FSB FINANCIAL STABILITY BOARD

US Dollar Funding and Emerging Market Economy Vulnerabilities

26 April 2022

The Financial Stability Board (FSB) coordinates at the international level the work of national financial authorities and international standard-setting bodies in order to develop and promote the implementation of effective regulatory, supervisory and other financial sector policies. Its mandate is set out in the FSB Charter, which governs the policymaking and related activities of the FSB. These activities, including any decisions reached in their context, shall not be binding or give rise to any legal rights or obligations.

Contact the Financial Stability Board

Sign up for e-mail alerts: www.fsb.org/emailalert
Follow the FSB on Twitter: @FinStbBoard
E-mail the FSB at: fsb@fsb.org

Table of Contents

Executive summary 1

1. Introduction 4

2. EME external vulnerabilities prior to the COVID-19 pandemic 5

   2.1. External debt increased and is mostly denominated in USD 5

   2.2. External financing by non-bank financial intermediaries has become more important 9

   2.3. EME external financing chains are complex 12

3. External financing strains during COVID-19 14

   3.1. The March 2020 market turmoil in EMEs 14

   3.2. Procyclicality in EM funds 27

   3.3. Credit rating downgrades and the March 2020 stress 30

4. Policies to address market strains in EMEs in March 2020 35

5. Policy implications 38

Annex 1: Dataset used in the report 43

Annex 2: Regression analysis 46

References 52

Abbreviations 56

Executive summary

This report presents the findings of the FSB-IMF work on the interaction between US dollar (USD) funding and external vulnerabilities in emerging market economies (EMEs). The report, which forms part of the FSB's work programme on non-bank financial intermediation, takes stock of recent trends in the structure of EMEs' external borrowing, focusing on the shift towards non-bank financing; examines how these developments contributed to the build-up of vulnerabilities in EMEs and to the USD funding stress during the March 2020 turmoil; and draws policy implications about measures to enhance EME resilience in order to lessen the impact of future episodes of stress.

Following the 2008 global financial crisis (GFC), EMEs benefitted from strong capital inflows. For most of the decade prior to the COVID-19 pandemic, abundant global liquidity – combined with low interest rates in advanced economies (AEs) and a search for yield among investors to boost their returns – helped to support the capital flows to EMEs. These inflows provided EMEs with the benefits of greater access to international capital markets but also contributed to the build-up of vulnerabilities, with EME external borrowing growing from $3.3 trillion (about 25% of GDP) at end-2010 to $5.6 trillion (about 30% of GDP) at end-2019. Overall, more than 80% of this debt was denominated in foreign currency, mostly USD, and the growth in borrowing likely spurred on currency mismatches, especially in the non-financial corporate (NFC) sector.

Over this period, non-bank financial institutions (NBFIs) played an increasing role in funding EME external debt. Part of this financing came from investment funds, whose assets more than tripled in the decade since the GFC. While this development added to the diversity of EME funding sources, it created new challenges for EMEs. Empirical evidence suggests that investment funds – especially those that are either passively managed or follow benchmark indices – may be more susceptible to global financial conditions, accentuating the procyclicality in capital flows.

The COVID-19 outbreak delivered a severe shock to global financial markets. The declines in EM asset prices during March 2020 were very large and, in some cases, comparable to those witnessed during the GFC. Sales by foreign investors resulted in large-scale capital outflows and contributed to local currency depreciation. These outflows, however, differed substantially across jurisdictions. Economies with greater vulnerabilities, such as higher levels of external foreign currency debt (relative to foreign exchange reserves), tended to suffer larger debt outflows.

During this episode, EM investment funds experienced substantial redemptions which were larger than the 2013 'taper tantrum'. Empirical evidence indicates that funds holding more illiquid assets tended to experience larger outflows. Funds undertook sales of EME assets in response, with many bond funds selling more assets than was strictly needed to meet redemptions. Although this was likely a precautionary step, in expectation of further withdrawals, the sales may have amplified the pressures in markets. Analysis suggests that jurisdictions which relied more on investment from global and passive bond funds tended to face greater capital outflows.

Sovereign rating downgrades in H1:2020 may have added to the pressures at least in some jurisdictions that lost their investment grade rating, and so became ineligible for inclusion in some

benchmark bond indices. EME companies with domestic credit ratings close to the sovereign rating were often downgraded shortly after the sovereign and this appeared to add to corporate borrowing costs.

EME authorities deployed a suite of measures to mitigate the pressures in local currency bond markets and to stem capital outflows during March 2020. These included standard crisis management tools, such as foreign exchange (FX) interventions and central bank liquidity support in both domestic and foreign currencies. A number of EM central banks, however, also introduced measures they had not used previously, such as large-scale asset purchases to mitigate stress in local currency debt markets.

Actions by AE authorities were also important in mitigating strains in financial markets globally and helped to address some of the pressures faced by EMEs. There were positive spillovers from measures directed at AE financial systems – such as asset purchases, liquidity operations and backstop facilities – that helped to restore investor confidence more generally. In addition, some measures – notably USD liquidity swap lines and the Federal Reserve's FIMA repo facility – were more targeted at addressing global USD funding pressures, including those in EMEs.

Absent these unprecedented policy interventions, market strains and capital flow volatility would have likely intensified and tested the resilience of the global financial system. While these actions succeeded in reversing the tightening in global financial conditions and ameliorated the deterioration in market functioning, they did not directly address the underlying vulnerabilities, so policy measures are needed to improve the resilience of EMEs' financial systems to future shocks. These measures seek to reduce EME vulnerabilities stemming from external funding and non-bank financing, as well as to enhance crisis management tools.

Policies introduced after the GFC helped increase the resilience of the global banking system, including by strengthening capital and liquidity, this prevented banks from becoming an amplifier of the pandemic shock. Bank FX mismatches during March 2020 were contained through, for example, FX reserve requirements, separate liquidity requirements by currency, and limits on foreign currency net positions. These policies should continue to help bolster the banking sectors in EMEs. In addition, there is a question whether consideration could be given to using measures to limit the build-up of NFC FX mismatches in some jurisdictions. Priority could also be given to further developing FX hedging markets at the domestic and regional levels to manage currency risks. The development of local currency debt markets has helped to reduce sovereign currency mismatches, but these markets also experienced stress, at least in part due to the withdrawal of foreign investors. This suggests the need to deepen local currency debt markets and foster a broader domestic investor base.

Work to tackle NBFIs' vulnerabilities should remain a priority at the international level. Since EM funds located in AEs have an impact on markets and capital flows in EMEs in times of stress, any policy measures adopted for open-ended funds (OEFs) in AEs will have implications for EMEs as well. For example, measures aimed at addressing liquidity mismatches in OEFs would also help bolster the resilience of EMEs' financial systems. The FSB is assessing the effectiveness of existing policy recommendations to mitigate liquidity mismatches in OEFs and will report on its findings, including whether these recommendations need to be enhanced, at the November G20 Summit. More generally, investors should continue to use due diligence with respect to their reliance on credit ratings, and there may be benefit in exploring how index

providers could reduce their mechanistic use of credit ratings, for example by avoiding a rebalancing of indices during periods of stress.

Finally, consideration should be given to closing data gaps to facilitate risk monitoring and the timely adoption of policies to mitigate external EME vulnerabilities. International organisations and national authorities should try to develop a comprehensive dataset on non-bank cross-border capital flows, as well as more detailed statistics on the currency denomination of those flows and of external debt. Supervisors in EMEs should also consider the types of additional information and tools needed to help assess vulnerabilities in this sector.

1. Introduction

This report presents the findings of the FSB-IMF work on USD funding and EME external vulnerabilities. The report was commissioned as part of the FSB's work programme on non-bank financial intermediation.[1] It examines developments in EMEs' external funding during the past decade, and how this contributed to a build-up of vulnerabilities in certain EMEs, some of which crystallised during the March 2020 market stress.[2] The report also: examines the channels through which the resulting stress propagated across financial markets; discusses the policy measures taken by financial authorities to address these market strains; and draws policy implications.

The focus of the report is the interaction between EMEs' USD external liabilities and the provision of external funding to EMEs by NBFIs.[3] Developments concerning banks – both in their role as intermediaries and as recipients of EME finance – are generally only focused on where they are relevant for developments concerning non-bank funding. The report concentrates on USD funding as this is the currency in which most EME external debt is denominated, though the report also considers other currencies as appropriate to its analysis.

The analysis is based on EMEs' external debt, as this is the most relevant concept in the literature for financial stability. In some cases, the report looks at external financing, which is external debt plus portfolio equity liabilities (Figure 1). While equity liabilities do not involve borrowing from non-residents, sales of equities by foreign investors can add to pressures on capital flows and EME exchange rates and so are also relevant for financial stability. The report, however, does not look at direct investment liabilities as these are longer-term investments that tend to be less affected in periods of stress.[4]

The report draws on a new dataset compiled by the workstream that allows a detailed analysis of EME portfolio and other investment liabilities. This dataset combines IMF balance of payments and international investment position data with BIS locational banking and international debt securities statistics in a novel way (Annex 1 provides more details).[5] This allows a decomposition of EMEs' external liabilities not only by currency denomination, but also by type of non-resident investor supplying the funding (into banks and NBFIs in aggregate). Further information on investment funds is gathered from Emerging Portfolio Fund Research (EPFR) data.

---

1 See FSB (2021).

2 This report focuses on a core set of 14 EME jurisdictions that are either FSB member jurisdictions or large EMEs for which the data needed for the analysis was available. These are: Argentina, Brazil, China, Hungary, India, Indonesia, Malaysia, Mexico, Poland, Russia, Saudi Arabia, South Africa, Thailand and Turkey. Many other EMEs had similar experiences to this core set during March 2020. The IMF definition of EMEs is used in the report.

3 For the purposes of this analysis, NBFIs are assumed to comprise all non-bank financial institutions that are not part of the official sector (e.g. central banks or public financial institutions), including investment funds holding securities issued by EMEs.

4 Direct investment is where a non-resident investor exerts a significant degree of influence in the management of the emerging-market enterprise in which it is invested.

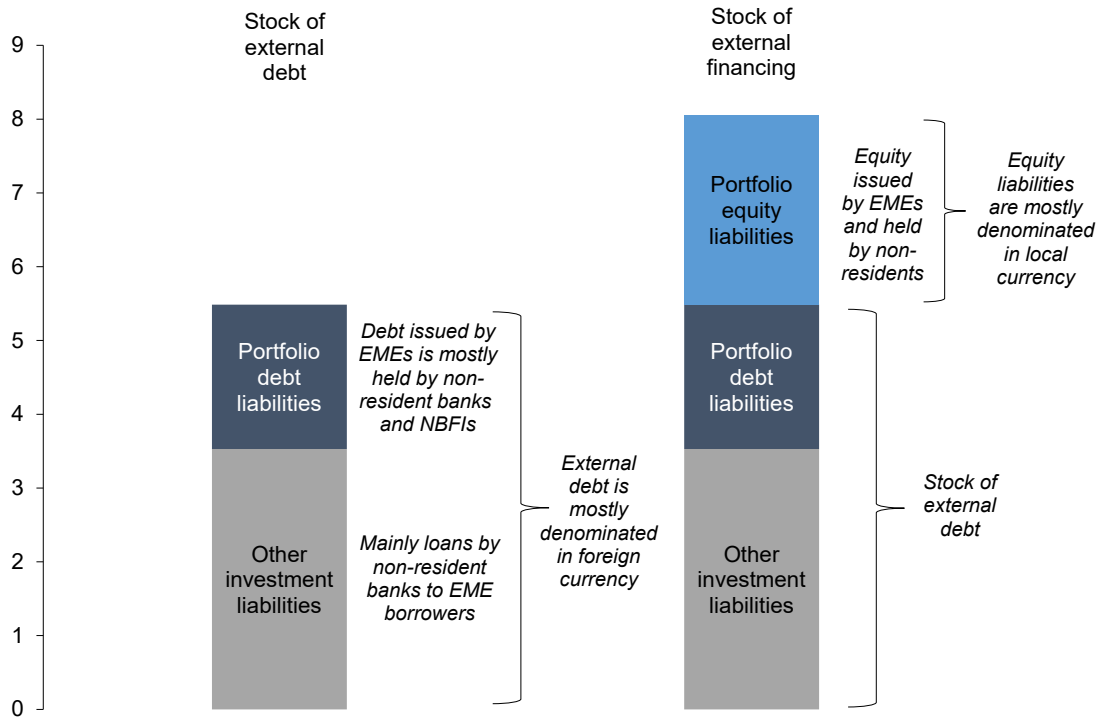
5 See IMF balance of payments and international investment position data, BIS locational banking statistics, and BIS international debt securities statistics.

The findings also draw on workshops with representatives of the private sector in October 2021 and with representatives of the FSB's six Regional Consultative Groups (RCGs) in November.

The report proceeds as follows. The next section outlines developments in the stock of EME external debt in the past decade, including the growth in the amount supplied by non-banks, as well as the vulnerabilities to which this gave rise. The third section discusses the external funding pressures during the March 2020 market stress, and spillovers across financial markets and jurisdictions. The fourth section explores the recovery in EME markets following a series of policy responses by authorities. A final section draws policy implications.

External debt and external financing[1] **Figure 1**

USD trillion



1 The figures shows aggregate data for all of the core EMEs at end-2019. The core EMEs are: Argentina, Brazil, China, Hungary, India, Indonesia, Malaysia, Mexico, Poland, Russia, Saudi Arabia, South Africa, Thailand and Turkey.

Source: FSB.

2. EME external vulnerabilities prior to the COVID-19 pandemic

2.1. External debt increased and is mostly denominated in USD

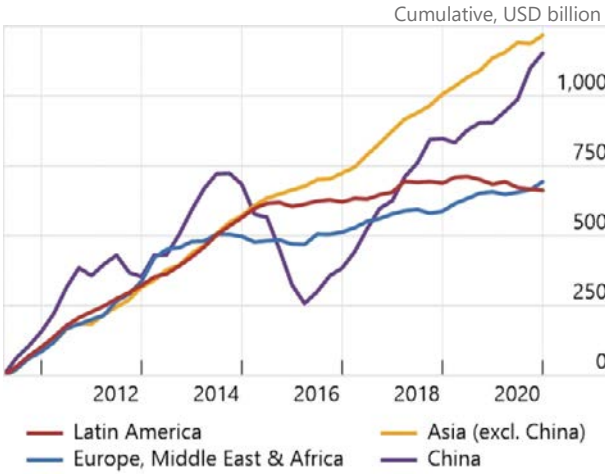
In the aftermath of the GFC, EMEs benefitted from strong capital inflows, particularly in Asia (excluding China) and Latin America (Graph 1, left panel). For most of the decade prior to the COVID-19 pandemic, abundant global liquidity – combined with low interest rates in AEs and a search for yield among investors – helped to support capital flows to EMEs.[6] This led to an

6 See, for example, CGFS (2021).

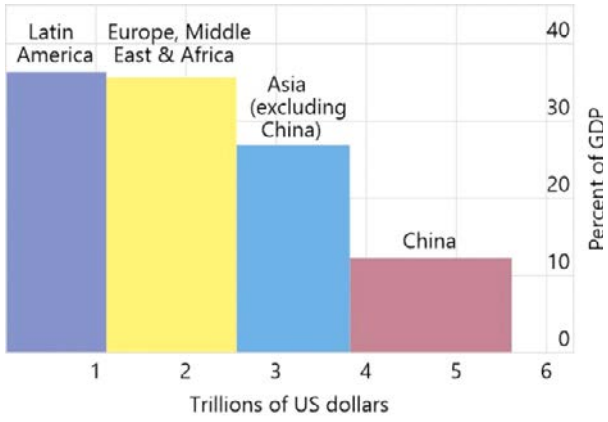
increase in external debt from $3.3 trillion at end-2010 to $5.6 trillion at end-2019, though the level of debt varies – with respect to GDP – across regions (Graph 1, right panel). External debt was higher in Latin America and the EMEA (Europe, Middle East & Africa) regions at around 35% of GDP in 2019. In Asia (excluding China) external debt was around 25% of GDP, while in China it stood at only around 10% of GDP. As the level of China's external debt is lower than in other regions, and because its large size dominates other countries, China is generally not included in aggregate EME data in this section of the report (as specified in the notes to the graphs).

Inflows to EMEs have led to an increase in external debt[1] **Graph 1**

1. EME debt inflows



2. EME external debt by region, 2019



[1] The graph shows the evolution of debt inflows for the 14 core EMEs: Argentina, Brazil, China, Hungary, India, Indonesia, Malaysia, Mexico, Poland, Russia, Saudi Arabia, South Africa, Thailand and Turkey.

Sources: IMF; FSB calculations.

Overall EME aggregate external debt (excluding China) increased from 24% of GDP in 2010 to 30% in 2019. While external financing brings benefits, it also makes EMEs sensitive to sudden tightening in global financial conditions. In times of stress, investors may seek to sell EM assets and the resulting increase in spreads raises the cost of new funding. In such periods of market strain, it might also be harder for EM entities to issue new or roll-over existing debt that is due.[7] Furthermore, as more than 80% of EME external debt is denominated in foreign currency – mostly USD – this creates currency mismatches (Graph 2, panel 1). This 'original sin' makes EMEs vulnerable to a large depreciation in the exchange rate, which raises the cost of financing in local currency terms. Moreover, in such circumstances, governments and NFCs might turn to the domestic financial sector to obtain the funding they need, reducing credit availability for other sectors, such as households and smaller firms.

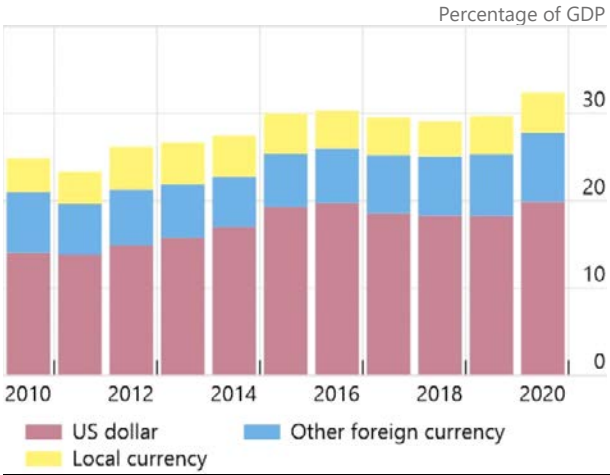
EME governments are the largest borrower from non-resident investors, representing around 40% of external debt in 2019, followed by NFCs and banks (Graph 2, panel 2). The currency composition of this borrowing varies across sectors. The development of local currency bond markets since the EME financial crises of the 1990s has reduced the reliance of governments

[7] For an overview of the general vulnerabilities related to EME external financing, see IMF (2019).

