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### The role of non-bank financial institutions in cross-border spillovers

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Monetary and Economic Department

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# The role of non-bank financial institutions in cross-border spillovers

Egemen Eren\* and Philip Wooldridge\*\*

## Abstract

The growing presence of non-bank financial institutions (NBFIs) helps to develop financial markets, yet it can also impact a country's vulnerability to cross-border spillovers. The risk of cross-border spillovers is especially acute for NBFIs' dollar positions. Other potential sources of spillovers include currency and liquidity mismatches on NBFIs' balance sheets, NBFIs' use of leverage, and herding. Evidence about whether the greater involvement of NBFIs has aggravated the procyclicality and intensity of cross-border spillovers is mixed.

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Keywords: non-bank financial institutions, international spillovers, financial integration, capital flows.

\* Bank for International Settlements

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## 1. Introduction

The growing presence of non-bank financial institutions (NBFIs) in the financial system has heightened concerns about their potential role in cross-border spillovers. For example, in recent years, liquidity shocks have been transmitted across countries more frequently and intensely (Eren and Wooldridge (2021)). The CGFS's 2021 report on capital flows concluded that the rising importance of NBFIs alters rather than reduces the risks associated with capital inflows to emerging market economies (EMEs); they expose EMEs to "old risks in new clothes" (CGFS (2021)). The current environment of monetary tightening puts NBFIs' potential role in cross-border spillovers firmly in the spotlight.

Although the growing presence of NBFIs can impact a country's exposure to cross-border spillovers, it also brings clear benefits ranging from a more diversified investor base to greater risk-sharing and a more efficient allocation of capital. The spillovers arising from NBFIs' activities can be significant depending on country characteristics, yet experience shows that they can be mitigated with the help of policy tools, particularly macroprudential measures, occasional foreign exchange intervention and liquidity provision mechanisms (CGFS (2021)).

This paper summarises the role of NBFIs in cross-border spillovers. It first presents stylised facts about NBFIs' cross-border activities, where NBFIs are defined as all types of financial intermediary other than banks. The paper then outlines six potential channels for spillovers from their activities, ranging from NBFIs' dollar positions to currency and liquidity mismatches on their balance sheets, their use of leverage and herding. The final section examines whether NBFIs act more procyclically than banks. As policy responses are assessed in complementary work, they are not further discussed here.<sup>1</sup>

## 2. Cross-border activities of NBFIs

Since the Great Financial Crisis (GFC) of 2007–09, NBFIs' share of the total assets of all financial institutions has increased to around 50% (Graph 1, left-hand panel). In advanced economies (AEs) and EMEs, NBFIs' cross-border holdings of debt securities account for a rising share of external liabilities (centre panel).<sup>2</sup> The interconnectedness of NBFIs has also increased, as shown by the growth in cross-border business between banks and NBFIs (right-hand panel).

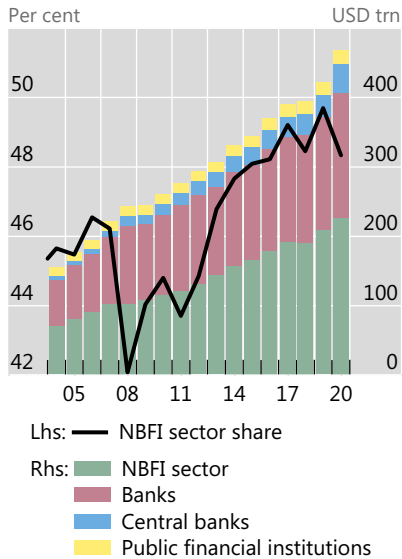
<sup>1</sup> The Financial Stability Board (FSB) has a broad work programme that aims to enhance the resilience of non-bank financial intermediation (FSB (2021a)). The CGFS report on capital flows assesses the effectiveness of policy tools for managing the risks associated with extreme shifts in capital flows (CGFS (2021)). The BIS's work on macro-financial stability frameworks highlights how central banks in EMEs have addressed the challenges from capital flow and associated exchange rate volatility through the use of complementary policy instruments (BIS (2019), BIS (2022)). The International Monetary Fund's integrated policy framework advances the understanding of policy options and trade-offs in pursuing domestic and external stabilisation objectives (IMF (2020)).

<sup>2</sup> While NBFIs account for the largest share of portfolio debt flows, banks are also important portfolio debt investors.

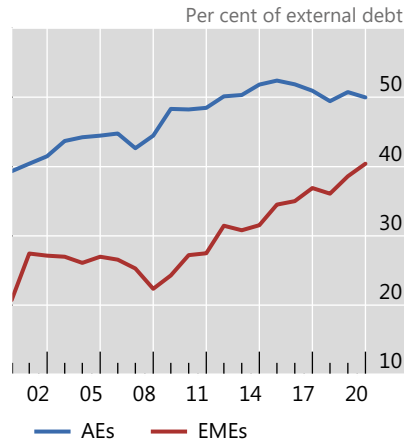
## The growing footprint of NBFIs

Graph 1

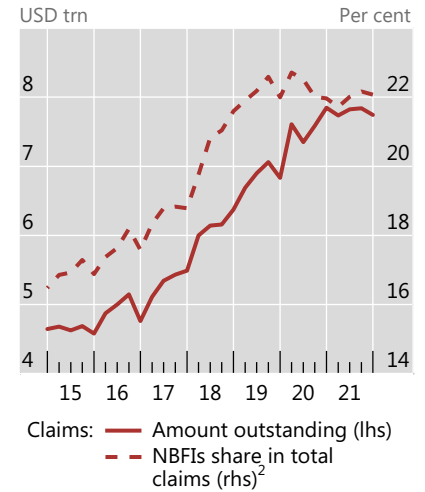
NBFIs hold a rising share of total financial assets



Portfolio debt rose as a share of AEs' and EMEs' external debt<sup>1</sup>



Cross-border links between banks and NBFIs have grown



<sup>1</sup> Stock of portfolio investment liabilities for all sectors. External debt is defined as the stock of debt securities portfolio investment liabilities plus the stock of other debt instrument liabilities across all sectors for both components. <sup>2</sup> On all counterparty sectors.

Sources: Aldasoro et al (2020); FSB; IMF; BIS locational banking statistics; BIS calculations.

