOEs financial strength has deteriorated sharply

Graph B



¹ Based on data from 34 SOEs. Latin America (eight SOEs): AR, BR, CL, CO, MX, PE; Emerging Asia (19 SOEs): CN, IN, ID, KR, MY, SG, TH; Other EMEs (seven SOEs): CZ, RU, AE, ZA. ² Non-tradable sector (16 SOEs) includes electricity, construction/real estate/ports, transportation and utilities. Tradable sector (18 SOEs) includes oil and gas, aluminium, chemicals, and copper. ³ Debt over equity. ⁴ Net income over equity. ⁵ Earnings before interest and taxes over interest expenses. ⁶ Based on S&P's long-term foreign currency issuer rating of 31 SOEs and their respective sovereigns.

Sources: Capital IQ; Bloomberg.

As SOEs have accumulated debt and their leverage increased, their profitability and debt servicing capacity have fallen (Graph B, centre panel). As a result, SOE credit ratings have dropped (Graph B, right-hand panel). Non-economic factors have helped to erode the financial strength of some major SOEs. For instance, weak corporate governance has led to the inefficient use of resources, and revenues have been diverted to government coffers. In 2015, some Latin American SOEs were on the verge of bankruptcy due to political corruption scandals.

The weak performance of SOEs has also affected the credit standing of their sovereigns. For most, SOE credit ratings have declined to levels just above investment grade. If SOEs' ratings dropped below this threshold, this would lead to forced bond selling by many investment funds. The reduced market access could force a government rescue, which in turn could put the stability of public finances at risk. A decomposition of changes in credit spreads suggests that, in recent years, the heightened credit risk of SOEs has spilled over into sovereign spreads (IMF (2019)).²²

²² Another financial stability issue is the degree of domestic banks' exposure to SOEs debt, including to the firms that provide services to them. Although bank solvency is not a major risk, a rating downgrade of the SOE could trigger higher capital requirements and increase credit costs.

Annex C: Institutional investors, FX derivatives and banking stability

Allowing domestic institutional investors to hold foreign securities and currency hedging practices can spur growth in FX derivatives market. This annex shows some examples.

Over the past decades, authorities have started to allow institutional investors to increase their foreign securities holdings. This has boosted their demand for hedging.²³ For example, in Israel, the increase in institutional investors' foreign assets holdings since 2009 has coincided with a less than proportionate rise in foreign currency exposure, pointing to the growing use of hedging (Graph C, left-hand panel).

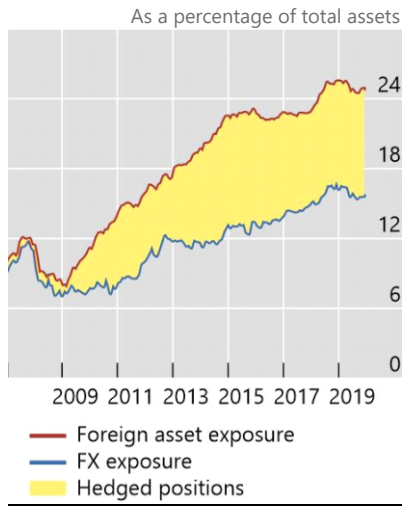
The growth in derivatives markets depends on the development of two-sided markets. The Chilean experience is a case in point (CGFS (2009)). Following the relaxation of capital controls in 2001, pension funds started to include foreign assets in their portfolios. In 2008, it was estimated that these pension funds hedged up to 80% of their FX exposure. Typically, this would involve Chilean pension funds selling long forward positions in foreign currencies to the local banking system. Local banks, in turn, would sell long forward positions in foreign currency to their clients. Notably, these would include domestic firms that had issued foreign currency-denominated debt or importers who needed to pay for imported raw materials. As such, banks' foreign currency exposures would net out to some extent, and would be kept close to zero if the two sides were of similar magnitude. To be sure, banks in many jurisdictions are required by regulations to keep net foreign currency exposures close to zero. However, in the Chilean case, the participation of pension funds allowed local banks to expand their role as matching agents, thereby facilitating the development of derivatives markets.

Matching demand in this way is important if banks are to reduce their foreign currency exposures, thereby enhancing their stability. This can be illustrated with data from Korea. When a Korean pension fund purchases a foreign bond and wants to hedge the FX risks, it can enter into a forward (or swap) contract with a local bank. In doing so, the bank effectively assumes the foreign exchange risk, recording an increase of FX position on the asset side of its balance sheet. The bank can offset this risk in two ways. It can borrow foreign currency. Alternatively, it can transfer the currency risk by signing an offsetting forward contract with a foreign bank branch or foreign investor. The difference between the two is that, in the latter case, the bank will not need to build up short-term external debts by meeting the hedging needs of its clients.²⁴ It can be seen that, despite the increase in swap contracts in banks' assets during this period, banks have reduced their FX debt due to an increase in NDFs on the liability side of the balance sheet (Graph C, centre and right-hand panels).

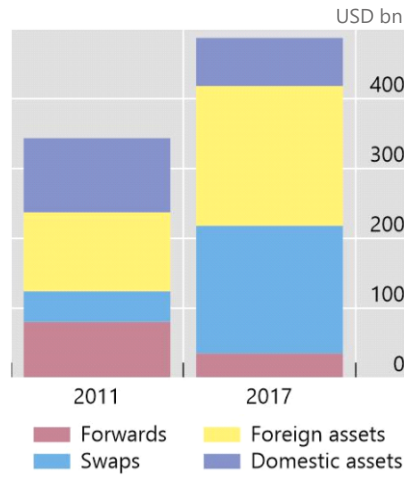
²³ In many jurisdictions, authorities also set limits on pension funds' foreign currency exposure to accompany the relaxation on their foreign securities holdings. In Hong Kong SAR, for example, there is no limit on a mandatory pension fund scheme's foreign investments but the fund must restrict its foreign currency exposure to not more than 70% of its total assets (CGFS (2009)).

²⁴ It should be noted that in both cases, Korean banks are building up debt vis-à-vis foreigners; but the difference is that by signing an offsetting forward contract with a foreign bank branch, the banks' debt are "collateralised" by the other currency leg.

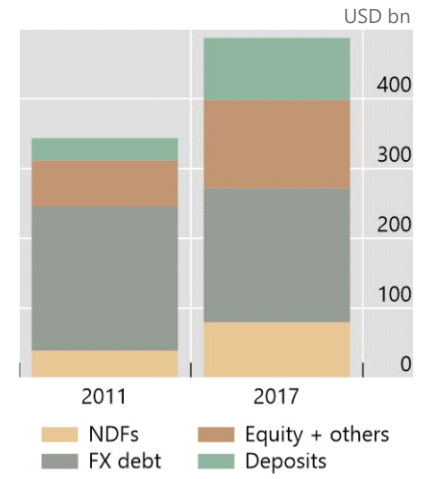
Foreign assets of Israeli institutional investors



Korean banks' assets



Korean banks' liabilities



Sources: Bank of Israel; Bank of Korea.