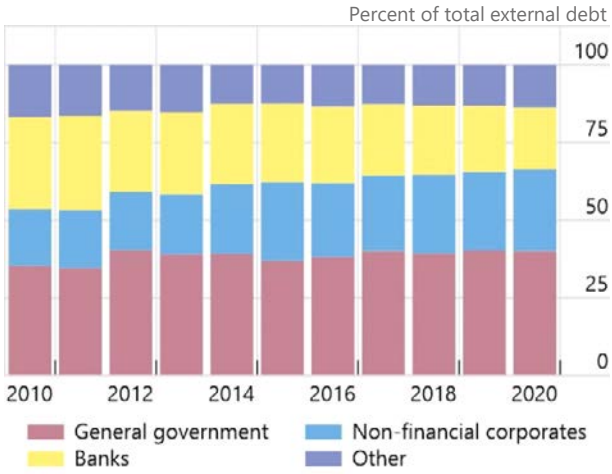
on foreign currency funding and so has limited government currency mismatches, despite the decline in non-resident holdings of local currency debt over the past few years.[8]

EME foreign currency debt remains significant, but varies by sector **Graph 2**

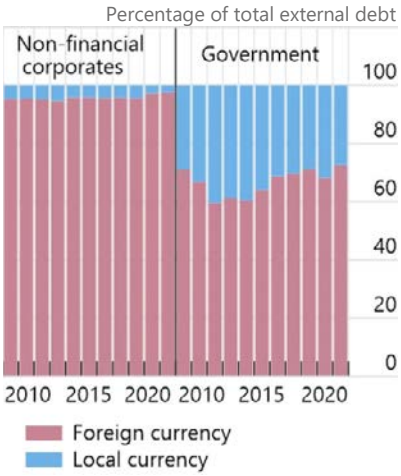
1. EME external debt, by currency[1]



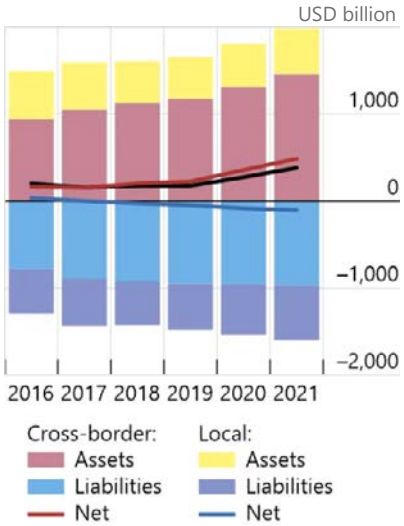
2. EME external debt by borrowing sector[1]



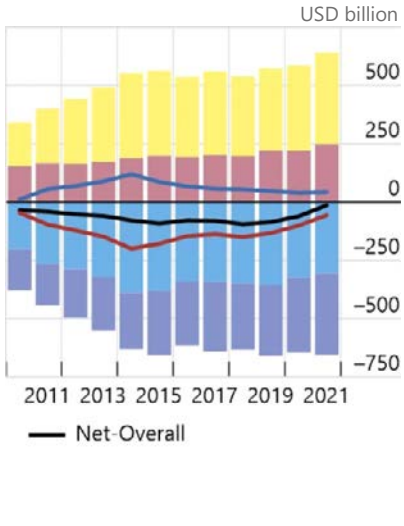
3. EME corporate and government external debt, by currency[2]



4.EME bank USD positions: larger sample of jurisdictions[3]



5. EME bank USD positions: smaller sample of jurisdictions[4]



[1] The graph does not include China. [2] Panel 3 does not include Saudi Arabia, due to a lack of data. [3] Panel 4 is drawn for the core EMEs,, except Argentina, Hungary, Poland and Thailand. For this sample, consistent data are only available from 2016 onwards. Note that China does not report banks' local positions vis-à-vis residents of China. [4] Panel 5 is drawn for a smaller sample of jurisdictions that have data from 2011 onwards (Brazil, India, Indonesia, Malaysia, Mexico, South Africa and Turkey).

Sources: Arslanalp and Tsuda (2014); BIS; IMF; FSB calculations.

While EME NFC external borrowing is smaller than for governments, it has grown more quickly, tripling in nominal terms over the post-GFC decade. Importantly, almost all EME NFC external debt is in foreign currency (Graph 2, panel 3). The full extent of the currency mismatch in NFCs, however, will depend on the degree to which a company has natural hedges – i.e. it receives revenues in USD – or hedges its foreign currency exposure through derivatives.

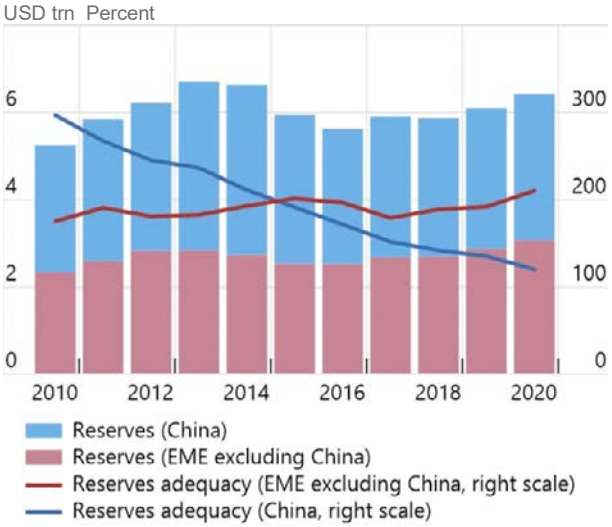
[8] See Miyajima et al (2012). Market contacts suggest that the general depreciation of EME currencies against the USD has been a disincentive for non-resident investors to hold local currency debt since around 2017-18.

EME bank USD positions grew significantly in the post-GFC decade, with assets doubling since 2010. This growth, however, was matched by an increase in USD liabilities, leaving net positions – a proxy for FX mismatches – relatively contained (Graph 2, panels 4 and 5).[9] Where net positions have grown, this has generally been following the onset of the pandemic, and driven by an expansion of cross-border assets. USD assets and liabilities with domestic borrowers (local positions) continue to be more matched.

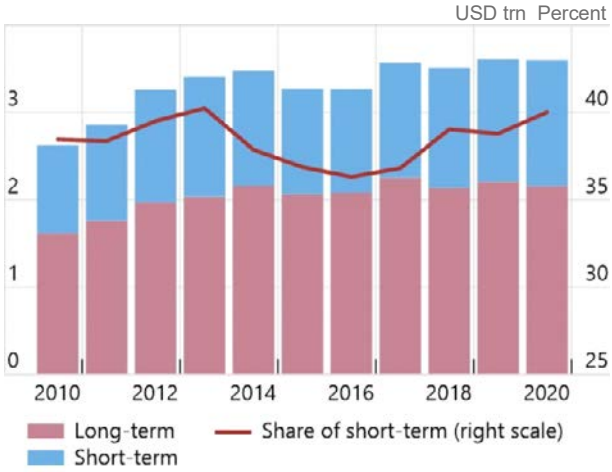
EMEs have taken some actions to build their resilience to FX mismatches. Official FX reserves have increased over the decade since the GFC, building EME buffers against shocks by increasing the amount of assets that can be sold to raise foreign currency. Aggregate reserves increased by around $1 trillion over the decade from 2010, although they are below the peak in 2013 (Graph 3, left panel). However, as discussed above, debt has also increased over the same period. This means that aggregate reserves adequacy – as assessed by the IMF ARA metric – has only increased slightly for the core EMEs (excluding China) and has fallen in China.[10] Nevertheless reserves adequacy in both the core EMEs and China remains above the 100% recommended level. In addition, as discussed in Section 5, some jurisdictions have implemented measures to reduce FX mismatches in the banking sector.

EMEs have increased some aspects of their resilience **Graph 3**

1. EME official reserves[1]



2. EME external debt, by maturity[2]



[1] Reserves adequacy shows the IMF ARA metric which shows official reserves as a percentage of a calculated adequacy metric, which has been adjusted for capital controls. [2] Short-term debt is defined on a residual maturity basis. Panel 2 excludes China and Saudi Arabia, the latter due to a lack of data.

Sources: IMF; FSB calculations.

Second, EMEs have also increased the amount of long-term debt they have issued, helping to lengthen the maturity profile of their external debt. In aggregate, EME long-term external debt has grown from around $1.6 trillion in 2010 to $2.2 trillion in 2019 (Graph 3, right panel). Having said this, the share of short-term debt in total external debt has not changed significantly over the same period as a whole.

9 This is part of a long-term trend in EMEs, following a strengthening of macroeconomic frameworks and the development of prudential regulations to reduce banks' currency mismatches in the previous decade. See Tobal (2018).

10 See IMF (2016) for a discussion of the reserves adequacy metric.

2.2. External financing by non-bank financial intermediaries has become more important

NBFIs have played an increasing role in supplying external debt to EMEs. Although comprehensive data on the type of NBFIs holding EME external debt is not available across a wide range of economies, this is likely to include open-ended investment funds, pension funds, life insurers, hedge funds, sovereign wealth funds, and so on. While non-resident banks are still the main lenders to EMEs (excluding China) in aggregate, debt provided by NBFIs has grown from just over 5% of aggregate GDP in 2010 to about 10% of GDP in 2019, around $1.3 trillion (Graph 4, panel 1). However, NBFIs have a much greater role in total external financing – external debt plus portfolio equity liabilities. On this metric, which includes financing in both USD and local currency, investment by NBFIs represented about half of external EME financing, more than that provided by banks (46%), and $2.7 trillion overall (Graph 4, panel 2).

Part of this financing from NBFIs has been from investment funds with portfolios of EM assets, either dedicated EM funds or global multi-sector bond funds with an allocation to EM securities (both in foreign and local currencies). The large majority (around 95%) of these EM investment funds are OEFs (Table 1). While most of these assets are in EM equity funds, bond funds have also grown. Passive investment funds – that is, investment funds that seek to replicate and hold a set benchmark portfolio of securities[11] – have also grown in importance since the GFC. Passive funds made up around 45% of EME equity funds in 2019 – an increase from around 30% in 2009 – and 17% of EM bond funds – an increase from around 7% in 2009. At the same time, funds for institutional investors have become more important, representing around 70% of EME fund investment on average in 2019, up from around 50% in 2009. Hard currency funds (i.e. foreign currency from an EME's point of view) still make-up the large part of EM bond fund assets under management and – consistent with the decline in non-resident investor holdings of local currency debt – the share of hard currency funds has risen since 2015.

Benchmark-driven investment has also increased. These investors use benchmark indices to guide their portfolio allocation, varying in the degree to which they track the underlying benchmarks. Unlike passive investors, however, benchmark-driven investors aim to outperform – rather than replicate – the performance of these benchmarks. Assets benchmarked against key EM indices have tripled since 2010 (Graph 4, panel 3). The number of countries represented in such indices has also increased over a similar period, with the EMBIG index including 70 countries in 2020, more than double that in 2007.[12]

[11] See BIS (2018) and IMF (2019).

[12] See Arslanalp et al (2020).

Table 1: EM bond and equity funds by type

Per cent of total EM bond or equity fund assets under management in each year

Bond funds

	Investment strategy									Fund type		
	Active				Passive				Total	Open-ended	Closed-end	Total
	Institutional		Retail		Institutional		Retail					
	Hard currency	Local currency	Hard currency	Local currency	Hard currency	Local currency	Hard currency	Local currency				
2009	33	12	34	11	3	4	0	0	**100**	95	5	**100**
2011	28	21	27	14	5	3	0	0	**100**	98	2	**100**
2013	23	17	29	22	4	4	0	0	**100**	99	1	**100**
2015	30	13	20	25	6	5	0	0	**100**	95	5	**100**
2017	32	14	20	20	8	6	0	0	**100**	96	4	**100**
2019	34	15	17	17	10	7	0	0	**100**	95	5	**100**
2021	34	16	17	14	11	7	0	0				

Equity funds

	Investment strategy					Fund type		
	Active		Passive		Total	Open-ended	Closed-end	Total
	Institutional	Retail	Institutional	Retail				
2009	24	43	31	0	**100**	96	4	**100**
2011	28	37	34	0	**100**	96	4	**100**
2013	33	30	36	1	**100**	97	3	**100**
2015	34	30	35	1	**100**	96	4	**100**
2017	34	26	39	1	**100**	97	3	**100**
2019	33	22	44	1	**100**	97	3	**100**
2021	33	21	45	2	**100**			

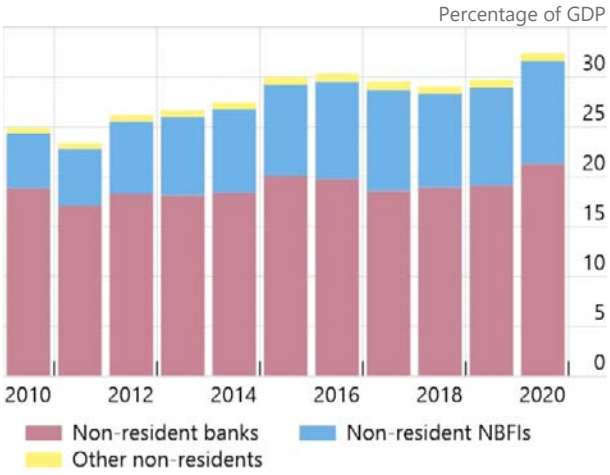
Sources: EPFR; Bank of England and FSB calculations.

There is also evidence that some active funds are tracking their benchmarks more closely. This may mean that their investment strategies and portfolio allocation are increasingly similar to those of passive funds (Graph 4, panel 4). The active share of EM local currency bond funds has fallen steadily over the last decade. This suggests that active fund holdings have become closer to the weights of assets in the benchmark index. This change has occurred at the same time as a decline in the tracking error of the same funds – that is, the difference in the performance of the funds relative to the benchmark index. The increased commonality between passive and active funds implies both sets of investors might behave very similarly during risk-off shocks, thus potentially exacerbating the risks.

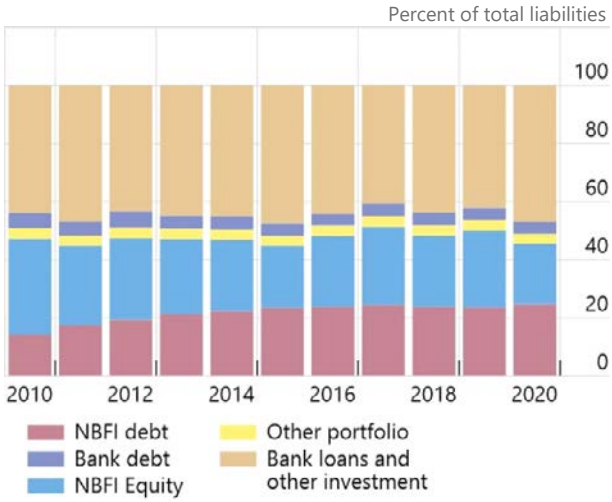
NBFIs' financing to EMEs has grown significantly

Graph 4

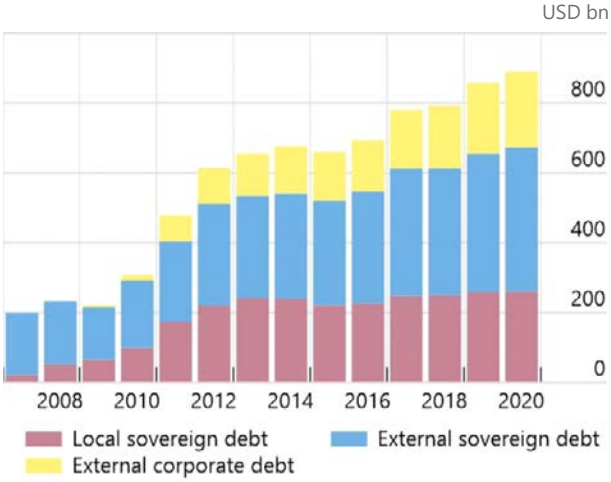
1. EME external debt, by type of non-resident investor[1]



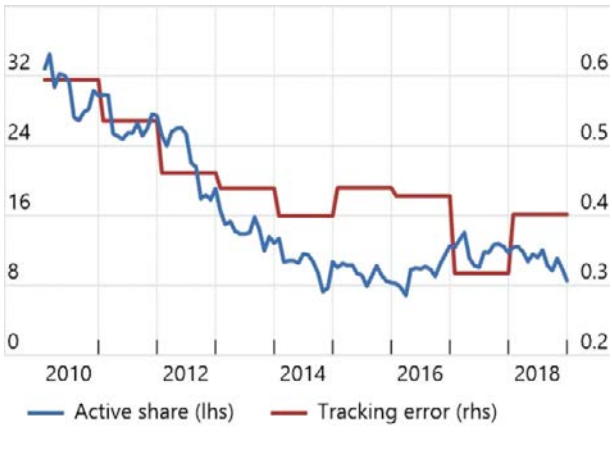
2. Breakdown of EME external financing[1,2]



3. Assets benchmarked against JPMorgan EM indices



4. Active share and tracking error of EM Local Currency Bond Funds[3]



[1] Panels 1 and 2 exclude China. [2] Note that external financing is a broader concept than external debt and includes portfolio equity financing. [3] Active share is the extent to which fund holdings deviate from the weights of the benchmark index. The higher the deviation, the more active the fund will be. The tracking error is the extent to which the fund returns differ from the return of the benchmark index. A passive fund would have a very low tracking error.

Sources: BIS; IMF; FSB calculations.

The developments in EM external liabilities over the past decade have had the benefit of adding to the diversity of financing to EMEs. Greater variety in sources of funding has the potential to improve access to financing, reduce the cost of capital, and increase the effectiveness and efficiency of markets through the better matching of savers and borrowers, as well as the sharing of risk across borders.[13]

However, the greater reliance on NBFIs may have contributed to new challenges for EMEs. There is a growing body of literature which suggests that NBFIs' flows may be more susceptible to global financial conditions. This may have introduced additional procyclicality into investment

[13] See Bank of England (2015).

flows that can amplify the volatility of capital flows to EMEs.[14] This sensitivity to global factors may have been spurred-on by the increase in benchmark-driven investors.[15] Some of these investors may perceive EMEs as a single asset class, and so would focus mainly on factors that affect the group of countries as a whole rather than country-specific developments, which may lead to greater correlation across different investors' investment decisions.[16] By one estimate, 70% of country allocations of mutual funds are influenced by benchmark indices,[17] while another study has found that flows from benchmark driven investors are three to five times more sensitive to global factors (e.g. global risk aversion) than total portfolio flows.[18]

2.3. EME external financing chains are complex

Behind the non-resident financing of EMEs is a set of cross-border connections across the global financial system. These links have become more complex over the past 10 years as market-based finance has grown and become more diverse.[19] The main interconnections are represented in a stylised map (Figure 2).

Horizontal lines on the map illustrate the flow of financing from ultimate savers on the right-hand side to EM borrowers (sovereigns, corporates and households) on the left-hand side. Ultimate savers are located in both AEs and EMEs. Savings can either be in the form of bank deposits, or investments in EM via institutional investors, which can be either leveraged (e.g. in the case of hedge funds) or unleveraged (e.g. in the case of most OEFs). The flow of funds to EMEs take place via lending to EM borrowers – both directly from institutional investors, as well as via loans extended by banks, both in the US, other AEs and in EMEs. Some institutional investors also purchase USD-denominated securities issued by entities in EMEs.

The flow of funds to EMEs also involves several market intermediaries, including banks and broker-dealers. These intermediaries, and the flow of funds between them, are shown by the boxes in the central column of the map, and by the vertical lines between them. These intermediaries facilitate the supply of funds to EMEs – both by extending loans (in the case of banks), and by facilitating the sale and purchase of securities.