The types of NBFIs and the intensity of their cross-border activity vary across regions. Fund managers catering to investors based in AEs are the largest cross-border investors. Institutional investors in EMEs are growing in size and increasingly investing in other EMEs in addition to AEs. The global footprint of reserve managers and sovereign wealth funds has also increased.

NBFIs domiciled in the United States invest abroad predominantly in equities but hold large amounts of debt securities as well.<sup>3</sup> Most of their debt holdings are denominated in US dollars (Maggiore et al (2020)). At end-2020, US NBFIs held more than \$2 trillion of US dollar-denominated debt securities issued by non-US entities (Graph 2, left-hand panel). Mutual funds have the largest holdings followed by insurance companies. In addition to investing in longer-term debt, US NBFIs also provide dollar liquidity in FX swap markets alongside banks to arbitrage deviations in covered interest parity (see Box A).

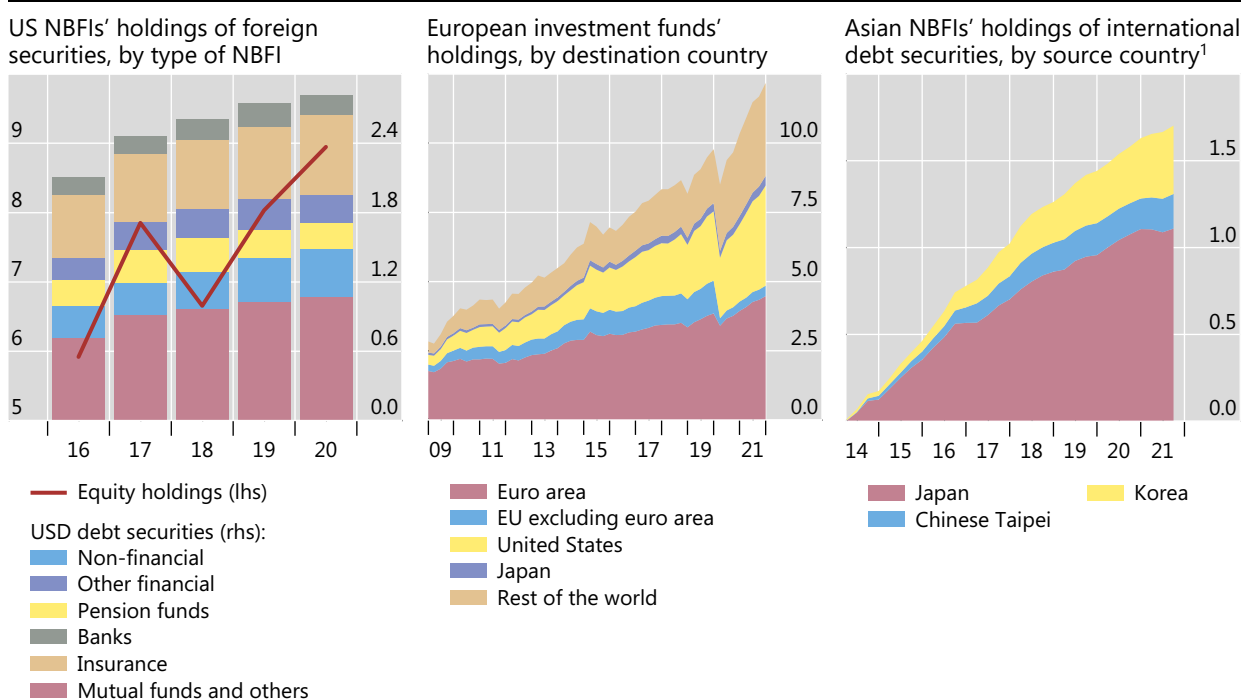
In Europe, investment funds are the largest cross-border investors. Their non-euro area assets account for more than half of their portfolio and are invested primarily in the other European countries, mostly in euros, as well as the United States, mostly in dollars (Graph 2, centre panel). European insurers, on the other hand, mainly invest in euro area securities (CGFS (2020)). Data are more limited for European

<sup>3</sup> NBFIs account for an important share of cross-border equity holdings globally, but due to data availability, cross-border debt holdings are highlighted in this note. Total US ownership of foreign equities was around \$9 trillion in 2020 (Graph 2, left-hand panel).

## Cross-border investments of NBFIs

Amounts outstanding, in trillions of dollars

Graph 2



<sup>1</sup> Cumulative sum of net fund of flows for securities and equities.

Sources: CGFS (2020); ECB; Bank of Korea; Bank of Japan; Central Bank of the Republic of China (Taiwan); US Treasury TIC data; BIS calculations.

pension funds, but foreign bond holdings are reportedly large in some countries (eg the United Kingdom and the Netherlands).<sup>4</sup>

In Japan and other east Asian economies, insurance companies and pension funds have been active buyers of foreign bonds in recent years, particularly securities denominated in US dollars, which often offer higher returns even after accounting for FX hedging costs. East Asian NBFIs' holdings of international securities have increased significantly over the past decade (Graph 2, right-hand panel). For example, in Japan, the foreign investments of insurance companies now match those of banks, and their foreign portfolios comprise mainly corporate bonds and government bonds. Chinese NBFIs have also stepped up their investments abroad in recent years.

In Latin America and other EMEs too, gross outward portfolio investment has been rising rapidly. Rising wealth, population ageing and policy reforms have fuelled growth in the assets managed by pension funds, insurance companies and other institutional investors (McGuire et al (2021)). For example, pension funds in Chile hold assets equivalent to 70% of GDP, a substantial portion of which is invested abroad (Vial (2020)).

A large share of NBFIs' cross-border business is booked out of financial centres. According to the IMF's Coordinated Portfolio Investment Survey, the top 10 countries by size of foreign portfolio holdings include three financial centres: Luxembourg, Ireland and the Cayman Islands. Activities in financial centres mask the true economic

<sup>4</sup> In some cases, the difference between pension funds and insurance companies could be blurred as life insurance companies offer products that may serve as pension income.

origin of NBFIs' investments. For example, nationality-based estimates of US investment in EME corporate debt securities are about 30% higher than residence-based estimates (Bertaut et al (2019)).

### 3. Channels of cross-border spillovers

The rising involvement of NBFIs in foreign markets contributes to the development of these markets. Their entry deepens local markets because their constraints, needs and expectations tend to differ from those of local investors as well as foreign banks. Their involvement reduces the cost of capital by enabling risk-sharing between domestic and foreign market participants. The participation of foreign NBFIs can also promote the implementation of international best practices and standards (CGFS (2019)).