Markets are used to manage the risk associated with the investment described above. This includes the use of FX swaps, FX forwards and cross currency basis swaps. These instruments enable the hedging of interest and exchange rate risk associated with investment in EMEs, including by foreign investors. NBFIs in both AEs and EMEs use these derivatives, which are typically intermediated by broker dealers.[20]

---

14 See Bertaut, Bruno & Shin (2021) and Carney (2019).

15 See Arslanalp et al (2020).

16 See Miyajima and Shim (2014), IMF (2019) and IMF (2021a).

17 See Raddatz et al (2017).

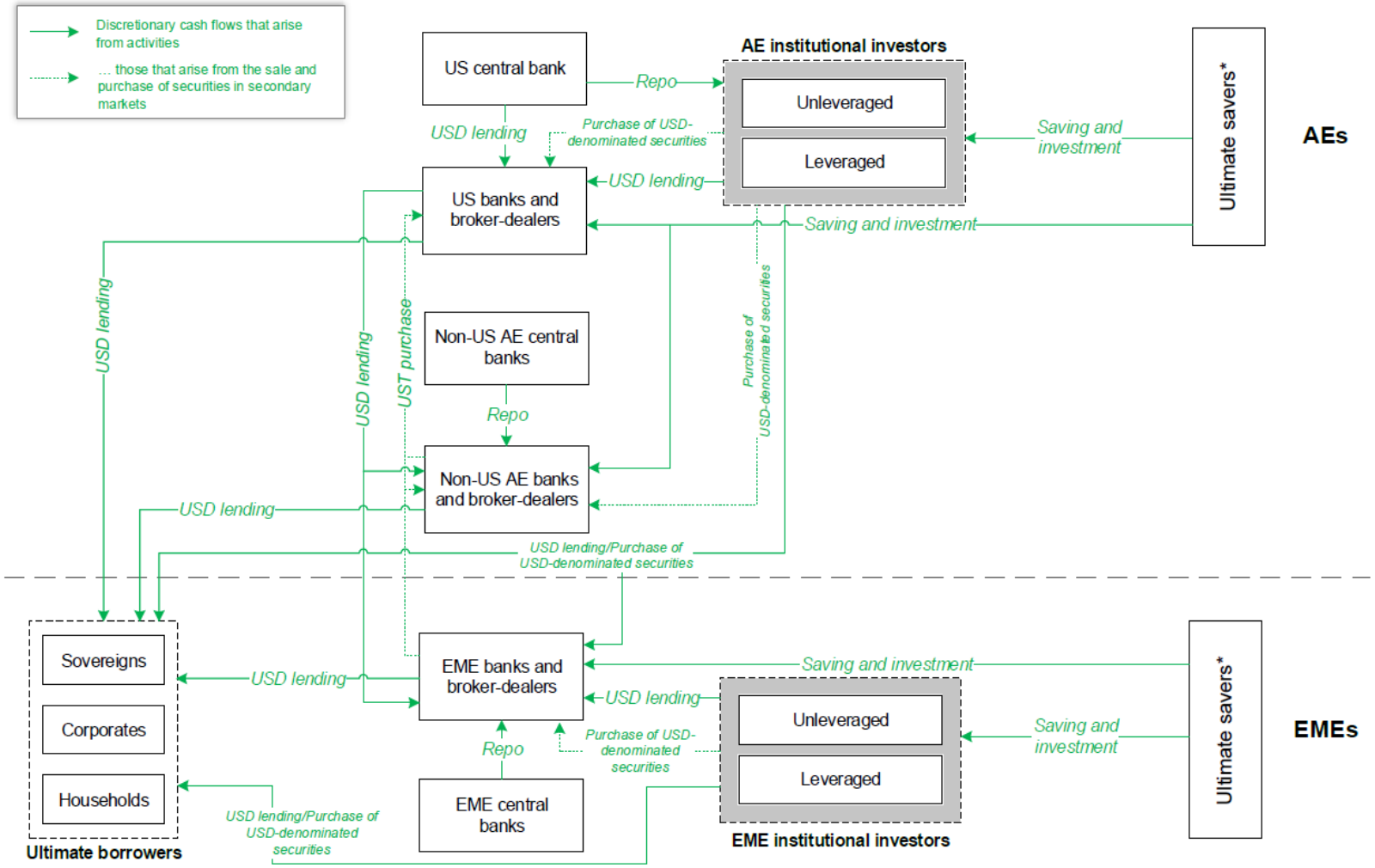
18 See Arslanalp et al (2021).

19 See FSB (2021).

20 Market contacts, however, suggest that foreign investors may only partly hedge exchange rate risks.

The provision of USD funding to EMEs: normal times[1]

Figure 2



[1] Ultimate borrowers and ultimate savers include sovereigns, corporates and households.

Source: FSB.

The flow of investment to EMEs can involve a chain of transactions that pass from ultimate savers to NBFIs and banks, then via broker dealers and other intermediaries, before the ultimate EME borrowers receive the funds. These intermediation chains are now long and complex, stretching not only across borders, but also across different markets, including those used to manage risks and collateralise parts of the investment flow. The intermediation chain is only as resilient as its most vulnerable part, and the linkages involved have altered the speed and breadth with which shocks can be transmitted through the financial system.[21]

The greater role of debt markets and NBFIs in funding EMEs, along with the chains of intermediation involved in supplying this funding, has made liquidity – particularly in USD – more central to the capacity of the financial system to absorb shocks. However, changes to the financial system have resulted in shifts in both the demand and supply of liquidity.[22] The demand for liquidity has grown as the size of debt markets and the importance of investment funds offering liquidity on demand have increased. The supply of market liquidity by banks, however, has not kept pace with this increase. Moreover, while new players have diversified liquidity provision in some markets, they may only have limited incentives to intermediate in periods of stress. Together this creates the potential for imbalances between the demand and supply of liquidity to develop when pressures build in markets.

3. External financing strains during COVID-19

3.1. The March 2020 market turmoil in EMEs

The COVID-19 outbreak delivered a severe shock to global financial markets. In early March 2020 the World Health Organisation's (WHO) declaration of a pandemic, combined with the announcement of lockdowns and border closures in many countries, led to a sudden flight to safety in markets.[23] Investors looked to sell their holdings of assets they perceived to be risk prone, including EME securities, in exchange for cash and assets perceived to be safe havens. The resulting corrections in EM asset prices were very large – and in some cases similar in size to those witnessed during the GFC – though the decisive interventions by central banks meant that the period of stress was shorter (Graph 5).

For EM borrowers, the sharp rise in bond spreads delivered a sudden tightening in financial conditions and a drying-up of issuance. This limited the ability of EM borrowers, including NFCs, to obtain market funding. A significant depreciation in EM exchange rates added substantially to USD funding costs for those NFCs without natural or market hedges.

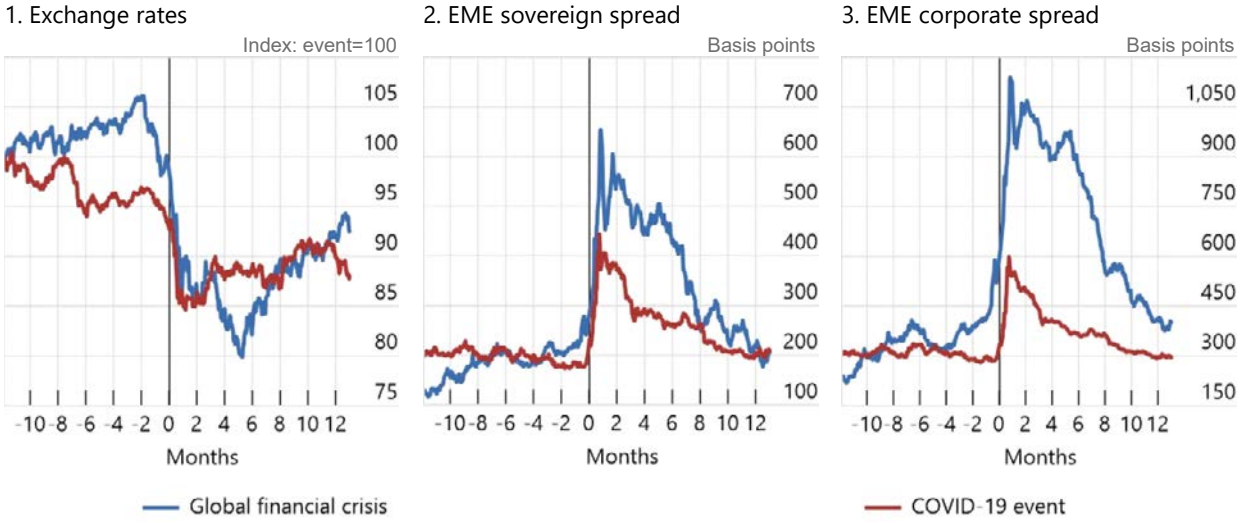
---

21 See FSB (2020).

22 See FSB (2021) for a more detailed discussion.

23 See FSB (2020).

The COVID-19 event delivered a sharp and sizeable market shock to EMEs[1,2] **Graph 5**



[1] In all charts the event date (time 0) for the COVID-19 crisis is the beginning of March 2020 and for the GFC it is the beginning of October 2008. [2] Panels 1 and 2 show the average market price across the 14 core EMEs, where data are available.

Sources: Bloomberg; JPMorgan; FSB calculations.

Concerns spread to oil markets where OPEC+ countries failed to reach an agreement on output cuts to maintain oil prices in the face of the virus-induced weakening in global demand. Crude prices dropped significantly in response, and the entire oil futures curve shifted down.[24]

The global shock afflicted a whole swathe of EMEs simultaneously. Non-residents pulled their investments from EMEs, resulting in large scale capital outflows. This is illustrated by the heatmap of portfolio flows in Graph 6 (panel 1) which compares quarterly flows during 2020 to flows over the previous 20 years. The red colours across the rows show that outflows were in the highest 20 per cent historically in the majority of the large EMEs. These outflows are also shown in Figure 3, where the previous flow of funding from institutional investors to EME borrowers is interrupted.

However, there were some differences in the impact on individual jurisdictions. Although many EMEs suffered portfolio outflows, the scale of these outflows differed substantially – in both nominal terms and relative to GDP – and some jurisdictions even saw overall inflows for the first half of 2020. The developments in vulnerabilities (discussed in Section 2) may partly explain these differences. Vulnerabilities are proxied through the ratio of reserve assets to foreign currency external debt. In general, those EMEs with greater foreign currency borrowing from non-residents relative to reserves (a lower ratio) tended to see higher debt outflows (Graph 6, panel 2). However, the vulnerability proxy is a simple metric that is not intended to capture all of the drivers of outflows. For example, country risk, the local economic situation, the impact of the oil price shock, and the size or liquidity of the EM bond market in the jurisdiction – to name a few – are likely to have also affected the scale of outflows.[25] It is also not suggested that the relationship shown here will necessarily hold over time.

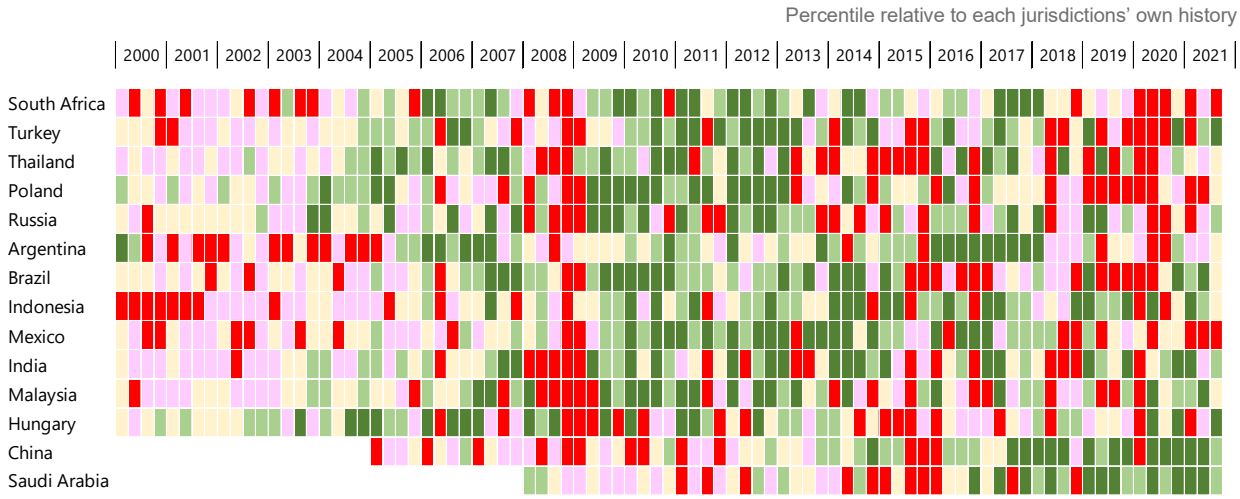
[24] See FSB (2020).

[25] See Cortes and Sanfilippo (2021) for a discussion of market liquidity and outflows.

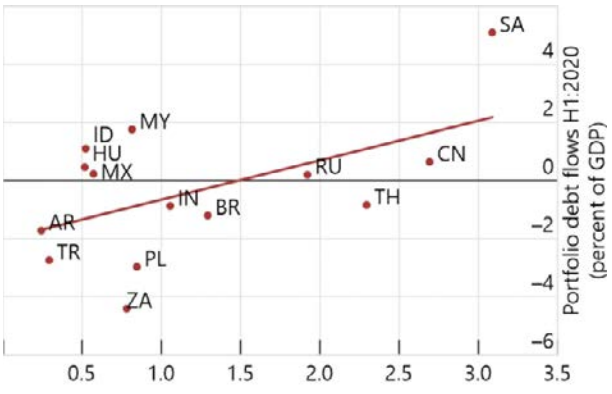
The COVID-19 event caused significant outflows

Graph 6

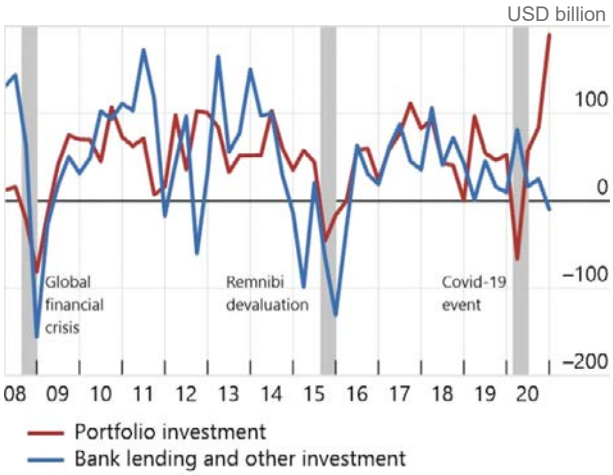
1. Portfolio flows to EMEs[1]



2. Portfolio flows and vulnerabilities



3. EME portfolio and other investment flows[2]



[1] Panel 1 shows the percentile of quarterly non-resident portfolio flows relative to each jurisdiction's own history since 2000. Red = 0-20th percentile, pink 20th-40th, yellow 40th-60th, light green 60th-80th and dark green 80th-100th. [2] Panel 3 shows flows for the core EMEs in aggregate (including China).

Sources: EPFR; IIF; IMF; FSB calculations.

Although portfolio flows were severely affected, this was not the case for the funding supplied by banks. Banking flows were much less affected in this period, in contrast to not only the GFC, but also the renminbi devaluation episode in 2016 (Graph 6, panel 3). Banks, which had much larger capital cushions than in the past – following the post-GFC strengthening in bank regulations – actually absorbed shocks rather than amplifying them.[26] Bank lending expanded in aggregate, mainly through corporates drawing heavily on their credit lines from banks, though other forms of lending were also not cut back. This is shown by the continued flow of funding from banks to borrowers in Figure 3. The actions taken by authorities – including central bank liquidity support, the temporary relaxation of compliance requirements and extending deadlines

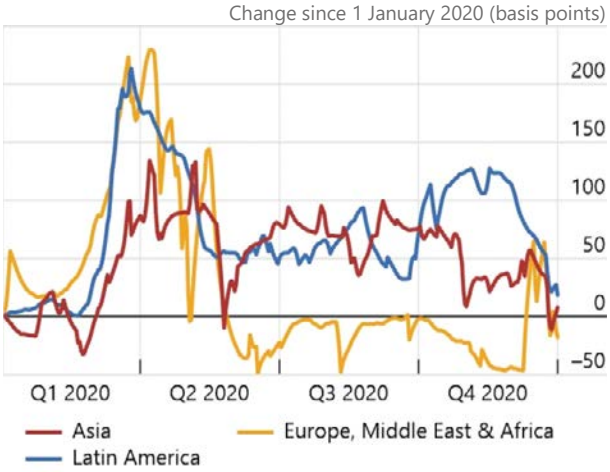
[26] See Avdjiev et al (2020), Borio (2020) and Ikeda et al (2021).

for implementing the final Basel III framework – also helped banks to continue lending in this period.[27]

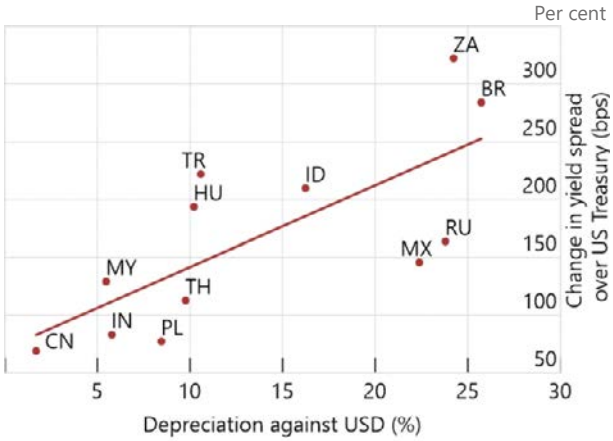
Local currency bond markets also experienced strains

Graph 7

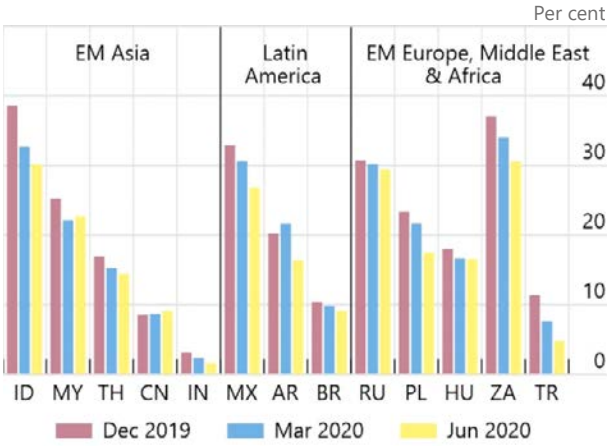
1. Change in EM local currency bond spreads[1]



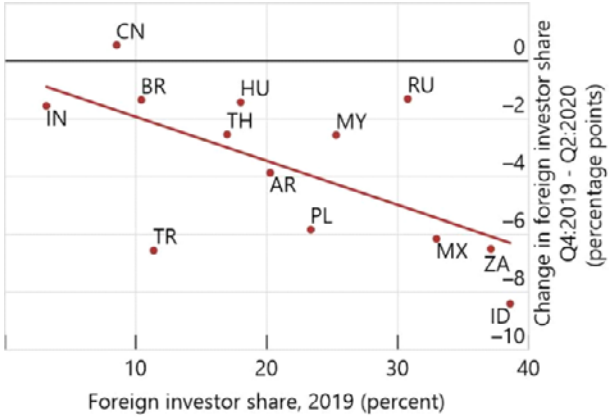
2. Currency depreciation and sovereign spreads[2]



3. Foreign investor share in EM local currency sovereign bond markets



4. Change in foreign investor share in EM local currency sovereign bond markets



[1] JPMorgan GBI EM indices, 7-10 yrs maturity relative to US treasury yields. The chart shows averages across jurisdictions in each region, and has been smoothed. Asia = China, India, Indonesia, Malaysia and Thailand. Latin America = Argentina, Brazil and Mexico. Europe, Middle East & Africa = Hungary, Poland, Russia, Saudi Arabia and South Africa. [2] 10-year LC sovereign bond yield spread over 10-year US Treasury yield. Changes from end-2019 to end-March 2020.