At the same time, NBFIs' rising involvement can impact a country's vulnerability to cross-border spillovers. Some channels for spillovers are the same as when banks were the major cross-border investors. Others are unique to NBFIs, or more important today than in the past because of the rising footprint of NBFIs. Some channels apply only to certain types of NBFIs and not others, and some are more important for EMEs than AEs.

#### 3.1 Complexity of dollar funding

The risk of cross-border spillovers is especially acute for NBFIs' dollar positions. The US dollar accounts for a large share of non-US NBFIs' cross-border activity. A characteristic of international markets for dollar funding is that they can involve several layers of intermediation that give rise to long and complex funding chains. These funding chains often extend across jurisdictions and sectors, and interconnections are sometimes not visible.

The complex network of banks and NBFIs shown in Graph 3 illustrates the potential for cross-border contagion through dollar funding chains. Large global NBFIs, from AEs and EMEs alike, invest in dollar assets either in the United States or elsewhere. Unless dollar assets can be used as collateral in repo transactions, they are typically funded by converting domestic currency into dollars in FX spot markets and hedged through FX forward and swap markets. The hedging counterparty is typically an internationally active bank. The bank in turn hedges its own currency risks by borrowing dollars from money market funds (MMFs) through the issuance of commercial paper or similar instruments.

Such complexity increases the risk that shocks to any individual player or sector might spill over to others in the network and get amplified. To illustrate how, suppose a European bank provides hedging services via FX swaps to a Japanese life insurance company invested in dollar assets and counterbalances its own currency exposure by issuing commercial paper. A US MMF in turn purchases this commercial paper. In the event of a run on the MMF, the European bank might be unable to roll over its commercial paper and hence withdraw from servicing the FX swap market.<sup>5</sup> In the case of a global dollar shortage, the last resort for the Japanese life insurance company to hedge its dollar positions can be through dollar swap lines between the

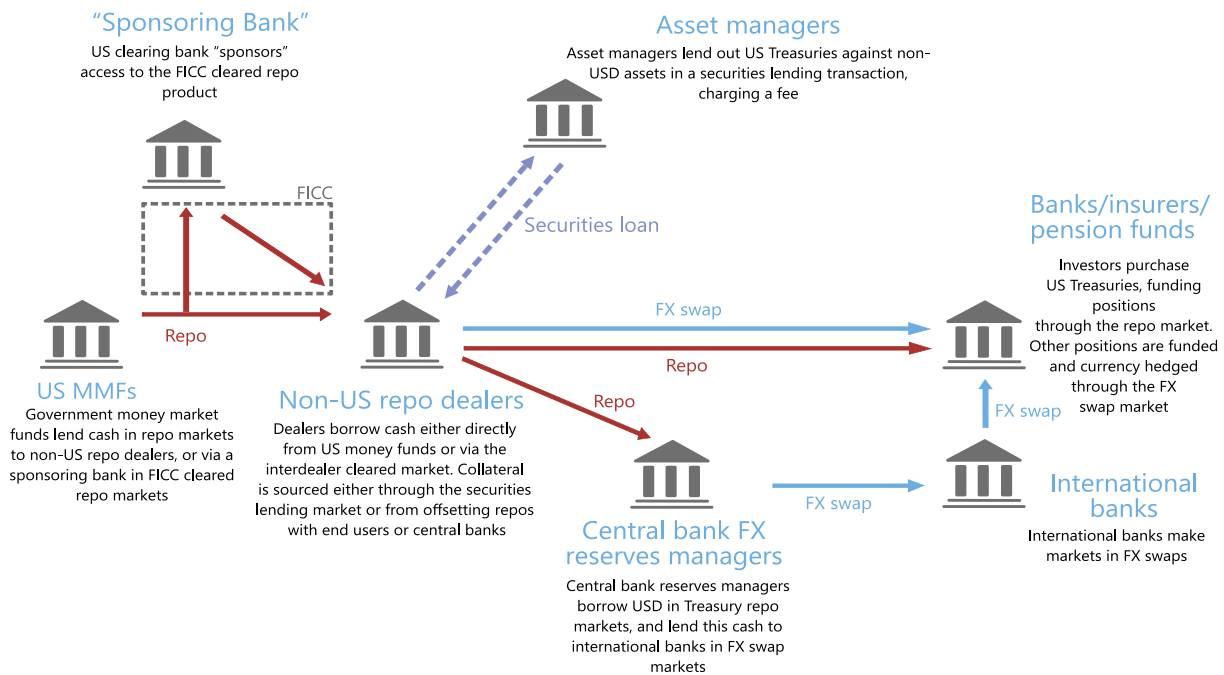
<sup>5</sup> For evidence on the interaction between short-term money markets and FX swap markets, see Aldasoro, Ehlers and Eren (2022)



US Federal Reserve and the Bank of Japan. Even in that case, dollar liquidity often needs to be transmitted via a Japanese bank that participates in the Bank of Japan’s dollar auctions and hinges on the constraints banks might face during such episodes. Hence, the rising cross-border activity by NBFIs also has implications for the global financial safety net (Carstens (2021)).

An example of a dollar funding chain

Graph 3



Source: CGFS (2020).

### 3.2 Unhedged FX exposures

Another potential source of cross-border spillovers is currency mismatches on the balance sheets of investors.<sup>6</sup> NBFIs often invest in debt securities denominated in foreign currencies, especially the dollar but also the local currencies of borrowers. In some cases, these investments are funded by liabilities denominated in investors’ home currency and are not hedged. In contrast, banks are typically prevented by regulation from running large open currency positions.<sup>7</sup> In other cases, NBFIs use FX forwards or swaps to hedge their FX exposures either fully, partially or using proxies. Even when hedges are in place, due to the short-term nature of these instruments, there is often a mismatch between the maturity of holdings and hedges. While gaps remain in the information available about the hedging activities of NBFIs, recent data collection efforts have shed more light on them (see Box A).

<sup>6</sup> This note focuses on NBFIs as cross-border investors. Currency mismatches on the balance sheets of NBFIs as borrowers can be an additional source of vulnerability if their liabilities are denominated in safe haven currencies, which tend to appreciate during flight-to-safety episodes.