Sources: Arslanalp and Tsuda (2014); AsianBondsOnline; Bloomberg; EPFR; JPMorgan; HKMA and FSB calculations.

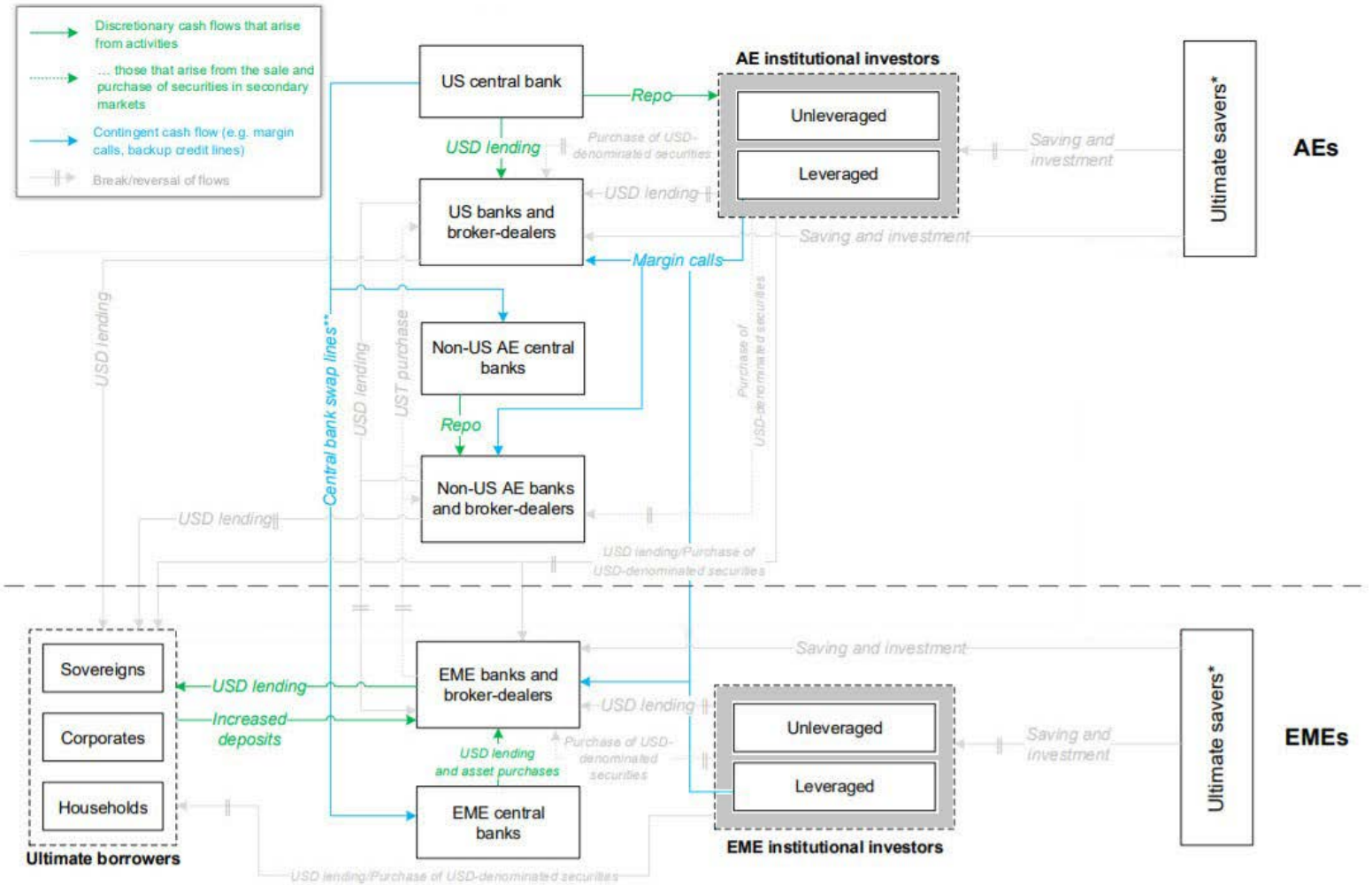
EME financial strains were not limited to USD markets. Local currency bond markets also experienced pressures, with a spike in the yields of local currency EM sovereign bonds (Graph 7, panel 1).[28] EM currency depreciation may have helped to transmit the global shock to local currency markets. The weakening in local currencies inflicted mark-to-market losses for foreign

[27] See FSB (2020).

[28] In some Asian EMEs, the local currency sovereign bond markets also saw widened bid-ask spread and lower bid-to-cover ratios for bond auctions during the stressful weeks in March 2020.

The provision of USD funding to EMEs: stressed times[1]

Figure 3



[1] Ultimate borrowers and ultimate savers include sovereigns, corporates and households.

Source: FSB.

investors who calculate profits in USD terms and who – according to market contacts – are at least partly unhedged against currency risk.[29] This channel of contagion is referred to as 'original sin redux' in the literature.[30] Graph 7 (panel 2) shows that exchange rate depreciation across EMEs was broadly correlated with local currency market strains, as reflected in local currency bond yields. Regression analysis also suggests that outflows were associated with a depreciation of EM currencies and a strengthening of the USD (Annex 2, Sections A and C).

This withdrawal of non-residents from local currency markets can also be shown by the declining share of foreign investors in these markets, furthering a trend that had been taking place over a number of years (Graph 7, panel 3). In general, those jurisdictions with a larger foreign investor share tended to see a greater fall in foreign investor participation (Graph 7, panel 4). Concentrated positions of foreign investors may have also added to the impact in local currency bond markets. Positions that may be a small share of global asset managers' portfolios can be very large from the point of view of an EME with a small or less liquid local currency market.[31] Research has found that – prior to the COVID-19 shock – a relatively small number of multi-sector bond funds had built-up concentrated positions in EM local currency sovereign bond markets.[32] These large positions created a positive correlation between changes in bond fund holdings and the performance of local currency bond markets. It is possible that such mechanisms also operated during the March 2020 market turmoil.

The period of market turmoil in March can be characterised as a dash for cash in the global financial system.[33] This was underpinned by an extremely high precautionary demand for cash and near-cash assets. Investor fears, combined with financial institutions' cash needs, and NFCs' concerns about having adequate foreign currency to service their FX debts contributed to a sudden spike in the demand for cash.

As a result, severe strains in offshore USD funding markets emerged. The marginal offshore USD funding cost, as implied by cross-currency basis swaps, widened sharply (Box 1). A decline in investors' risk appetite, combined with strains in short-term markets, led to a reduction in USD supplied by banks and NBFIs in funding markets. A strengthening of the USD contributed instead to a lower repayment capacity of unhedged borrowers outside the US, further limiting their direct access to USD, and thereby increasing the demand for the synthetic funding available in the FX swap and cross-currency basis swap markets. Furthermore, as NFCs drew-down their committed credit lines with banks, USD funding needs of banks increased.

Margin calls, prompted by sharp movements in asset prices, added to the demand for liquidity (see the blue lines in Figure 3 and Box 2). Furthermore, EM NBFIs, needing to rollover currency hedges on their US dollar denominated assets, added to the scramble for liquidity.[34]

Market conditions forced some EME central banks to liquidate part of their foreign exchange reserves in order to accommodate the demand for USD in their jurisdictions. EME investors

---

29 This finding is also reported in Cantú and Chui (2020).

30 See Carstens & Shin (2019).

31 See IMF (2021a).

32 See Cortes and Sanfilippo (2020).

33 See FSB (2020).

34 See McGuire et al (2021).

(primarily central banks) sold over $150 billion of US treasuries in March 2020, around 2.5% of the $6 trillion in reserve assets in the core EMEs (Graph 8, panel 1).[35] Sales were particularly strong in EMEs dependent on exports of oil and other fuel. These countries accounted for nearly 40% of all sales of US treasuries by EME investors in March and April, despite accounting for less than 15% of EME treasury holdings. Overall, the median net sales of treasuries by fuel exporters was over four times larger than median sales for other EMEs (Graph 8, panel 2).[36] Furthermore, among fuel exporters, those who pegged their currency to the USD appeared to be more likely to sell treasuries in 2020 than those that did not (Graph 8, panel 3).

Looking beyond fuel exporters, a vulnerability that appears to be related to sales of US treasuries by EMEs was external short-term debt (Annex 2, Section B). These countries perhaps believed that the short tenor of their debt meant that they would face more acute funding pressures. In fact, while many EMEs sold treasuries, usage of the foreign repo pool at the Federal Reserve Bank of New York (FRBNY) increased at the same time, suggesting that at least some of the US treasury sales were used to build precautionary buffers. [37] Indeed, as shown in Annex 2, short-term debt is also related to the combination of both US treasury sales and changes in cash positions at the FRBNY.[38]

EME central banks were by no means the only sellers of US treasuries in March 2020.[39] Leveraged investors – likely behind the sales from investors domiciled in the Cayman Islands in Graph 8 (panel 4) – sold treasuries in order to unwind basis trades that they were losing money on. There is, however, less evidence of leveraged investors being a major driver of EME capital outflows. Market contacts suggest that these investors may have had comparatively less leverage going into this crisis than in some previous EME crises. There is also anecdotal evidence that leveraged investors bought EME assets after the initial shock to take advantage of price dislocations, though buying investment grade sovereigns and corporates first.

---

35 A portion of sales of US treasuries by EM investors likely came from sovereign wealth funds rotating into riskier assets purchased at low prices in order to generate higher returns.

36 Here fuel exporters refers to jurisdictions classified as such in the 2019 UNCTAD report on State of Commodity Dependence (see Annex 2, Section B).

37 See Choi et al (2021).

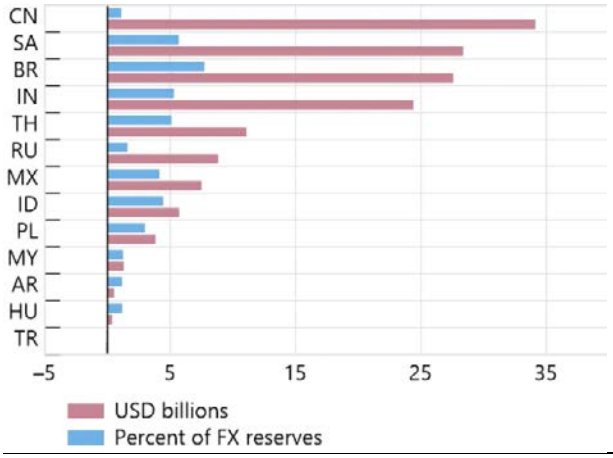
38 Cash positions are dollar deposits at the FRBNY and holdings in the foreign repo pool. For more information on the foreign repo pool, see https://www.newyorkfed.org/markets/central-bank-and-international-account-services.

39 See Board of Governors of the Federal Reserve System (2021).

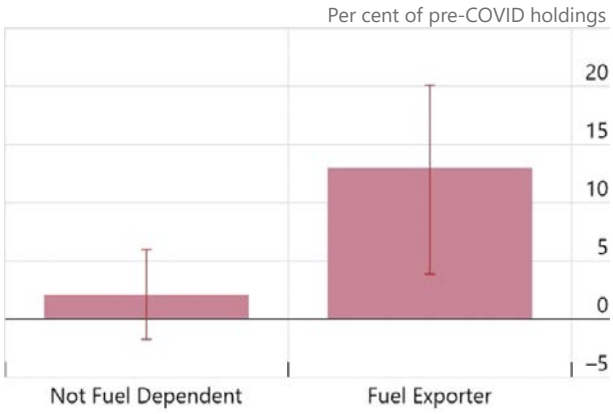
EME sales of US treasury bonds

Graph 8

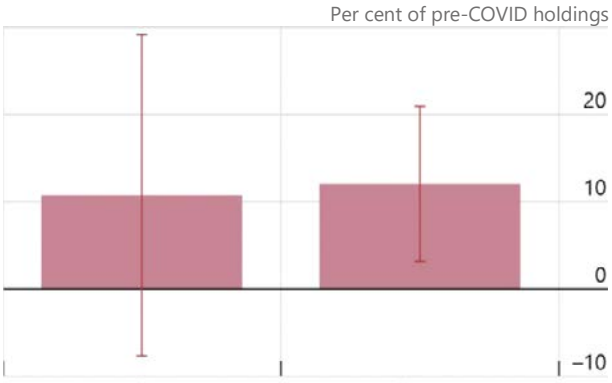
1. Net sales of US treasuries by EMEs, March 2020



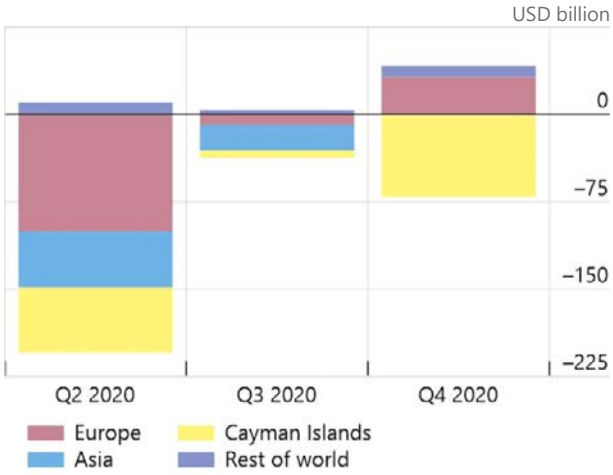
2. Median sales of US treasuries by EMEs, March-April 2020[1]



3. Median sales of US treasuries by fuel exporting EMEs, March-April 2020[1]



4. Net foreign purchases of US Treasury bonds



[1] The whiskers in the charts show the 95% confidence intervals.

Sources: Federal Reserve Bank of New York; US Department of the Treasury; FSB calculations.

Box 1. Drivers of USD funding costs during the COVID-19 pandemic[1]

USD funding pressures heightened as the COVID-19 pandemic spread across the world. The cross-currency basis (CCB),[2] a proxy for the marginal cost of offshore USD funding, became more negative in both EME and AE currencies, reflecting an increase in USD funding costs in FX markets relative to cash markets. The median one-month and three-month cross-currency bases widened by more than 100 basis points from early January 2020 to mid-March, approaching levels last seen during the GFC (Graph A, panel 1). Longer maturity contracts followed a similar pattern. After the initial shock, funding pressures subsided, but the CCB remained negative and wider for some emerging market currencies such as the Malaysian ringgit and the Philippine peso.

What explains the changes in the basis in EMEs?

The cross-currency basis is generally determined by supply-demand dynamics as well as the cost of arbitrage. Following a sudden shift in global risk sentiment, most of these structural factors moved in the direction of a more negative CCB. On the supply side, for example, the increase in the LIBOR-OIS spread, a measure of credit risk in the home economy, and FX volatility, reflecting a decline in investors' risk appetite, led to a reduction in USD intermediation of banks and NBFIs in USD funding markets, and hence to a widening of the CCB (Graph A, panel 2). On the demand side, a strengthening of the USD contributed instead to a lower repayment capacity of unhedged borrowers outside the US, further limiting their direct access to USD, and thereby increasing the demand for synthetic funding.

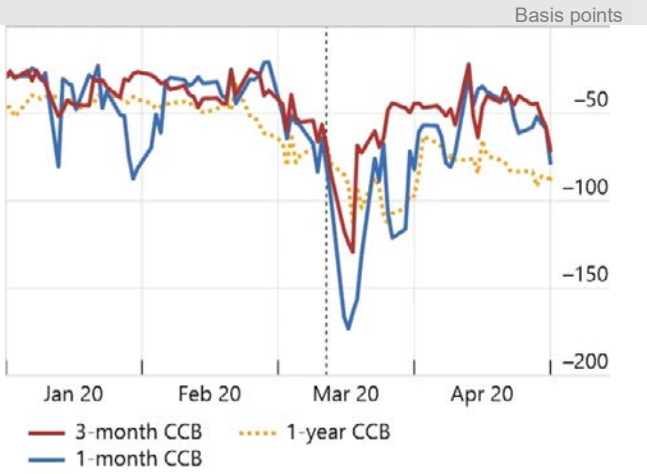
A dramatic shift of money market investors away from prime money market funds into government money market funds also contributed to the increase in funding pressures. The outflow from prime money market funds in March 2020 (which amounted to $152 billion) constrained funding available for large banks, directly increasing their funding costs (Graph A, panel 3). The outflow from prime money market funds also caused commercial paper-reliant firms to draw down their credit lines, which further added to the funding pressure in the US financial sector. As non-financial corporations drew-down their committed credit lines, USD funding needs of banks increased.

Additionally, non-US institutional investors might have also increased their demand for FX swaps amid the increase in volatility in FX and US financial markets. In recent years, insurers and asset managers outside the US have increasingly engaged in swap arrangements to strategically hedge foreign currency investments. Similarly, non-financial firms and quasi-sovereigns from EMEs that borrow opportunistically in markets where credit spreads are narrower could have propped-up the demand for synthetic USD funding in order to reduce their currency mismatches.

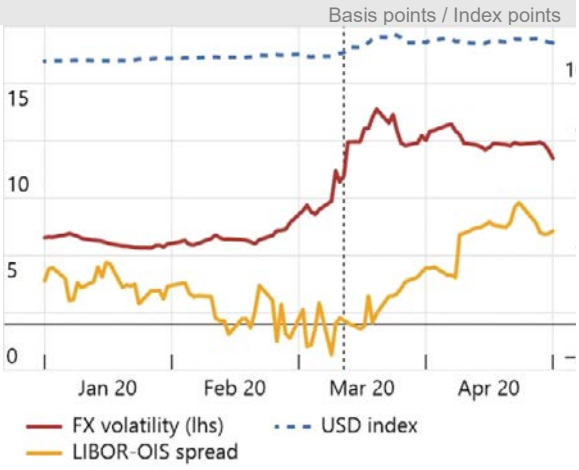
Looking at the factors that led to a narrowing of the CCB in the second half of March 2020, policy actions seem to have played a vital role. Actions by the US Federal Reserve in collaboration with other central banks in the period 15-20 March 2020 to enhance the provision of USD liquidity outside the US via swap lines helped to alleviate some of the stress, including for EMEs, especially for short tenor transactions.[3] By the end of March, the total take up of US central bank liquidity, including outstanding USD liquidity swaps, reached $439 billion (Graph A, panel 4). Funding strains in short-term markets of currencies not covered by swap line arrangements partially eased as well, which implies that the swap lines indirectly alleviated USD shortages more broadly. The new Foreign and International Monetary Authorities (FIMA) Repo Facility, which was established on March 31 and became fully operational a few months later, may have also helped to ease funding strains.[4] Nevertheless, longer-dated FX swap basis spreads in EMEs remained relatively wide even after the implementation of the swap lines and the FIMA Repo Facility. A possible explanation is that foreign financial institutions with access to USD operations from their central banks hoarded term liquidity for precautionary purposes and were reluctant to provide longer-term funding to end-users transacting in FX markets.

The cross-currency basis was equally driven by supply and demand factors **Graph A**

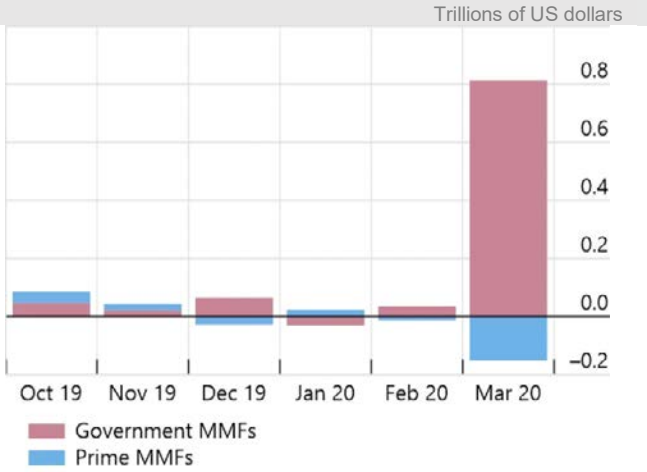
1. Cross-currency basis in EMEs[1]



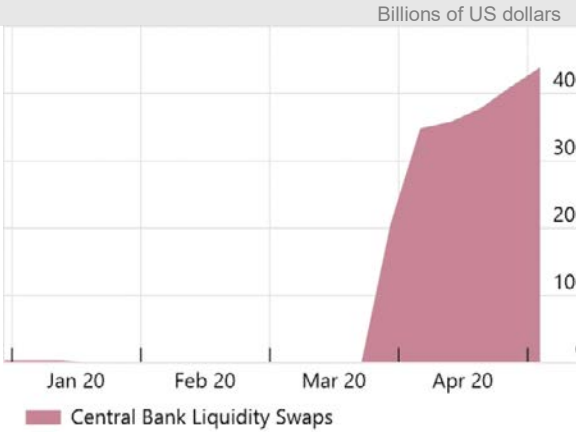
2. Structural supply and demand factors[2]



3. Change in Money Market Fund assets



4. USD central bank liquidity swaps[3]



Sources: BIS; Bloomberg; Crane Data Money Fund Intelligence; Federal Reserve Bank of St. Louis FRED Economic Data.

[1] Panel 1 shows the median one-month, three-month and one-year CCB based on LIBOR rates for a sample of 13 emerging market currencies. [2] Panel 2 shows the median of demand and supply factors for synthetic dollar funding across the sample of emerging market currency areas. The dotted line in panel 2 is for 11 March 2020 when the WHO declared a pandemic. The LOBOR-OIS spread is computed using 3-moonth LIBOR and OIS rates. FX volatility refers to FX option-implied volatility. USD index refers to the Federal Reserve Board trade-weighted nominal dollar index (broad). [3] Panel 4 shows the outstanding amount of central bank USD liquidity swaps (Wednesday observations). CCB = cross-currency basis; FX = foreign exchange; LIBOR-OIS = London interbank offered rate–overnight index swap; MMF = money market funds; USD = US dollar; WHO = World Health Organization.

[1] It is worth noting that the main drivers of the widening of the basis described in this box are not unique to emerging market economies, but they could also explain similar developments in FX markets of AEs during the peak of the pandemic. See Avdjiev et al (2019) and Barajas et al (2020) for a more general analysis of the structural drivers of CCB in both EMEs and AEs. See Choi et al (2021), Cetorelli et al (2020) and Goldberg and Ravazzolo (2021) for additional details on the objectives and effects of the US Federal Reserve's central bank swap lines and FIMA repo facility.

[2] The cross-currency basis captures deviations from the covered interest rate parity (CIP). A negative dollar basis implies thus that direct funding in USD is cheaper than synthetic funding via swaps.

[3] On March 15, 2020, the Federal Reserve announced a coordinated action with five central banks (Bank of Canada, Bank of England, Bank of Japan, European Central Bank, Swiss National Bank) to enhance the provision of liquidity by lowering the pricing on standing USD liquidity swap arrangements by 25 basis points as well as adding an additional set of USD swaps with an 84-day maturity. Given the continued pressure in the markets, the Federal Reserve announced additional swap lines on March 19, 2020, with nine other central banks/monetary authorities (Australia, Brazil, Denmark, Korea, Mexico, New Zealand, Norway, Singapore, Sweden). On 20 March 2020 the Federal Reserve announced daily auctions for the USD liquidity swap lines for the five central banks with standing facilities.

[4] FIMA repos are complementary facilities to the USD liquidity swap lines. The facility temporarily exchanges USD at a set rate against US treasury securities.

Box 2. Margining requirements and EME USD funding markets at the outbreak of COVID-19

The COVID-19 pandemic presented a real-world test of derivatives and securities market functioning. In March 2020, amid broad liquidity pressures and high market volatility, there were reports of margin calls adding to market strains.[1] Large increases in aggregate margin requirements across asset classes were reported in both centrally and non-centrally cleared instruments. While some firms apparently used available cash deposits to meet these margin calls, others had to rely on repos and asset sales.[2] Some market participants noted that, in some instances, margin payments were eventually met by drawing on committed credit lines with local banks or with USD cash borrowed in global funding markets.

Information gathered through conversations with market participants suggest that the observed aggregated margin increases were only minimally related to foreign exchange (FX) derivatives. Furthermore, many contacts viewed the margin-related USD cash demand as a minor contributor to the strains observed in EME funding markets in March 2020. Most market participants highlighted that unprecedented central bank actions in the spring of 2020 were critical in stabilizing market conditions, supporting the clearing ecosystem and containing related financing stability risks, including the strains that had become evident in EMEs.

What are the relevant margining practices and how do they relate to US dollar funding costs?

Uncleared margin

In response to the GFC, the G20 agreed to a financial regulatory reform agenda covering the over-the-counter derivatives markets, including recommendations for implementing margin requirements for non-centrally cleared derivatives.[3] The Basel Committee on Banking Supervision (BCBS) and International Organization of Securities Commissions (IOSCO) subsequently developed a framework which sought to establish minimum international standards for margin requirements to be phased in over time.[4,5]

Cleared margin

By taking-on counterparty risk between bilateral parties, central clearing counterparties (CCPs) mitigate credit risk, though they create new liquidity risks because they rely on participants to provide margin.[6] CCPs collect initial margin (IM) – paid through a mix of cash and securities – from their members to cover positions, while variation margin (VM) – typically meet in cash – is to cover for adjustments in market pricing and risks not covered by margin. VM is passed from portfolios in a loss position to those who gained; as a result, variation margin on net does not typical remove liquidity from the system but rather redistributes it. In addition, at time of stress, CCPs may realize that the IM set beforehand is insufficient, thus issuing IM calls to return to the safer levels. A common practice of members and clients is to post collateral at the CCP that exceeds the portfolio requirement. This excess collateral is used as buffer for intraday margin calls, reducing the need to source liquidity. However, because during times of broader market volatility margin calls are often made simultaneously across CCPs at short notice, member banks may have to source cash to meet margin payments, further intensifying market and liquidity strains across market segments.[7] Therefore, margining practices may increase procyclicality during market turmoil.

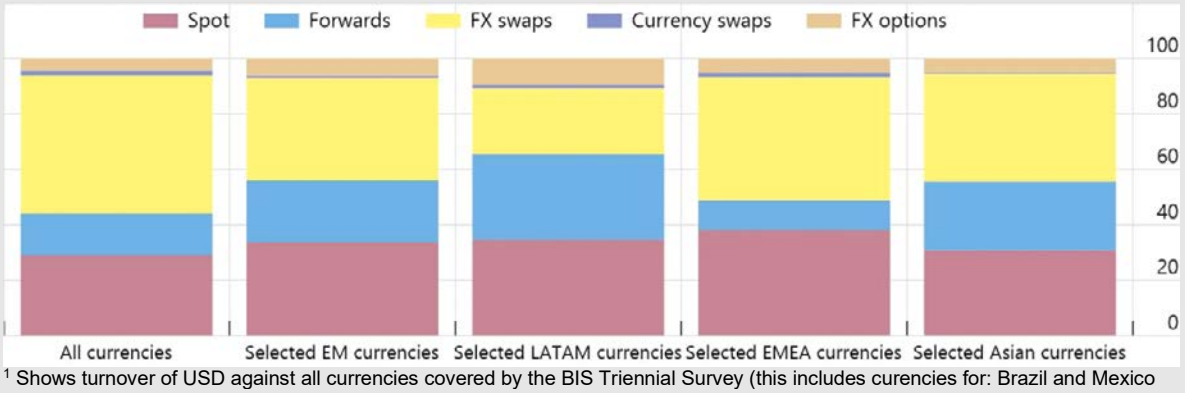
FX derivatives

Currently, only a small share of FX derivatives is centrally cleared—mainly FX options and cross currency swaps.[8] The latest (2019) BIS Triennial survey shows that as a share of total foreign exchange market activity (where the US dollar is one leg of currency pairs), most of the daily turnover on FX derivatives is in swaps or forwards (Graph B). Pairs of US dollar against selected emerging market currencies show a similar pattern. As a result, market contacts suggest that margining requirements on these specific instruments generally have only a minor impact on broader funding

markets. However, the sourcing of discretionary margin calls, determined bilaterally per commercial relationships and not subject to non-centrally cleared margin rules, could impact broader liquidity funding dynamics. Margin dynamics may continue to evolve as more FX activities become centrally cleared after the framework on margin requirements for non-centrally cleared derivatives is fully implemented.[9]

Foreign exchange turnover by instrument, April 2019[1] **Graph B**

Percent of total turnover



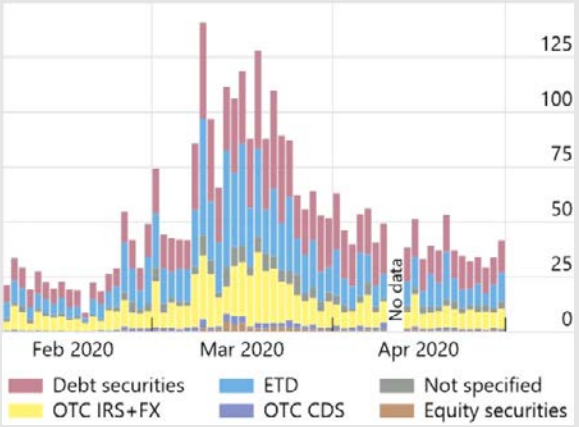
[1] Shows turnover of USD against all currencies covered by the BIS Triennial Survey (this includes curencies for: Brazil and Mexico (LATAM); China and Indonesia (Asian); and Poland, Russia, Turkey and South Africa (EMEA).
Source: BIS, Triennial Survey, 2019.

In addition, market participants indicated that their trading activity with clients is commonly covered by a general agreement whereby margining is applied on the entire portfolio. They noted that margin calls on portfolios can eventually be met by their clients in USD cash sourced in the USD funding market – even when positions are denominated in local currencies – potentially creating an indirect link between general margining practices and local USD funding costs.

CCP margin[1] **Graph C**

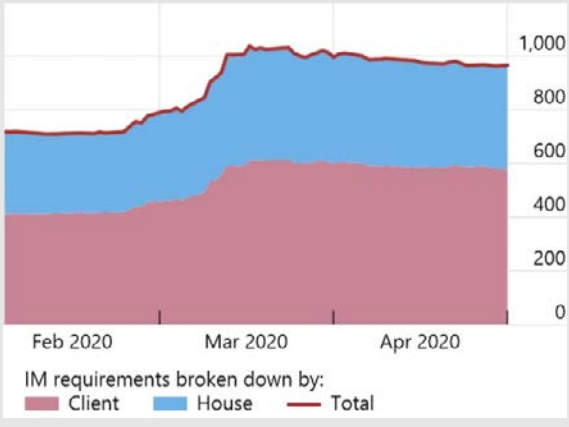
1. Variation margin paid: by asset class

Billions of US dollars



2. Initial margin required: by account type

Billions of US dollars



[1] The graphs were first published in BCBS, CPMI and IOSCO (2021).
Source: IOSCO Finanical Stability Engagement Group's Data Working Group Survey of CCPs.

Were margin calls a relevant driver of EM USD funding strains in March 2020?

The March 2020 episode brought these clearing dynamics to the fore, amid heightened volatility and broad market strains. Although clearing mandates helped to limit counterparty risk, large moves in asset prices led to a broad-based and rapid increase in margins across the financial system.[10] CCPs reported significant increases in aggregate daily variation margin (VM) from around $25 billion in February 2020 to a peak of $140 billion (roughly 460 percent higher) in early March 2020 (Graph C, panel 1). Of note, VM related to FX transactions (the yellow bars, which include both interest-rates

and FX OTC transactions) made-up only a small part of total VM. As market volatility jumped, IM levels were also raised, with total IM required (as reported by CCPs) increasing by approximately $300 billion (40 percent) between end-February and mid-March 2020 (Graph C, panel 2). Excess collateral at CCPs also increased in March 2020 by approximately $115 billion.[11]

According to market participants, banks and their clients were generally able to meet margin calls at the period of heightened market volatility in March 2020. More than half of surveyed clients reported no significant increases in liquidity demand related to margins for both cleared and non-centrally cleared derivatives, although some faced liquidity needs that were materially greater than anticipated.[12] There is indeed some evidence that certain entities had to sell liquid assets quickly in order to meet cash margin calls.[13] Indeed, some firms facing increased liquidity needs to meet margin payments used available cash deposits, but others also had to rely on repos and asset sales.[14]

Market participants viewed the observed aggregate increase in margins in March 2020 as only minimally related to FX derivatives, as in scope FX instruments remain a small share of margining requirements.[15] Information gathered from contacts for the purpose of this report points to some cases of increased dollar demand to fund margin payments on local EM portfolios or to build precautionary liquidity buffers in expectation of potential upcoming margin calls.[16] Some contacts added that banks' clients may have raised cash to meet margin calls by also using committed credit lines. Overall, many contacts believe that cash demand to meet margin calls did contribute – at the margin – to the strains in funding markets in emerging market economies. Market participants highlighted that central bank actions in the spring of 2020 were critical to quickly stabilize market conditions, supporting the clearing ecosystem and containing related financing stability risks, including the risks building in EMEs.

The BCBS, CPMI and IOSCO are consulting on six potential areas for further work that may inform policy considerations, including: (1) increasing transparency in centrally cleared markets; (2) enhancing liquidity preparedness of market participants as well as liquidity disclosures; (3) identifying data gaps in regulatory reporting; (4) streamlining VM processes in centrally and non-centrally cleared markets; (5) evaluating the responsiveness of centrally cleared IM models to market stress with a focus on impacts and implications for CCP resources and the wider financial system; and (6) evaluating the responsiveness of non-centrally cleared IM models to market stress.

[1] See FSB (2020).
[2] See BCBS, CPMI and IOSCO (2021).
[3] G20 Pittsburgh Summit (24-25 September 2009).
[4] See BCBS-IOSCO (2013). In March 2015, the revised BCBS-IOSCO implementation timeline for the Final Framework recommended uncleared margin rules to begin to be phased-in in September 2016, with the broader implementation of VM requirements to occur by March 2017 and IM requirements to be phased-in through 2020 (postponed to 2022 in April 2020).
[5] CPSS and IOSCO (2012) helped to enhance the robustness of central clearing counterparties.
[6] See King et al (2020).
[7] Benos, Ferrara and Ranaldo (2022) finds evidence of a positive relationship between repo rates and initial margin calls.
[8] For example, in the US, FX swaps and forwards are exempt from Dodd-Frank central clearing and trade execution requirements (see Title VII of the Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010).
[9] See International Swaps and Derivatives Association (ISDA) SIMM™ Phase 5 and 6 License Agreement.
[10] See Box 1 in Bank of England (2020).
[11] See BCBS, CPMI and IOSCO (2021).
[12] See BCBS, CPMI and IOSCO (2021).
[13] See Schrimpf, Shin and Sushko (2020) and Seidner et al (2021).
[14] See BCBS, CPMI and IOSCO (2021), Figure 22 in the report.
[15] Data provided by Acadia indicates that collateral posted to meet non-centrally cleared margin calls, aggregated across instruments type, peaked in March, with average daily posted gross collateral balances related to netted non-centrally cleared discretionary margin calls rising by 37 percent month over month and those related to non-centrally cleared VM calls rising by 55 percent, See BCBS, CPMI and IOSCO (2021), page 17.
[16] For example, South Korean securities firms offering equity-linked products with overseas equity (indices and futures) positions received margin calls in March 2020 when global equity indices declined sharply. As some of these calls were reportedly met with USD funded via the FX swaps market, margin calls appeared to have contributed to USD funding strains in the spring of 2020.

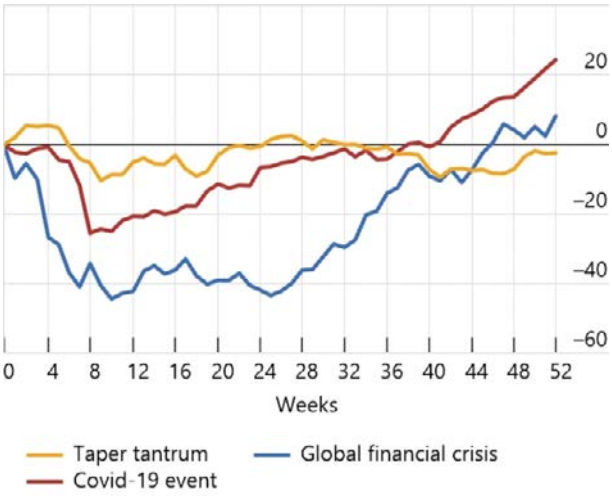
3.2. Procyclicality in EM funds

EM investment funds experienced very large redemptions as investors liquidated their positions. Overall outflows from EM funds were larger than during the 2013 'taper tantrum', though lower than during the GFC (Graph 9, panel 1). The outflows from bond funds were largely in hard currency, though local currency funds also experienced significant redemptions, especially in March (Graph 9, panel 2).[40] There was, however, a quicker recovery in outflows than in the GFC.