<sup>7</sup> While NBFIs operate with currency mismatches, they also tend to have portfolios biased towards cross-border securities denominated in their home currency, which somewhat reduces currency mismatches in their portfolios. A notable exception to this is the dollar. Foreign debt holders hold more dollar debt issued by US investors and this pattern has grown stronger over the last decade (Maggiore et al (2020)).

### NBFIs' use of FX swaps

FX forwards and swaps are widely used to hedge currency exposures. Their use has increased over the past decade (Graph A, left-hand panel). According to the BIS Triennial Central Bank Survey, the turnover of FX swaps topped \$3.8 trillion per day in April 2022, exceeding even that of FX spot trading. Their short maturities necessitate continuous rollovers.

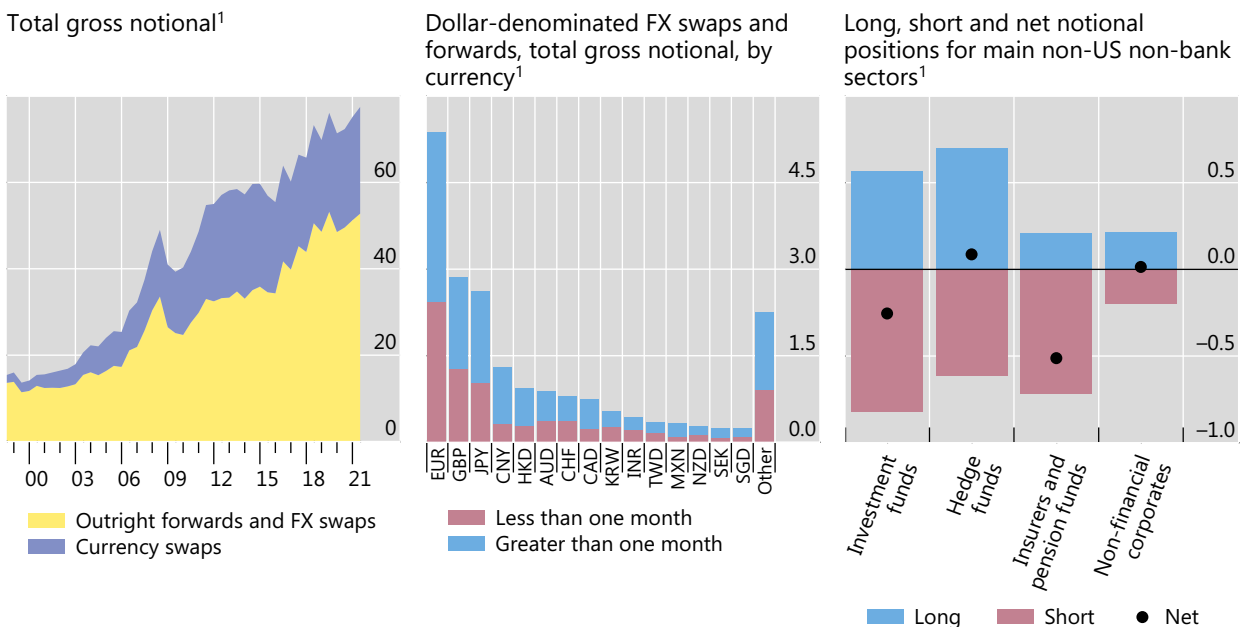
While detailed information about FX swap use is lacking, data reported to the Bank of England provide insights about the direction of participants' FX forward positions. London accounts for about 40% of FX swap trading. In this sample, the currency in the non-dollar leg of the FX forwards is mostly EUR, followed by GBP, JPY, CNY and HKD. Around 40% of FX forwards mature within one month (centre panel). The main non-US, non-bank users of FX forwards in this sample are investment funds, hedge funds, insurers and pension funds. Almost all outstanding positions in this sample involve a bank and just over two thirds of positions are interbank. Banks are net long dollars via forwards, although their net position is significantly smaller than their gross position (CGFS (2020)).

The directional positions vary across sectors (right-hand panel). The insurance and pension fund sectors (combined) as well as the investment fund sector have net short dollar forward positions (shown by the black dots below the line), consistent with using FX swaps to hedge dollar assets. That said, some of institutions within these sectors are providers of dollars in FX forward markets. Hedge funds in this sample have broadly flat dollar forward positions. This reflects the fact that many individual hedge funds have long and short positions at different maturities as part of their arbitrage strategies. These trades leave them with a slight net long position in dollars, suggesting that hedge funds as a sector are providers of dollars in forward markets.

### Dollar-denominated FX swaps and forwards

In trillions of dollars

Graph A



<sup>1</sup> Notional, global total amounts outstanding. <sup>2</sup> Outstanding positions on 9 July 2019 based on EMIR trade repository data reported to the Bank of England. Intragroup trades and trades with central counterparties have been removed.

Sources: CGFS (2020); Bank of England; DTCC; Regis and UnaVista trade repositories; BIS OTC derivatives statistics; BIS calculations.

Unhedged FX exposures or maturity mismatches between holdings and hedges can generate distress if exchange rates move sharply. The short-term nature of FX forwards and swaps exposes investors to rollover risk, which can amplify spillovers during periods of stress. If an NBFIs is unable to roll over its FX swaps, it may require foreign currency funding from other sources such as repo or the unsecured money market funding. In the worst case, the NBFIs may need to sell foreign currency assets if it cannot fund them in the same currency, hedge the currency risk in a short time or operate with lower hedge ratios. The impairment of sources of funding on a systemic scale could lead to fire sales.

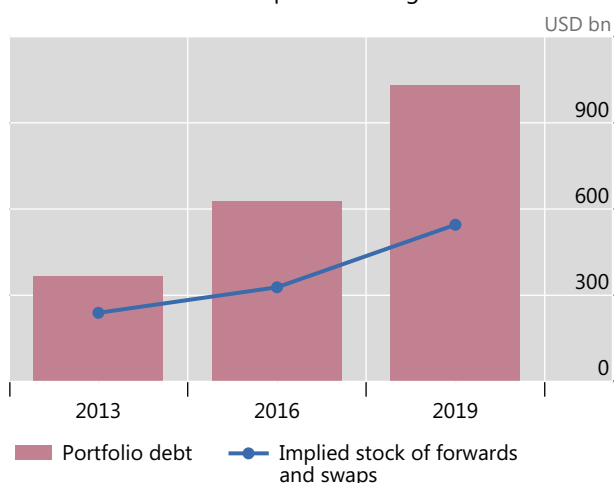
Proxy hedging can also be a source of cross-border contagion. When investors invest in assets denominated in illiquid currencies, hedging them might be very costly or there might be no viable hedges available. In that case, investors might choose to hedge using currencies that are sufficiently correlated to act as a proxy and mirror the target currency. These proxies are typically more liquid and can be hedged at significantly lower costs. For example, some investors use relatively more liquid EME currencies, such as the Mexican peso and the South African rand, to hedge their exposures to a broader set of EMEs. When hedging demand increases, this behaviour is likely to amplify volatility in the currencies used for proxy hedging.