Portfolio outflows and the reliance on bond funds **Graph 9**

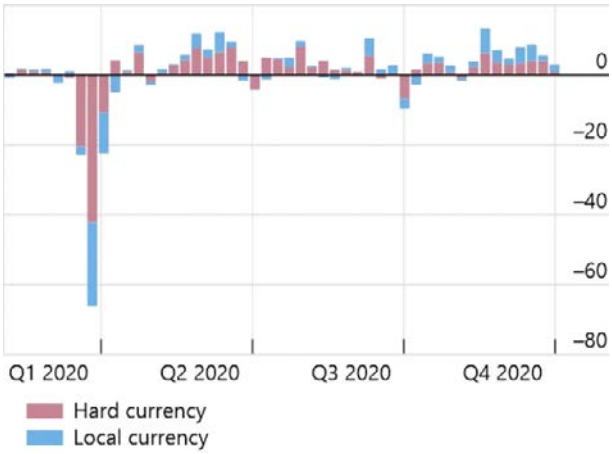
1. Flows to EM funds[1]

Cumulative flows, percent of assets under management

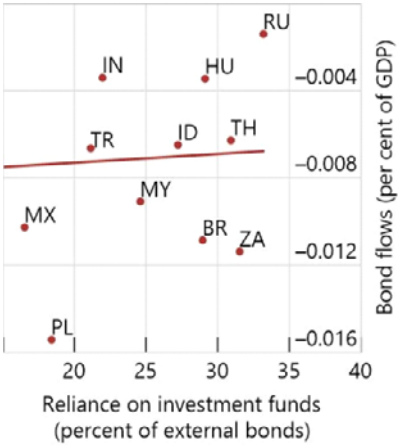


2. EM bond fund flows-2020

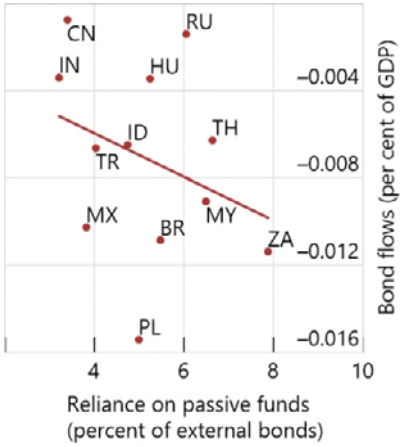
USD billion



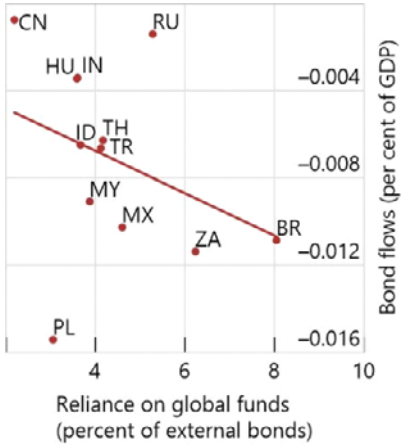
3. All bond funds[2,3]



4. Passive funds[2,3]



5. Global funds[2,3]



[1] Panel 1 shows flows to EME bond and equity funds in aggregate. The timeline for the GFC starts in September 2008, the Taper Tantrum in May 2013 and the COVID-19 event in January 2020. [2] Bond flows shows cumulated flows between March and April 2020 in the IIF's monthly portfolio flows database. [3] The reliance on funds is the amount of assets under management in each type of fund as a proportion of total external bond portfolio liabilities in 2019.

Sources: EPFR; IIF; IMF; and FSB calculations.

[40] See also Hofmann and Park (2020).

Differences in the degree to which individual EMEs relied on certain investment funds to finance their external debt may have also contributed to the range of portfolio outflows across jurisdictions. While the total reliance on EM bond funds does not appear to be correlated with bond outflows, there is a more of a relationship between the reliance on global and passive bond funds and outflows, which is explored further in Annex 2, Section C (Graph 9, panels 3-5).

This suggests that global and passive funds may have contributed to the stress in some EMEs, though as the focus of this analysis is for a certain time period and with a core set of countries, it is not clear whether more generalised conclusions can be drawn from this work.[41] Nevertheless, the greater procyclical nature of passive funds is consistent with research that has linked countries with a high weight in the GBI-EM index to higher outflows.[42] Similarly, further research found that in periods of stress, capital outflows involving investment funds are greater than those involving other NBFIs, and several times greater than those involving banks.[43]

Certain open-ended funds had to undertake large sales of assets to meet redemptions. These withdrawals were particularly large in bond funds – including both EM and AE bond funds – at some 5% of assets under management, relative to around on 1% for equity funds (Graph 10, panel 1). Data on historical redemptions from funds shows that EM bond funds have been particularly procyclical during previous periods of stress (Graph 10, panel 2).[44] This is also illustrated in Graph 10 (panel 3), which shows that in episodes of stress (sell-off episodes), fund outflows are often significant.

Liquidity mismatches in EM funds may have affected the scale of redemptions. Of the largest 1,000 open-ended EM funds that invest in both equity and bonds, those holding less liquid assets – as measured by the bid-ask spread of those assets – experienced larger outflows (Graph 10, panel 4). This is consistent with the view that funds with larger mismatches between the liquidity of their assets and the daily liquidity offered to their investors faced greater pressures.

The behaviour of fund managers may also have exacerbated the sales. [45] Many EM bond funds ended up with higher cash holdings at the end of March 2020 than at the beginning of the month. Rather than eating into their cash buffers to meet the substantial redemptions, managers sold more assets than was strictly necessary to do so. This behaviour was particularly pronounced for those funds that held lower cash buffers at the beginning of the period. Although it is likely that fund managers were rationally de-risking and positioning their portfolios in expectation of additional future redemptions, by doing so they amplified the selling pressure.

EM funds made extensive use of swing pricing.[46] However, in contrast to previous research that showed that swing pricing was effective at reducing redemptions in periods of moderate stress,[47]

---

41 See Moro and Schiavone (forthcoming).

42 Arslanalp et al (2020).

43 As measured by capital-flows at risk as a proportion of GDP; see Carney (2019).

44 See also IMF (2021a).

45 See Lewrick and Claessens (2021) and Schrimpf et al (2021).

46 See Lewrick and Claessens (2021). Swing pricing is a mechanism that allows fund managers to reduce the fund's NAV when outflows exceed a "swing threshold". It thus allows asset managers to allocate transaction costs in the best interest of all investors and achieve a more equitable treatment, because transaction costs are borne by investors selling the shares rather than those remaining in the fund.

47 See Jin et al (2021) and Lewrick and Schanz (2017).

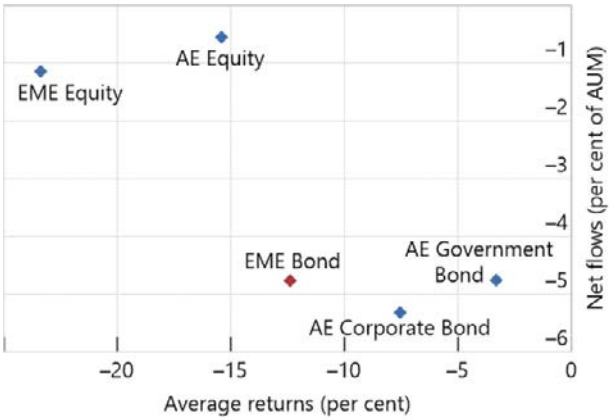
recent research on the March 2020 turmoil found no evidence of a dampening effect on investor redemptions from the use of swing pricing.[48] One potential explanation could be that the swing factors used were too modest in the face of large dislocations in markets and so may not have reflected the true cost of selling in a particularly illiquid market.[49] Another contributing factor may have been large variations on how the swing factor was calculated.[50] In particular, considerations on the impact of sales on the price of the underlying assets were rarely incorporated in the adjustments, making the use of swing pricing potentially less effective.

EME investment via open-ended funds can be procyclical in stress

Graph 10

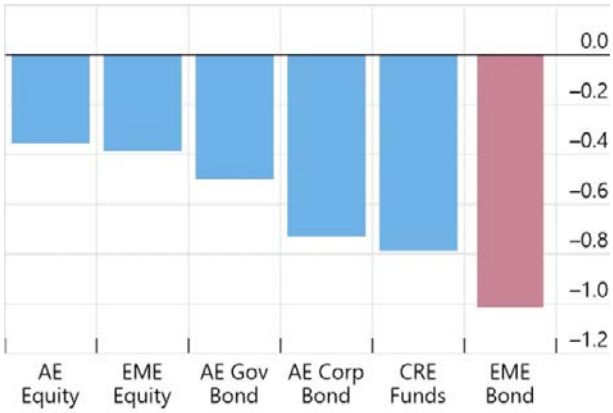
1. Open-ended fund flows and average returns in March 2020[1]

Fund flows (percentage of AUM)

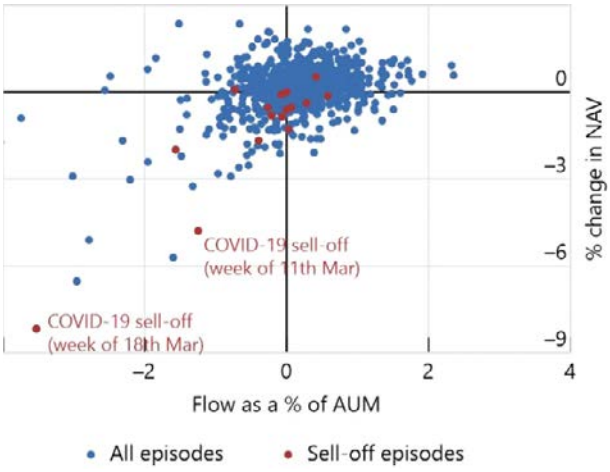


2. Historical estimates of fund outflows over the past decade following a 5% fall in fund monthly returns[2]

Expected fund flows (per cent)

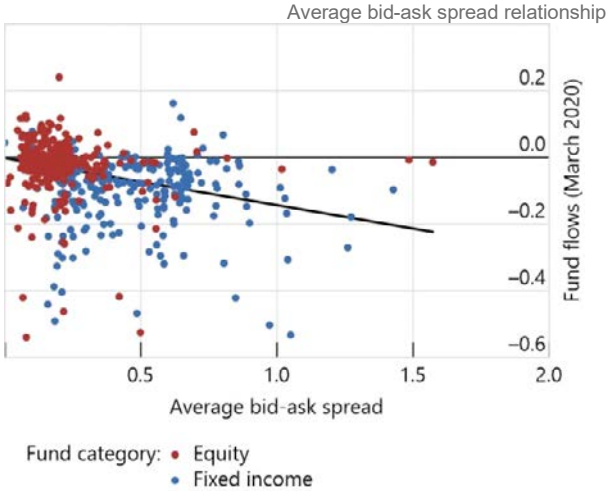


3. EM bond fund outflows and changes in net asset values



4. Open-ended EM fund flows in March 2020 and their average bid-ask spreads in the prior Month[3]

Average bid-ask spread relationship



[1] Funds categorised are those with at least 30% of their portfolio invested in a given asset class (equity, bond, corporate bond or government bond) and region (AEs or EMEs). [2] Emerging market funds are those with at least 30% of their portfolio invested in emerging market assets. Estimates are from a cross sectional regression of fund flows during March 2020 as a function of a range of covariates from the month before.

[3] Estimates from a panel regression using monthly data between 2005 and 2019.

Sources: Morningstar; Bank of England; IMF and FSB calculations.

48 See Lewrick and Claessens (2021).

49 See Lewrick and Claessens (2021).

50 See Bank of England (2021).

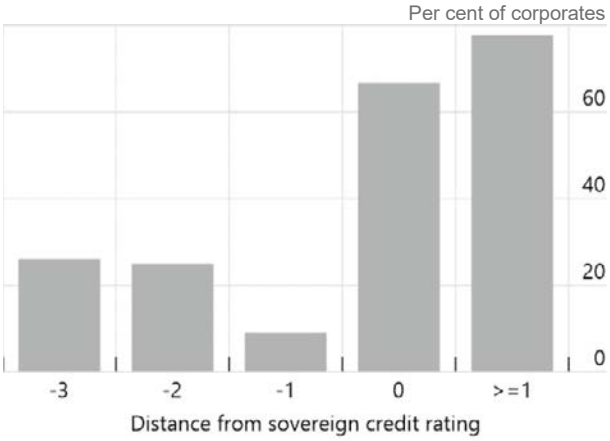
3.3. Credit rating downgrades and the March 2020 stress

Sovereign rating downgrades may have added to the pressures in markets, particularly when countries lost investment grade ratings. While there were a large number of EM sovereign downgrades during this period, and also some sovereign defaults, there were only three examples of a downgrade among the core EMEs in H1:2020 (Argentina, Mexico and South Africa). Argentina's downgrade took place from an already low rating following long-standing concerns about debt sustainability rather than the COVID-19 episode, so this section focuses on the downgrades in Mexico and South Africa.

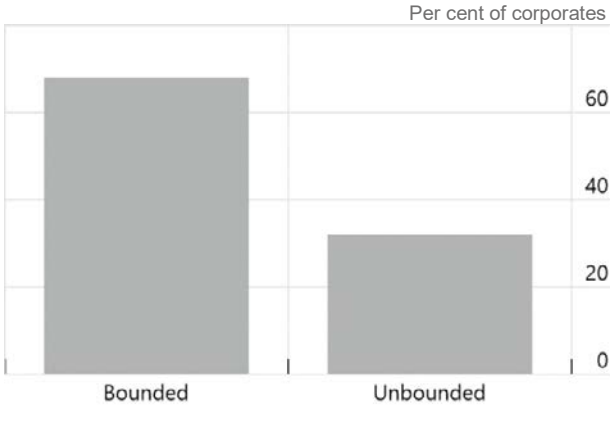
One way in which sovereign downgrades may have increased pressures was through their impact on corporate ratings. Companies with ratings that are close to the sovereign are often mechanically downgraded following the sovereign downgrade to ensure that an individual corporate rating is not too far from the government rating – the so-called sovereign ceiling. Graph 11 (left panel) shows the companies with ratings that were the same, or above, the sovereign (bounded companies) were downgraded significantly more than lower-rated (unbounded) firms. Indeed of all the corporates downgrades that took place within a month of the sovereign downgrade, 68% of them were bounded companies (Graph 11, right panel).

Sovereign and corporate ratings downgrades[1] **Graph 11**

1. Corporate bond downgrades following a sovereign downgrade, 2020



2. Relative rating of companies that were downgraded after the sovereign, 2020



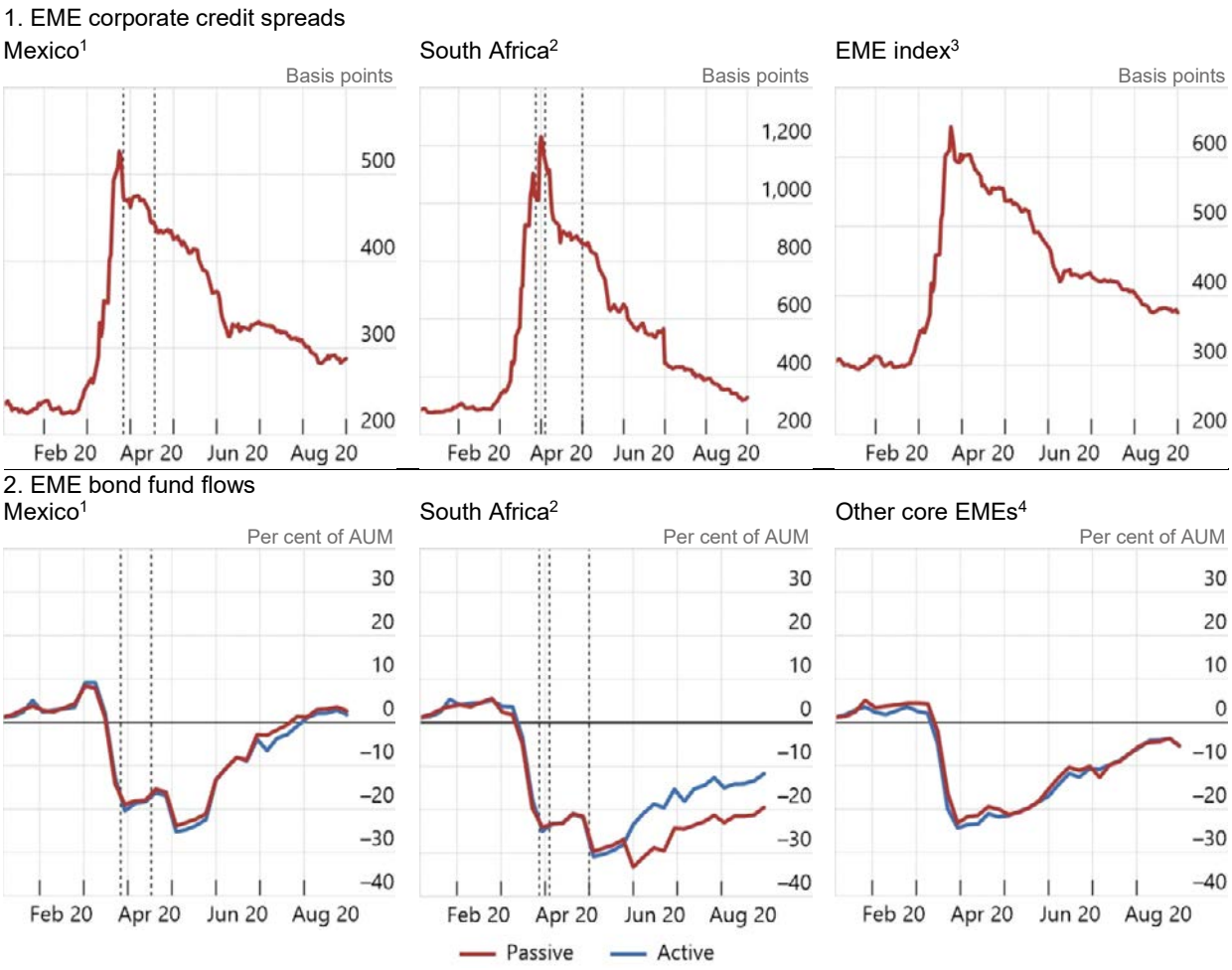
[1] The graph is based on a sample of 62 non-financial firms from Mexico and South Africa and shows corporate downgrades that took place within one month of the sovereign downgrade. Firms are considered to be bounded if they had a credit rating that was equal or higher than that of its sovereign.

Sources: S&P, FSB calculations

This sovereign ceiling effect may have added to corporate financing pressures. Bond spreads in Mexico and South Africa rocketed with the onset of the pandemic, along with spreads in other EMEs. However, in South Africa bond spreads rose further after the first downgrade (Graph 12, upper panel). While the Mexican downgrade did not appear to lead to a further rise in spreads, this is perhaps because the sovereign maintained its investment grade rating after the downgrade (Box 3). In contrast, South Africa's downgrade took the country to high-yield status, leading to its ejection from some benchmark bond indices (Box 4).

EME bond fund flows and credit spreads

Graph 12



[1] The Mexican sovereign was downgraded by S&P on 27 March and by Fitch and Moody's on 17 April. [2] The South African government was downgraded by Moody's on 27 March, by Fitch on 3 April, and by S&P on 30 April. [3] The EME index is the CEMBI index of corporate bond spreads. [4] The other core EMEs are Brazil, Hungary, India, Indonesia, Malaysia, Poland, Russia, Saudi Arabia, Thailand and Turkey

Sources: EPFR, JP Morgan Markets

It is possible that the sovereign downgrades (including market expectations for such downgrades) may have affected outflow pressures. In both Mexico and South Africa there were further outflows after the end of the first quarter, following the sovereign downgrades (Graph 12, lower panel). In the other core EMEs – on average – outflows peaked in March 2020. An interesting observation is that the pattern of outflows was similar for both active and passive funds, contrary to expectations that passive funds would have reacted more to South Africa being ejected from bond indices. However, while active funds have more discretion over the bonds they include in their portfolios, they may also respond to changes in the composition of bond indices if their performance is benchmarked against them.