In many cases, investors operate with partial hedges (Graph 4, left-hand panel). Moreover, their demand for hedging is countercyclical: it is low in good times but increases precisely when the risk-bearing capacity of intermediaries that supply hedging services is weak (right-hand panel). Recent evidence suggests that countries with positive dollar imbalances draw on central bank swap lines more heavily than those with negative dollar imbalances (Liao and Zhang (2021)). Together with the countercyclical movements in the hedge ratios, this suggests that investor demand for short-term dollar funding to hedge positions increases during stress episodes.

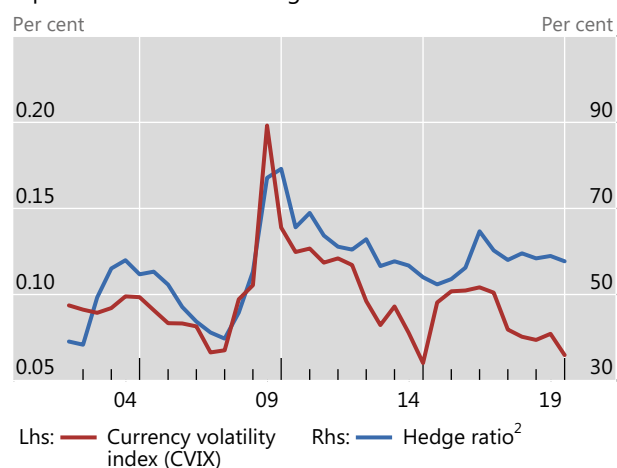
## Hedging behaviour of NBFIs

Graph 4

Debt investments and implied FX hedges<sup>1</sup>



Japanese life insurers' hedge ratio



<sup>1</sup> Implied stock of FX swaps/forwards derived by multiplying the average maturity (in days) by the average daily trading volume (blue dots); and countries' combined external portfolio debt investment (red bars). <sup>2</sup> The hedge ratio is calculated by dividing the net notional amount of foreign currency forward and swap contracts (sold minus bought) and put options by the foreign currency-denominated asset holdings reported in public disclosures of nine large Japanese insurers.

Sources: Liao and Zhang (2021); BIS Triennial Central Bank Survey; BIS calculations.

In FX forward and swap markets, global banks are the main suppliers of hedging services. Their lending in FX swap markets is influenced by the availability of dollar funding from MMFs, which invest in commercial paper and other instruments issued by banks (Eren et al (2020a)). Moreover, since the GFC, global banks' willingness to supply FX hedging services has fluctuated with the strength of the dollar (Avdjiev et al (2019)). A key mechanism through which the dollar exchange rate can affect the risk-taking capacity of banks is the financial channel of exchange rates (Bruno and Shin (2015)). For banks that hold a diversified portfolio of loans to borrowers, some of whom have currency mismatches, a broad dollar appreciation tends to result in an increase in the credit risk of the loan portfolio. This drives up the tail risk in banks' portfolios, which in turn reduces their risk-taking capacity if the bank adjusts total lending so that total risk is managed down to match the bank's economic capital.

The financial channel has manifested itself in the negative relationship between the broad dollar index and the FX swap basis for number of currencies. In particular, periods of broad dollar strength have coincided with a large (negative) basis for most major currencies. This relationship was especially strong during the period of pandemic-induced stress in global financial markets (Avdjiev et al (2020)).

### 3.3 "Original sin redux"

The financial channel of exchange rates also gives rise to spillovers whenever investors do not fully hedge their foreign asset holdings into their home currency. The development of local currency markets helped EMEs to overcome the "original sin" of not being able to borrow internationally in their own currency. However, it did not fully eliminate the risks associated with currency mismatches. Instead, the development of local currency markets has shifted these risks from borrowers to creditors – a phenomenon dubbed "original sin redux" by Carstens and Shin (2019).

Some investors elect not to fully hedge their foreign assets in order to take advantage of the appreciation of EME currencies to enhance returns during risk-on periods. During such periods, an appreciation of the EME currency increases the value of their foreign assets, and such a mark-to-market gain might ease their risk limits or release margin. In turn, this might lead to more purchases or less hedging, which would further push up foreign asset prices. The result is a mutually reinforcing loop between capital inflows and currency appreciation. However, when the exchange rate depreciates, the same mechanism plays out in reverse: depreciation amplifies the losses to foreign investors, leading to larger outflows.

This mechanism was evident during the Covid-19 crisis. During the initial phases of the crisis, EMEs with greater foreign ownership of local currency bonds experienced significantly larger increases in their local currency bond spreads (Hofmann et al (2020), Hördahl and Shim (2020)). Indeed, foreign mutual funds exhibited a more procyclical pattern of flows than other investors, in part as they sought to reduce currency mismatches on their balance sheets. During the Covid-19 crisis, dollar appreciation amplified the sell-off of local currency bonds but not that of dollar-denominated bonds (Bertaut et al (2021)).

### 3.4 Redemption risk

Another channel of cross-border spillovers stems from redemption risks due to liquidity mismatches on NBFIs' balance sheets. Liquidity transformation is an important feature of many NBFIs, such as open-ended bond funds and MMFs that promise daily redemptions while holding less liquid assets.

Liquidity mismatches are not specific to NBFIs and indeed are also a characteristic of banks. However, the risk of contagion is higher for NBFIs than banks for three reasons. First, depending on the jurisdiction, NBFIs typically do not have access to central bank liquidity backstops, whereas banks do. For example, during the Covid-19 crisis, dollar-denominated MMFs in the United States had access to a facility temporarily established by the US Federal Reserve whereas those in Luxembourg and Ireland did not (FSB (2021b)). Second, many types of NBFIs are subject to less rigorous prudential regulation than banks, with more leeway to determine the adequacy of their liquidity buffers. Third, NBFIs often rely on liquidity management tools that do not take systemic considerations into account (Claessens and Lewrick (2021)).