Box 3. Case Study: Mexico's External Funding and COVID-19

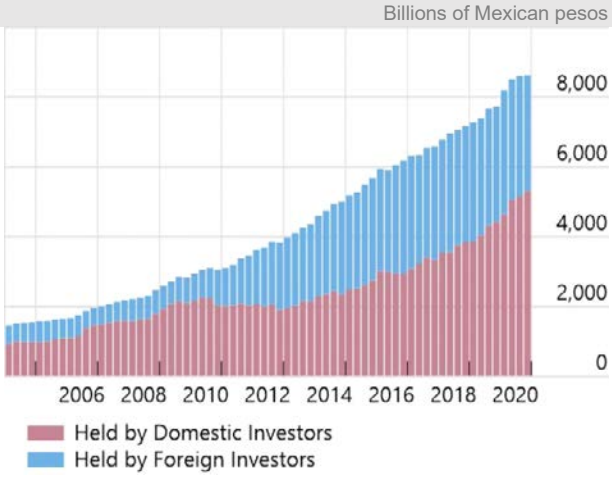
During March-April 2020, the COVID-19 outbreak had a significant impact in Mexico. In early 2020, the country suffered an 18.8% (for Q2, annualised) drop in economic activity, a rise in unemployment to a peak of 4.6% in April, a decline in headline inflation to a record low of 2.15% (annualised) in April, a spike in bond and CDS spreads, and a sharp depreciation of the exchange rate. In addition, the country faced sovereign debt downgrades by the three major rating agencies (between late March and mid-April).

Despite the size of these shocks, the financial system remained solid, with no serious liquidity problems, insolvencies, or refinancing difficulties. Although there were increases in the delinquency rate of some loans, these were considerably smaller than would have been expected. A key element that helped protect the financial system was the soundness of the macro-financial framework. Banks were well-capitalized, profitable and had high liquidity, public debt was sustainable and currency mismatches in the non-financial corporates were contained.

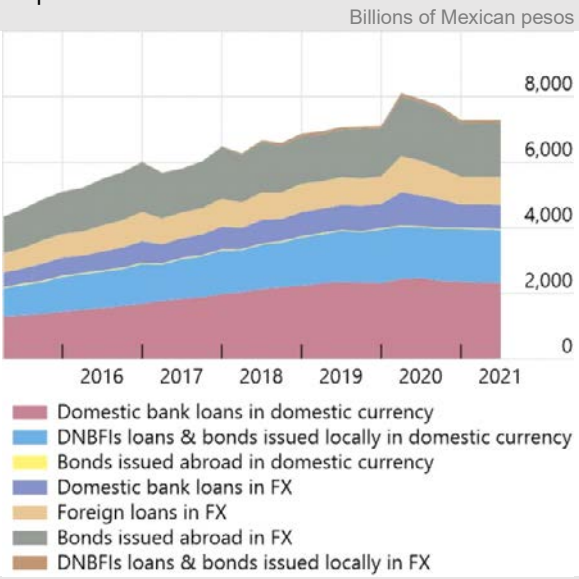
The depth and high liquidity of the bond market were also critical to the capacity of the financial system to absorb the shock. The foundations for these structural features of Mexican financial markets are not new but were the result of a long process that started after the financial crisis of 1994-1995. The first step was the implementation of a flexible exchange rate regime. Subsequently, macroprudential regulation was oriented towards the creation of futures contracts to facilitate hedging, liberalize capital flows, and limit the exposure of domestic banks to exchange rate variations, which helped to develop the foreign exchange market. Later, in the early 2000s, Mexican authorities focused on developing and strengthening the money and bond markets. They implemented a market maker program and improved the transparency, predictability and organisation of the debt issuance process which allowed the local currency bond market to mature. Additionally, in 2008 the Mexican peso was included in the Continuous Linked Settlement (CLS) system which allowed investors to mitigate settlement risk.

Non-financial sector funding **Graph D**

1. Mexican government debt securities, by residency of investor[1]



2. Total financing to Mexican non-financial private corporates[2]



[1] Debt securities of the central government sector, which consists of the institutional unit(s) of the central government plus those nonmarket non-profit institutions (NPIs) that are controlled by the central government. While the central government may also control non-financial or financial corporations, these corporations are classified outside of the central government sector. [2] Figures for FX liabilities are expressed in pesos at the corresponding USD end of the month exchange rate, however, the exact currency of denomination is not known.

Sources: Arslanalp and Tsuda (2014); Banco de México, Comisión Nacional Bancaria y de Valores (CNBV) y Comisión Nacional para la Protección y Defensa de los Usuarios de Servicios Financieros (CONDUSEF).

The sovereign debt market developed considerably since the early 2000s, pushed by an enlargement of the foreign investors, especially in domestic currency, over the last decade. The inclusion of Mexican government bonds in the World Government Bond Index (WGBI) in 2010 supported the diversification of the investor base. These developments, which have been built over the years, allowed the Mexican government to adopt a debt management strategy of shifting funding from external to domestic debt, diversifying issuance in currencies other than the USD, extending debt maturities and developing a liquid domestic yield curve. This strategy ensured that, prior to the financial market turmoil in March-April 2020, the federal government's debt portfolio remained primarily held by domestic investors (Graph D, left panel). In addition, the long maturity of sovereign debt and the high proportion of domestic currency funding reduced exposure to depreciation risks at the height of the turmoil.

In contrast to the public sector, non-financial corporates did not use external debt financing until early 2010 and foreign credit has subsequently been mostly foreign currency denominated. In the early 2020s, around 45% of their total funding came from foreign currency debt, mainly through international bonds (Graph D, right panel). In addition, about 20% of domestic bank loans were foreign currency denominated (mostly USD), though banks regulation limits balance sheet currency mismatches. By the end of the first quarter in 2020, during the market turmoil, total financing to non-financial corporates increased. This was the case in particular for domestic financing as bank credit lines were tapped in order to accumulate cash in a precautionary manner or to meet their short-term liabilities, though external financing also grew by 6% (annualised), after having contracted for the prior two years. In contrast, domestic non-bank financial intermediaries (DNBFIs) decreased their financing to the corporate sector as in some cases they faced liquidity strains themselves. However, in the second half of 2020, as mobility restrictions diminished, economic activity resumed, country risk premiums declined significantly and the exchange rate stabilized. In this context, non-financial private companies resumed their debt placements in local and international markets, with the main objective of refinancing their debt.

Although corporate profitability was weakened by the onset of the pandemic, and some companies experienced temporary liquidity strains, there was little concern about the general solvency of the corporate sector. Moreover, foreign currency debt obligations mostly came from companies that generated cash flows in foreign currency, either from their exports or from their subsidiaries abroad. The combination of these factors mitigated the risk of exchange rate depreciation, helping maintain the stability of the country's financial system.

In conclusion, despite the external headwinds of the COVID-19 pandemic, there was an orderly adjustment in Mexico, which avoided second-order effects and minimized the financial stability impact. The resiliency of the financial sector, with well-capitalised and liquid banks, liquid markets and a solid macroeconomic framework, was fundamental in the country’s ability to face the pandemic and continue accessing foreign financing. These structural features were the result of a consistent commitment to financial development and macro financial stability over many years.

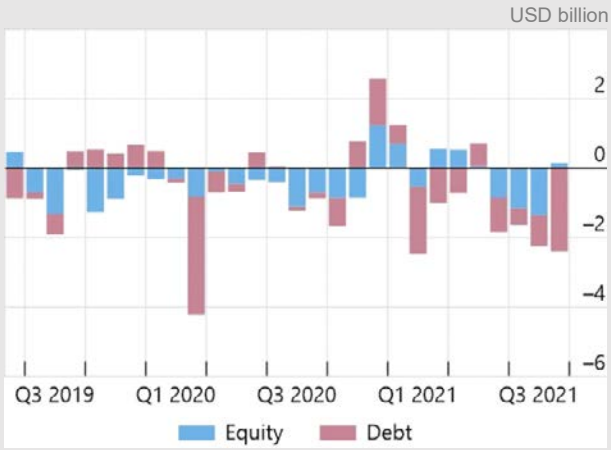
Box 4. Case Study: South Africa's Rating Downgrade

South Africa lost its last investment-grade credit rating, from Moody's, on the 27th of March 2020. This left the sovereign without an investment-grade rating for the first time in 25 years, triggering the country's exit from the World Government Bond Index (WGBI). The downgrade also coincided with the most acute stage of the COVID-19 crisis. Combined with the usual high responsiveness of South African asset prices to global trends, it is unsurprising that the country was a major underperformer in 2020:H1, compared to peers. For instance, it experienced larger capital outflows than most emerging markets, as well as a sharper exchange rate depreciation (more than 20% weaker in the trough).

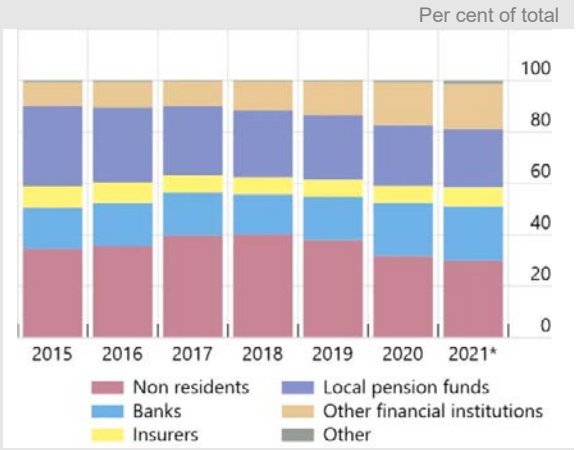
South Africa's loss of investment-grade status was a shock long foretold. It was preceded by an eight-year trend of downward rating adjustments by all three major ratings agencies. Fitch and Standard & Poor's had downgraded South Africa's credit rating to sub-investment grade in 2017, while Moody's had placed South Africa on a negative outlook in November 2019. By March 2020, South Africa was the highest-yielding sovereign in the WGBI, with the market already pricing its debt in line with sub-investment grade peers.

The shock hitting South Africa changed aspects of the financial system **Graph E**

1. Portfolio flow shock



2. Changes in the ownership of government bonds



Source: IIF, National Treasury of South Africa

The exclusion from the WGBI index prevented certain foreign investors from holding South African bonds, contributing to the capital outflows. Although this was particularly the case for passive investors following the index, as well as fund managers with mandates restricting their portfolios to investment-grade bonds; it might also have affected active managers closely tracking the WGBI. The country had a weighting of 0.45% in the index, implying potential outflows of $14 billion on exclusion. Nonetheless, investors could be over- or under-weight on South Africa, and many appeared to have pre-positioned their asset allocations with a downgrade in mind. The share of government bonds held by non-residents, for instance, had fallen from a peak of almost 43% in April 2018 to 37% in February 2020; it subsequently declined to around 30%. Pre-crisis estimates suggested outflows of around $2-8 billion.[51] In the event, it appears the net outflow was around the lower end of that projection (Graph E, left panel). But as the downgrade coincided with the COVID shock, an event never contemplated in downgrade scenarios, it is difficult to estimate the stand-alone contribution of the ratings shock.

[51] This is based on estimates from a range of banks gathered by the South African Reserve Bank (SARB); the SARB's own estimates showed a range of $2.2-$8.6 billion in outflows, which reflected the active and passive investors using the WGBI as well as rebalancing affects for the GBI-EM, where South Africa's weight was expected to fall as China joined that index.

Despite strong capital outflows, the market nonetheless recovered quite fast. Nominal bond yields returned to pre-COVID levels by November 2020, with some support from the South African Reserve Bank's bond purchase programme. Similarly, the JSE All-share Index recovered its pre-crisis levels by October 2020, with the exchange rate passing that threshold by December 2020.

Foreign funding was effectively replaced from domestic sources, linked to a sharp increase in private sector saving (mostly corporates). This saving had both negative and positive aspects, with the negative being a collapse in investment demand and the positive being windfall gains from the commodity boom which commenced in mid-2020. This additional saving nonetheless permitted the government to avoid a sudden funding crunch, despite the pullback of a key investor base. Accordingly, while non-residents remain the single largest category of sovereign creditors, their share has declined from around 40% of all government debt in 2018 to less than 30% in 2021 (Graph E, right panel).

The investor base has also changed in other ways. Long-term pension funds have been replaced by more speculative investors with higher risk tolerances, with a stronger disposition to hold assets for shorter periods through hedged positions. The bond market has also become less liquid. Local firms, for instance, report generally lower levels of liquidity and greater difficulty making large trades, with market conditions stable but at a lower equilibrium relative to the investment-grade era.

4. Policies to address market strains in EMEs in March 2020

EM authorities deployed a suite of measures to mitigate the pressures in local markets and stem capital outflows. Standard crisis management tools were utilised in most of the core EMEs covered by this report. All of the central banks provided bank and other funding support, and these operations were not only provided in local currencies, but also in USD in some jurisdictions (Graph 13, left panel). These measures also included policies to increase the amount of liquidity available in the financial system by reducing bank reserve requirements. In addition, around half of the jurisdictions conducted FX operations to counter the excessive volatility in these markets.

These more traditional policies were often twinned with newer measures. Some EM central banks launched large-scale asset purchase schemes for the first time. Overall many of the core EMEs engaged in asset purchases.[52] While these purchases were not as sizeable as those undertaken in some AEs, they were still effective in restoring market functioning.[53] Some jurisdictions also used market functioning measures, including adjustments to market circuit breakers and temporary short-sale bans.

Countries often implemented a package of different measures to combat the market dysfunction. While none of the core EMEs implemented all five types of measures in Graph 13 (left panel), four jurisdictions deployed four types of measures, three economies used three types of measures and two implemented two types of measures (Graph 13, right panel). Moreover, the measures to mitigate market pressures discussed here were complemented by a whole range of fiscal, regulatory and supervisory actions taken to mitigate the economic impact of the COVID-19 pandemic.

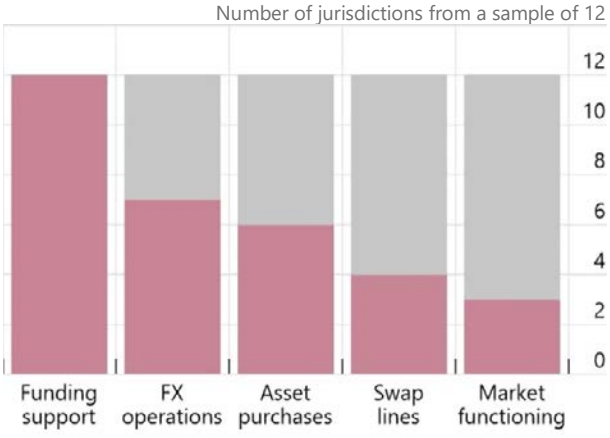
[52] In India asset purchases had been undertaken before 2020.

[53] See Cantu et al (2021) and IMF (2021b).

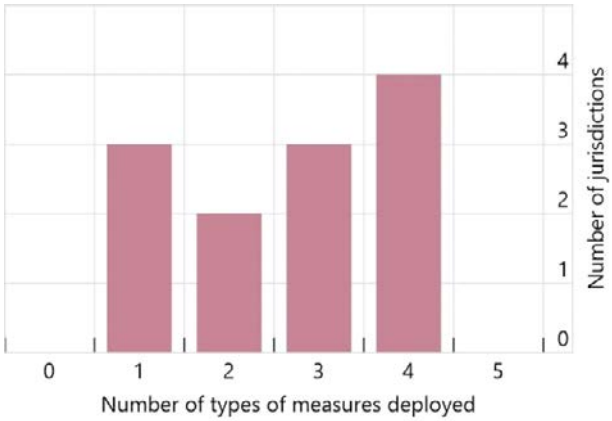
EMEs deployed a whole suite of measures to tackle market pressures

Graph 13

1. Number of EMEs adopting measures



2. Number of measure types implemented by each EME



[1] The FSB COVID-19 policy measures database does not include any entries for Hungary and Malaysia, so the information covers 12 of the large EMEs.

Sources: FSB COVID-19 policy measures database; FSB calculations.

Actions by AE authorities were also important in mitigating EM market strains. There were positive spillovers from measures deployed by AE central banks but that were predominantly aimed at their local financial systems. The combination of liquidity operations, asset purchases and backstop measures that were launched by a number of central banks at a similar time helped to restore investor confidence and alleviate USD funding shortages.[54] Given the increasing role of global investors in EM markets, these measures also helped to address some of the pressures faced by EMEs.

Some of the actions AE central banks took to ease funding strains were targeted at selected EMEs. The best example of this is the swap lines that were deployed. For example, the US Federal Reserve granted temporary USD liquidity swap lines to Brazil and Mexico (as well as seven other AEs) and started a new FIMA repo facility to provide a source of USD liquidity to foreign monetary authorities.[55] Additionally, the European Central Bank initiated bilateral euro swap lines with Croatia and Bulgaria and had euro repo lines with Romania and Hungary (among others). These global actions were instrumental in alleviating funding pressures, including in FX swap and cross-currency basis swap markets, as discussed in Box 1.

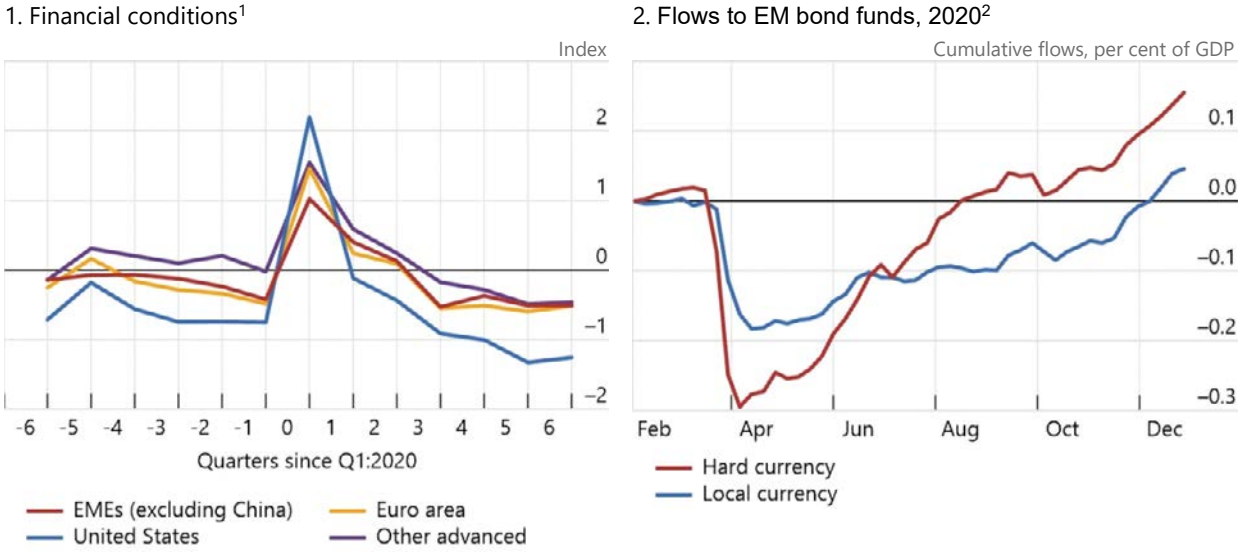
EME asset prices recovered quickly in response to the large interventions by central banks across the globe. This can be illustrated using the IMF's financial conditions indices, which show that broad conditions returned to normal levels – by historical standards – within two quarters of the onset of the COVID-19 pandemic (Graph 14, left panel). This recovery in EM markets was very similar to that which took place in most AEs outside the United States (which returned back to normal levels within one quarter).