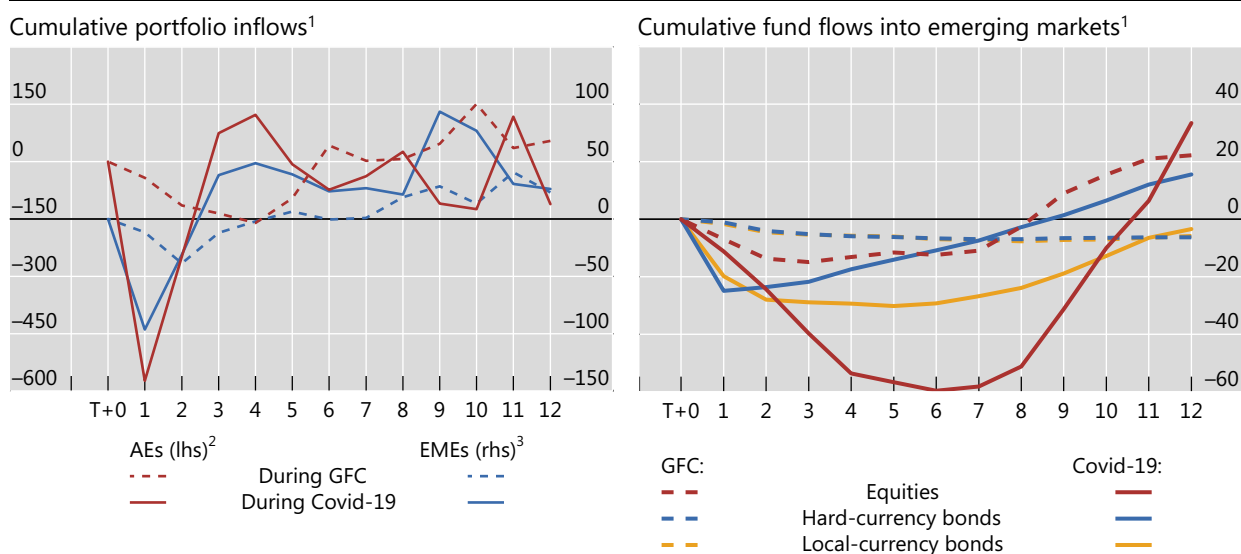
Prominent among NBFIs exposed to redemption risks due to liquidity mismatches are open-ended bond funds and similar investment vehicles that invest in corporate bonds and other less liquid assets but pay out in cash. Such funds hold small cash buffers and so typically liquidate their investment positions to meet large investor redemptions (Coval and Stafford (2007)). This gives rise to a first-mover advantage in redemptions, making these funds vulnerable to runs, which lead to procyclical behaviour and fire sales. Sudden portfolio reallocations are an important channel for cross-border spillovers (Jotikasthira et al (2012)).

Such dynamics were at play during the Covid-19 crisis and the GFC (Graph 5, left-hand panel), as well as during other EME crises such as the 2013 taper tantrum. Especially during the Covid-19 crisis, AEs and EMEs saw sharp portfolio outflows, led by outflows from mutual funds and ETFs. In EMEs, outflows were particularly pronounced for funds that invested in local currency government bonds. During both the GFC and the Covid-19 crisis, cumulative fund outflows from equities were sharper than from bonds. In the case of the Covid-19 crisis, equity flows also took longer to return to pre-crisis levels (right-hand panel).

## Capital flows in response to crisis episodes

In billions of dollars

Graph 5



<sup>1</sup> Each period is a month. Period 1 corresponds to March 2020 for Covid-19 and September 2008 for the GFC. <sup>2</sup> EA, JP, US. <sup>3</sup> BG, BR, CL, CN, CO, CZ, EE, HU, IN, ID, KE, KR, LB, LK, LT, LV, MK, MN, MX, MY, PH, PK, PL, QA, RO, RS, RU, SA, SI, TH, VN, TR, TW, UA and ZA.

Sources: ECB; Ministry of Finance of Japan; US Department of the Treasury; International Institute of Finance; EPFR; JP Morgan; BIS calculations.

Selling pressures can have an impact on bond markets that are usually considered more liquid. If funds hold a mix of illiquid assets combined with more liquid government bonds, they might sell more liquid bonds first to raise liquidity in the face of redemptions (Huang et al (2020)). Indeed, during March 2020, many funds sought to increase the liquidity of their portfolios by selling US Treasuries. Similarly, reserve managers contributed to the selling of US Treasuries to raise precautionary FX liquidity for possible intervention in FX markets. A significant portion of sales by non-US institutions were by private entities domiciled in financial centres, suggestive of sales by hedge funds and similar leveraged investors. The “dash for cash” by investors and borrowers contributed to strains in the US Treasury market, but these strains did not spill over to other AE markets in any significant way (Eren and Wooldridge (2021)). The euro area and Japan saw only modest outflows.

Redemption risks at MMFs can also spill over through the funding they provide to banks in short-term money markets. Owing to the relatively short maturity of their holdings, MMFs usually respond to redemption pressures by either not rolling over their investments or drastically reducing the maturity profile of their holdings, as seen during the Covid-19 crisis (Eren et al (2020b), FSB (2021b)). A reduction in funding from MMF can then spill over to the international lending activities of banks, as discussed above.

### 3.5 Leverage and relative value trades

NBFIs’ use of leverage can further amplify the cross-border spillover of shocks affecting them. Leveraged investors might have leveraged cross-border long or short positions or they might combine long and short positions as part of relative value trades (Duarte et al (2007)). During stress episodes, margin calls can prompt the disorderly closing of these positions in an attempt to reduce the risk in their portfolios as spikes in margins can lead to system-wide deleveraging (Aramonte et al (2022)). In extreme cases, leveraged investors have multiple relative value trades that make losses and trigger margin calls, and their exposures to the rest of the financial system might lead to systemic events. Hidden exposures, as in the case of the Archegos hedge fund in early 2021, might further exacerbate vulnerabilities.

The failure of Long-Term Capital Management (LTCM) in 1998 is a prominent example of how a hedge fund’s unwinding of relative value trades can amplify financial stress and spread it across borders. LTCM took very large, highly leveraged positions to take advantage of small discrepancies in the prices of various instruments relative to historical norms, including in some small and illiquid markets. Losses on these relative value trades mounted after Russia’s default, and to avoid a disorderly unwinding of LTCM’s positions, creditors and counterparties agreed to recapitalise LTCM. Nevertheless, the actual and anticipated unwinding of LTCM’s portfolios and similar portfolios held by other leveraged investors contributed to tremendous volatility in financial markets worldwide (CGFS (1999)).

### 3.6 Passive investing and herding

The universe of NBFIs encompasses investors with diverse preferences and risk management practices. In principle, this diversity dampens financial market volatility. However, in practice, asset managers tend to herd, which can exacerbate cross-border spillovers (CGFS (2021)). Banks also tend to herd, as demonstrated by repeated booms and busts in international lending (McCauley et al (2021)). Yet, NBFIs tend to move faster than banks and so contribute to volatility at a higher frequency.

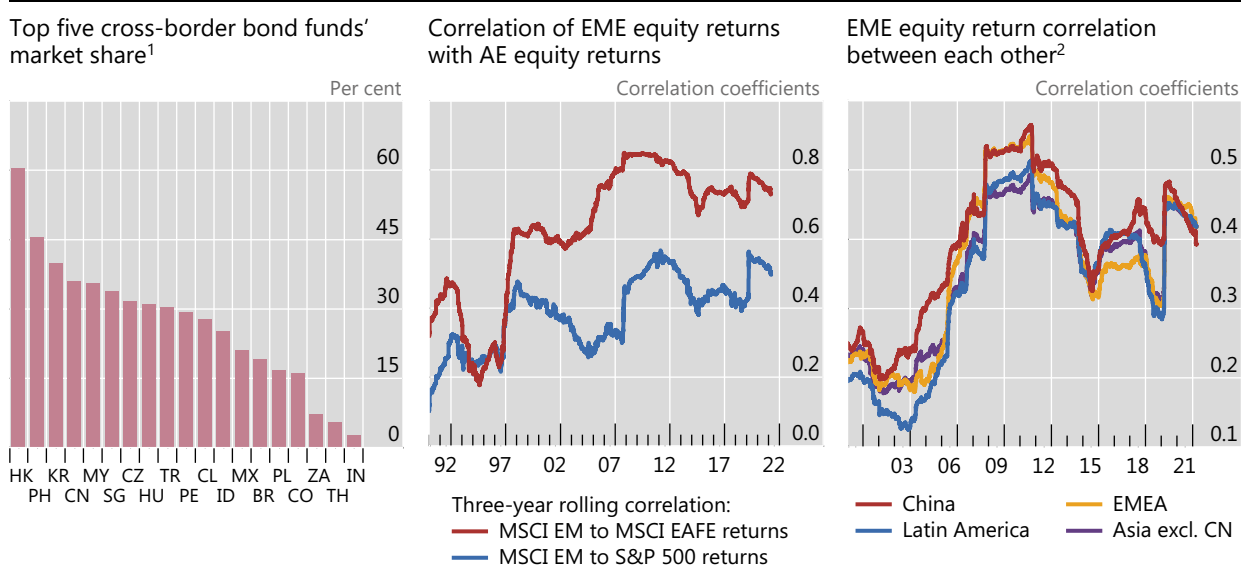
With the rise of passive investment strategies, NBFIs have deferred to market indices and credit ratings from external providers in place of their own internal risk assessment. For example, investment funds that passively track an index represent around half of fund flows into EMEs according to EPFR. While active funds have more discretion over the assets that they include in their portfolios, they also have incentives to follow indices closely if their performance is benchmarked against them.

Owing to their mechanistic behaviour, passive funds respond differently to shocks than actively managed funds do, reacting more forcibly to unexpected rises in uncertainty and global risk aversion. Moreover, the lack of discretion enjoyed by passive fund managers creates a pass-through mechanism that leads to a greater co-movement in flows as well as elevated return correlations. For example, the higher the weight of two countries in the MSCI EM index, the greater their bilateral return correlation in the event of a global uncertainty shock (Chari et al (2022)).

The importance of indices and ratings as sources of spillovers is amplified by the high degree of concentration in the fund management industry. A few large global asset managers command a large share of some markets (Graph 6, left-hand panel). If a large investor is a common creditor to many counterparties, portfolio rebalancing decisions might have a larger impact on markets, simply because the reallocation might be sizeable.

Market share of cross-border funds and EME stock return correlations

Graph 6



<sup>1</sup> Total net assets as of 31 December 2021. Both domestic and cross-border funds are included in the market size. <sup>2</sup> Based on regional average of three-year rolling average pair-correlation of each equity market with 18 other equity markets.

Sources: Datastream; EPFR; BIS calculations.

Fundamentals in borrowing countries are clearly important drivers of investments, notwithstanding the rising importance of passive investment strategies. For EMEs especially, improvements in macroeconomic fundamentals and institutional frameworks, as well as financial sector development, have made investors more selective when assessing opportunities, leading them to focus on cyclical differences across countries, such as economic growth (CGFS (2021)). In line with this focus on pull factors, correlations of EME stock returns both with AEs (Graph 6, centre panel)

and other EMEs (right-hand panel) have been declining since the GFC during normal times, although they rise during crisis episodes.

#### 4. The procyclicality of NBFIs' cross-border behaviour

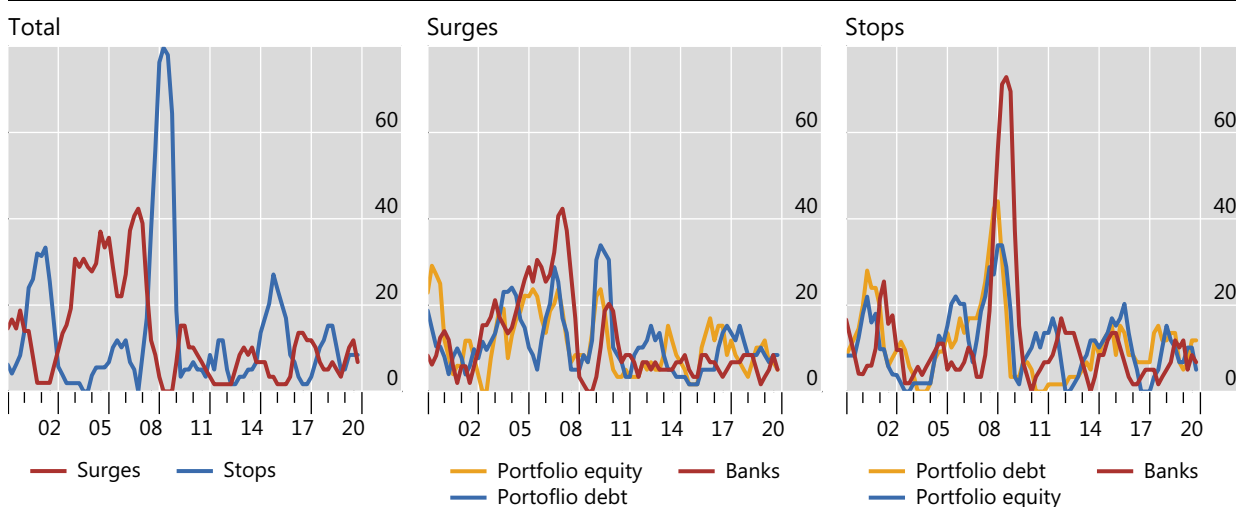
Has the greater involvement of NBFIs in recent years aggravated the procyclicality and intensity of cross-border spillovers? Some evidence suggests yes. For example, since the GFC, changes in global risk aversion have been a significant source of co-movement in cross-country asset returns (Rey (2013), Miranda-Agrippino and Rey (2020)). Other evidence suggests no. For example, the incidence of extreme capital flows has not increased in the post-GFC period and has decreased for most measures.

The rising influence of NBFIs has not had a strong impact on extreme capital flows. Surges became less frequent after the GFC and the frequency of stops was little changed (Graph 7, left-hand panel; CGFS (2021)).<sup>8</sup> Surges and stops in bank flows, portfolio debt flows and portfolio equity flows appear fairly similar between the pre- and post-GFC periods (centre and right-hand panels).

##### Extreme capital flows<sup>1</sup>

In per cent of countries in the sample

Graph 7



<sup>1</sup> Shows the number of countries with an extreme value of capital flows according to the Forbes and Warnock (2021) methodology, for a large sample of EMEs and AEs. Surge and stop episodes are defined the following way: the variable is the moving sum of annual nominal capital flows. Year-on-year changes are calculated and compared over time. Episodes are identified using three criteria: (1) at least one quarter within the episode shows a year-on-year change of more than two standard deviations from the long-term average (five-year rolling average). (2) the episode continues over all consecutive quarters where the year-on-year change exceeds one standard deviation. (3) the episode is at least two quarters long.

Sources: Forbes and Warnock (2021); BIS calculations.

The reduced incidence of extreme moves persisted even during the period of heightened market volatility in the first half of 2020 during the Covid-19 crisis. That said, gross equity and bond inflows in EMEs relying more on global mutual funds

<sup>8</sup> Surges occur when gross capital inflows are very high relative to a reference level, whereas sudden stops occur when gross capital inflows are very low. As a general pattern, stops tend to follow surges.



were more sensitive to changes in global conditions between 2001 and 2015 (Cerutti et al (2019)).

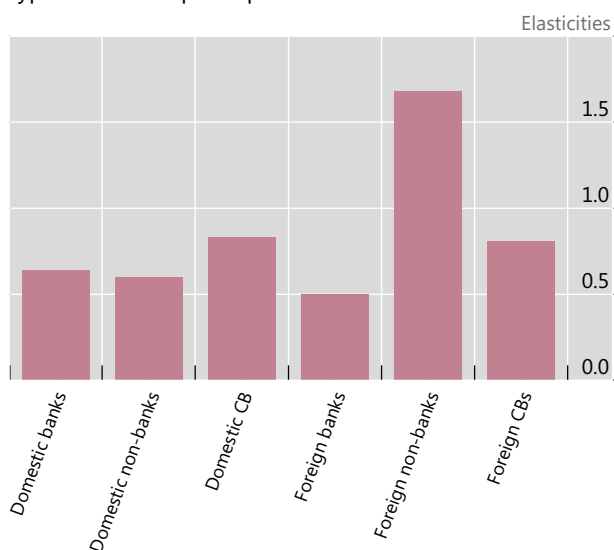
However, aggregate flows might present a misleading picture of the contribution of banks and NBFIs to cross-border spillovers. Central banks have intervened to support market functioning, most notably during the Covid-19 crisis. Also, during the post-GFC period, prudential regulations for banks were tightened, which might have moderated their incentives for risk-taking. Moreover, some countries have made more active use of macroprudential measures. By moderating credit growth, such measures can dampen the volatility of capital flows and limit the build-up of vulnerabilities (CGFS (2021)).

Studies focusing on NBFIs' behaviour suggest that they tend to act more procyclically than banks, especially when it comes to cross-border activity. For example, for sovereign bonds, foreign NBFIs' demand elasticity to changes in yields is orders of magnitude greater than those of domestic banks, domestic NBFIs or foreign banks (Graph 8, left-hand panel; Fang et al (2022)). Similarly, for syndicated lending, in the face of domestic shocks NBFIs tend to reduce their cross-border lending by more than banks do, thus exhibiting a greater "flight home" effect than banks (right-hand panel; Aldasoro, Doerr and Zhou (2022)).

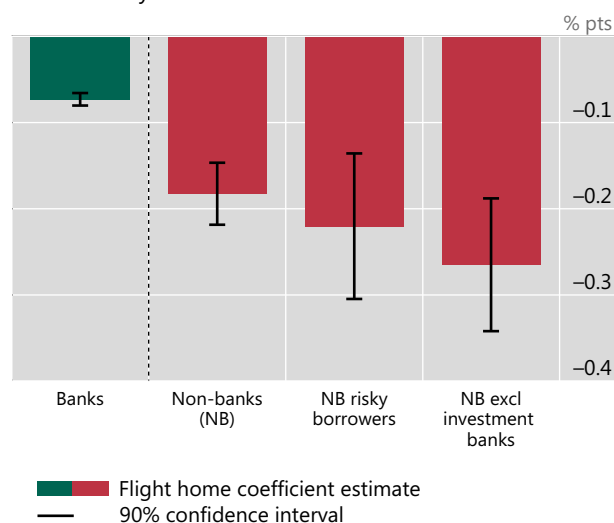
### Procyclicality of NBFIs' cross-border activities

Graph 8

Estimated elasticities to changing yields of different types of market participants



During domestic crises, non-banks cut credit to foreign borrowers by more than banks do



Sources: Aldasoro, Doerr and Zhou (2022); Fang et al (2022).

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