54 See FSB (2020).

55 See Choi et al (2021).

Flows into EME bond funds, however, recovered much more slowly than for other asset classes.[56] While assets in AE funds had fully recovered by mid-2020, EM bond fund assets were still significantly below the January 2020 level at the end of the year. Furthermore, while cumulative flows into EME hard currency bond funds had offset the initial outflows by August 2020, local currency fund flows did not recover to the same extent until December (Graph 14, right panel).

Financial conditions recovered quickly but flows returned more slowly **Graph 14**



[1] The financial conditions indices are those used in the IMF's Global Financial Stability Report. [2] Panel 2 shows aggregate flows to EM bond funds. Hard currency funds are foreign currency funds from an EME's point of view.

Sources: EPFR; IMF, FSB calculations.

There was also heterogeneity in the recovery of portfolio debt flows across EMEs. In some cases, portfolio debt flows were not significantly affected by the whole COVID-19 episode and there were inflows throughout 2020 (economies in the upper-right quadrant of Graph 15, left panel). In another group of countries there were initially outflows as the pandemic set-in, but there was a subsequent recovery in flows (upper-left quadrant). In the third group of EMEs, however, the initial outflows were not offset by a recovery during 2020 (lower-left quadrant).

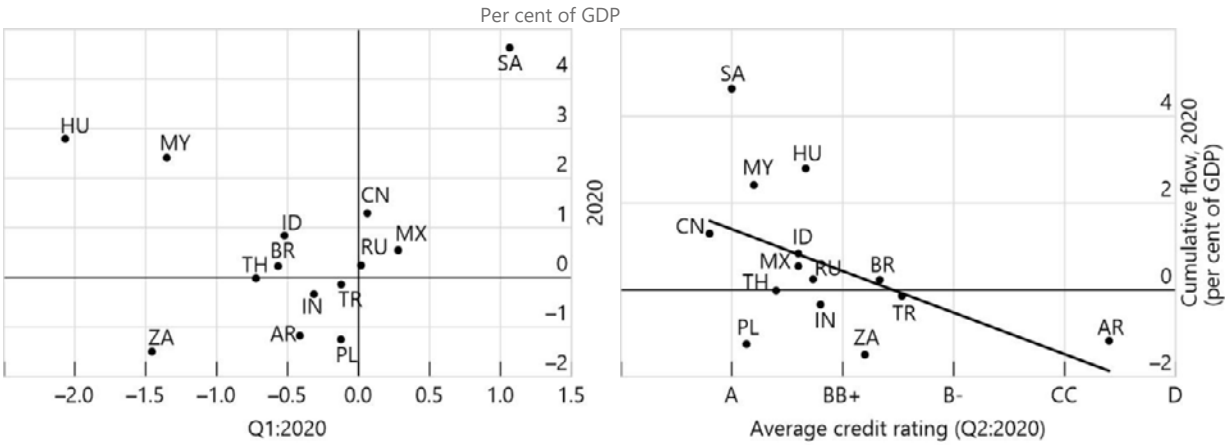
While the discussion in Section 3 linked the scale of the COVID-related outflows to vulnerabilities, it is more difficult to fully explain the heterogeneity in the recovery. Regression analysis, based on bond fund flows, suggests that investors differentiated across countries in the recovery phase according to their fundamentals, as proxied by credit ratings (Annex 2, section D). Indeed, there is a positive correlation between a country's sovereign credit rating and the cumulative portfolio bond flows in 2020 (Graph 15, right panel). However, this does not fully explain the pattern of portfolio debt flows and many other factors are likely to have been taken into account by investors when deciding which bonds they should purchase, including the expected returns on a USD basis, the expected volatility of holding the position, and the economic outlook in the country, to name a few. Indeed Goel and Papageorgiou (2021) showed

[56] See Lewrick and Claessens (2021).

that domestic fundamentals weighed significantly on local currency debt and equity flows, while hard currency debt flows were primarily driven by the external risk sentiment.

EME portfolio bond flows **Graph 15**

1. Cumulative portfolio bond flows in each period 2. Credit ratings and portfolio bond flows, 2020[1]



[1] In panel 2 the average credit rating is the average rating for the sovereign across 3 major credit rating agencies.

Sources: Bloomberg, IMF, FSB calculations.

5. Policy implications

The outbreak of COVID-19, and the consequent reversal in investor risk appetite, delivered a harsh blow to EMEs. Long-standing currency mismatches, particularly among NFCs, were exposed and interacted with new vulnerabilities stemming from a greater reliance on NBFIs in financing EME external debt. Part of this financing was from investment funds that – in response to the combination of a sudden deterioration in global financial conditions, redemptions by investors seeking liquidity and credit rating downgrades – sold EM assets. These asset sales crystallised vulnerabilities in EMEs associated with the financing and rolling over of external debt denominated in foreign currency. They contributed to sharp falls in EME asset prices, significant depreciation of currencies against the dollar, and large-scale capital outflows.

Absent the unprecedented central bank intervention, strains in EM markets and volatility in capital flows would likely have intensified. While these actions succeeded in reversing the abrupt tightening in global financial conditions, and ameliorating the deterioration in market functioning, they did not directly address the underlying currency and liquidity mismatches. Further policy measures are therefore needed to improve the resilience of EMEs' financial systems to future shocks.

5.1 Currency mismatches

The foreign currency debt issued by EME NFCs likely increased currency mismatches. However there is considerable opacity about the scale of FX or natural hedges that could mitigate these mismatches. This suggests that authorities should comprehensively assess corporate currency mismatches as part of their financial stability surveillance. Priority could be given to further developing FX hedging markets to facilitate the management of currency risks. Some jurisdictions have measures in place to indirectly restrict the build-up of NFC FX mismatches, for

example limits on FX bank lending and rules on corporate hedging. There is a question whether consideration could be given to using such policies in other jurisdictions. However, further research into the effectiveness of these tools may be needed before such a decision is made. There may also be a question about how these measures should be implemented, and whether they should be applied to all NFCs in a jurisdiction or just a subset of them.

Sovereign FX mismatches in aggregate were more limited than in the past through the development of local currency debt markets. However, local currency debt markets also experienced stress, at least in part due to the withdrawal of foreign investors from local currency markets. Much of that debt was bought by local banks, which highlights the importance of a resilient banking system in helping to absorb shocks. However, very large bank holdings of local government debt raise concerns about the sovereign-bank nexus, particularly in jurisdictions where the sovereign has a high level of debt. This suggests a need to develop deeper local markets and foster a broader domestic investor base that can mitigate the impact of outflows of foreign capital.[57]

Bank FX mismatches were contained successfully in the period before the pandemic. This was due to the implementation of a whole series of measures in EMEs in the period following the GFC. This included the use of separate liquidity requirements by currency, foreign currency reserve requirements, and limits on banks' foreign currency net positions. The policies should continue to help protect the banking system.

Capital flow management measures may also play a useful role.[58] This is particularly the case when capital inflow surges are contributing to elevated systemic financial risk, where substantial market frictions exist, and where macroeconomic policies are constrained and might take time to have an effect. However, such measures should not substitute for warranted macroeconomic adjustment.

5.2 Liquidity mismatches in investment funds

There is some evidence that the behaviour of fund investors and managers in March 2020 may have been an additional source of vulnerability. Some fixed-income OEFs – particularly those that had invested in less liquid assets – experienced large outflows and sold assets into markets with deteriorating liquidity and arguably added to existing selling pressure. Taking steps to enhance the resilience of investment funds therefore remains important to further bolster EMEs' financial systems.

The FSB, in collaboration with IOSCO, has jointly examined the experience of OEFs in March 2020; the redemption pressures they faced and the availability and effectiveness of liquidity risk management tools, and the degree to which the use of such tools mitigated redemption pressures. Similarly, the IMF undertook work on investment managers and identified similar vulnerabilities in relation to funds' liquidity mismatches.[59] While this work is not specific to EMEs, it encompasses all types of OEFs, including those that invest in EM instruments.

---

57 For a discussion on how to broaden the domestic investor base, see IMF and World Bank (2021).

58 See IMF (2012).

59 See IMF (2021a).

This analysis is informing additional work recently launched by the FSB and its members. The work includes IOSCO's review of the implementation of its 2018 Recommendations on Liquidity Risk Management for OEFs and the FSB's assessment of its 2017 Policy Recommendations to Address Structural Vulnerabilities from Asset Management Activities. These two exercises, which will be based on a coordinated analytical framework, will assess the effectiveness of existing policy recommendations to mitigate liquidity mismatches in OEFs and their impact on the broader economy. The work will assess whether the policy recommendations need to be enhanced – and if so in what way – and, more generally what additional steps are needed to address any identified shortcomings.

The IMF has already identified a number of tools that could be used to mitigate any remaining vulnerabilities in OEFs.[60] These include providing fund managers with a waterfall of liquidity management tools, such as liquidity matching and asset eligibility requirements. Furthermore, greater flexibility of investment mandates could help make investment positions of some institutional investors less flight prone. It is also important to increase the range and granularity of disclosures regarding leverage and to ensure that supervisory resources and skills keep pace with expanded and more demanding mandates and tasks.

The extent to which additional interventions are needed will depend on the results of the exercises mentioned above both in respect to the adequacy of the recommendations as a whole and to the way in which these have been implemented across jurisdictions. Moreover, as investment funds in AEs have an impact on markets and capital flows in EMEs, any policy measures that are adopted should ideally be applied globally and in a coordinated fashion.

Credit rating downgrades can mechanically lead to changes in bond index composition.[61] Many of the largest bond indices use credit ratings to help determine whether a specific bond is eligible for inclusion in an index, while many investors use credit ratings to define the relevant investment universe. Passive investors who track bond indices may need to sell downgraded bonds that have been withdrawn from these indices. In addition, market contacts suggest that global funds with investments in EMEs as part of a broader portfolio may be more reliant on credit ratings for investment decisions and so may be more likely to sell EM assets as an asset class in response to downgrades. While investors should continue to use due diligence with respect to their reliance on credit ratings, there may also be benefit in exploring how index providers could reduce their mechanistic use of credit ratings, for example by avoiding a rebalancing of indices during periods of stress.[62]

5.3 Crisis management tools

The experience of the COVID-related market strains has illustrated that while flexible exchange rates should help to absorb external shocks, in the face of a major shock in a jurisdiction with financial system vulnerabilities, FX intervention may be warranted to try and limit excess

---

60 See IMF (2021a).

61 There are other reasons why the composition of bond indices can change suddenly. For example, the imposition of financial sanctions may present a range of investors from holding particular assets, which may lead to these assets failing the liquidity or tradability criteria for inclusion in market indices.

62 Some index providers did postpone their rebalancing of bond indices in March 2020. There may be merit in exploring whether a similar postponement in stressed market conditions could be incorporated into index providers' procedures.

exchange rate volatility. It is, therefore, important to maintain adequate levels of foreign exchange reserves.

The March 2020 market turmoil highlighted the effectiveness of central bank swap lines and repo facilities in providing backstops in offshore USD funding markets.[63] However, in the case of the FIMA repo facility, EME central banks would need to ensure that they are operationally ready to use this facility in case they need to exchange USD denominated securities for liquidity again in any future period of stress. It is also important for this USD liquidity to be distributed by EM central banks to domestic banks, NBFIs and non-financial corporates who might need it in periods of stress. This could be achieved through local central bank conducting USD repo operations with domestic banks, assuming that this is lent on to NBFIs and corporates. Consideration could also be given to emergency repo operations with certain NBFIs, however the benefits and costs of such a policy would need to be weighed-up carefully, and if access to central bank liquidity is being considered for some NBFIs, authorities should assess whether the regulatory framework for those NBFIs is appropriate.

The experience of EM central bank asset purchases suggests that these could be part of the toolkit used by authorities to help mitigate severe periods of market stress. However, as recently highlighted by the IMF it is important that any asset purchases are initiated by the central bank and undertaken to achieve mandated central bank objectives to maintain the independence and credibility of central banks.[64] Completing these purchases on the secondary market would also help to avoid direct financing of governments. Finally, the size and duration of asset purchases should be in-line with central bank objectives. For example, asset purchases undertaken with a financial stability objective should be wound down when financial stresses ease.

More generally, in response to external shocks, many countries use multiple policy tools simultaneously to address stress and vulnerabilities. These policy measures – such as FX intervention, macroprudential tools, and adjustments to the stance of monetary policy – can interact with each other, so policymakers should identify the combination of policies best suited to achieve the desired objective. In particular, authorities may want to consider using a framework to assess these policy trade-offs holistically.[65] It is also important for EME authorities to clearly communicate their policy objectives and decisions to enhance the credibility of their actions, especially during periods of stress in financial markets. A well-articulated policy framework can help with effective and clear communication by explaining the rationale behind the choices made.

5.4 Data gaps for risk monitoring

Consideration should be given to closing a number of the data gaps to facilitate risk monitoring and the timely adoption of policies to mitigate vulnerabilities. First, there is no comprehensive dataset on cross-border investment by NBFIs in EMEs, despite the fact that their role in financing EMEs has grown significantly.[66] More information is needed to accurately assess vulnerabilities given the different types of risks that NBFIs face. While the IMF's Coordinated Portfolio

63 See Cetorelli et al (2020), Choi et al (2021) and Goldberg and Ravazzolo (2021).

64 See IMF (2021b).

65 For example, see IMF (2020) for the Integrated Policy Framework and BIS (2019).

66 See also Lepers and Mercado (2021).

Investment Survey data does collect some data on NBFIs, as the country coverage is incomplete it is not possible to build-up the full picture of NBFIs' investment in EMEs. As is discussed in Annex 1, this report used a combination of datasets to estimate total investment by NBFIs in EMEs. The methodology, however, was not able to estimate data for the different types of NBFIs. International organisations and national authorities should work together to develop more detailed statistics on NBFIs' cross-border investment, ideally broken down into types of NBFI (e.g. investment funds, leveraged investors, insurers and pension funds, etc.).

Second, international organisations and national statistical agencies should try to develop more comprehensive information on the currency denomination of capital flows (for both borrowers and lenders) and external debt. While the IMF does publish data on borrowing by currency, this is only available for certain countries and for some sectors in the economy. This report again had to use a combination of datasets to estimate the currency breakdown of sovereign and NFC borrowing from non-residents (see Annex 1). In addition, in order to fully assess currency mismatches in NFCs it is important to collect data on the extent to which foreign exchange risks may be mitigated by hedging or through natural hedges.

Third, a greater amount of information on investment funds would support assessing vulnerabilities in the sector. Many supervisory authorities across the globe lack the granular data necessary to assess the liquidity of funds and the tools used to manage liquidity risks in different types of investment funds. IOSCO is trying to improve the coverage and comparability of this information.[67] It would also be helpful to better understand the degree to which investment funds have concentrated positions in smaller EME markets, as changes in these holdings could have an amplified impact on the prices of assets in domestic EME markets if the investment fund holdings are large relative to the size of the local market. Supervisors should consider the benefits and costs of collecting such information from larger investment funds.

[67] See IOSCO (2022).

Annex 1: Dataset used in the report

This annex explains how the main dataset used in the report was constructed. The dataset comprises information on portfolio and other investment liabilities (levels and flows) of 14 large EMEs (Table 1.1) on a quarterly basis. It includes a breakdown of levels by currency (local currency, USD and other foreign currency), by sector of the borrower, and by the sector of the non-resident investor (bank, NBFIs and other).

Table 1.1. Large Emerging Market Economies included in the dataset

Europe, Middle East & Africa		**Latin America**	
Hungary	HU	Argentina	AR
Poland	PL	Brazil	BR
Russia	RU	Mexico	MX
Saudi Arabia	SA	**Emerging Asia**	
South Africa	ZA	China	CN
Turkey	TR	India	IN
		Indonesia	ID
		Malaysia	MY
		Thailand	TH

The dataset is constructed from a combination of IMF balance of payments and international investment position statistics, as well as BIS international debt securities and locational banking sector statistics (Table 1.2). The main aggregates – i.e. total portfolio investment, portfolio equity investment, portfolio debt investment and other investment – are from IMF data. The breakdown by currency, sector of borrower and sector of non-resident investor are either from BIS data or estimated.

Table 1.2. Dataset construction

		External debt															
		Portfolio investment liabilities									**Other investment liabilities**						
		Total	Equity	Debt							**Total**	USD	FC	LC			
				Total	USD	FC	LC										
								EME issued international debt							Lending by foreign banks		
								Total	USD	FC	LC				Total	USD	FC	LC
Total		IMF	IMF	IMF	Est.	Est.	Est.					IMF	Est.	Est.	Est.				
EME borrowers	Government				Est.	Est.	Est.	BIS	BIS	BIS	BIS								
	Non-finanical														BIS	BIS	BIS	BIS
	- o/w NFCs				Est.	Est.	Est.	BIS	BIS	BIS	BIS							
	Banks							BIS	BIS	BIS	BIS				BIS	BIS	BIS	BIS
	NBFIs							BIS	BIS	BIS	BIS				BIS	BIS	BIS	BIS
Foreign investors	Banks	BIS	-	BIS				BIS	BIS	BIS	BIS				BIS	BIS	BIS	BIS
	NBFIs	Est.																
	Others	Est.																

Key

- IMF balance of payments and international investment position
- BIS international debt securities
- BIS locational banking statistics
- Estimated data

Acronyms

USD	US dollar	NFCs	Non-finanical companies
FC	Other foreign currency	NBFIs	Non bank financial intermediaries
LC	Local currency		

A. Breakdown of levels

Breakdown by sector of non-resident investors

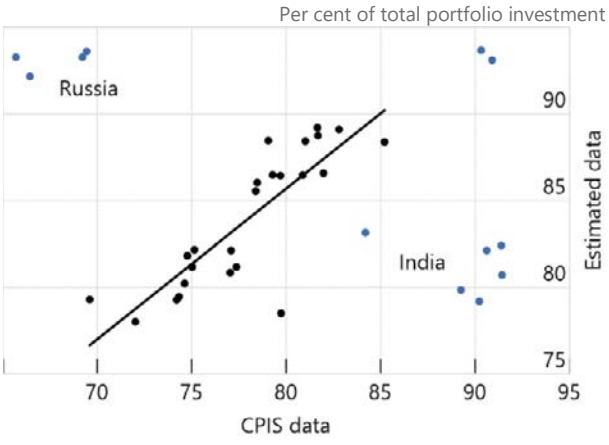
One key part of the report is to assess the role of NBFIs in the 2020:H1 COVID-19 episode in EMEs. However, there is no single dataset that provides NBFIs' portfolio investment for all the large EMEs in the dataset. Nevertheless, it is possible to estimate the level of NBFIs' portfolio investment by using a combination of IMF and BIS data.

Some information on non-resident investors in EMEs is available from the IMF Coordinated Portfolio Investment Survey (CPIS). These data allow one to construct investment in a certain EME, based on information provided by the economies investing in that country. The CPIS dataset also includes a breakdown by the sector of the investor.

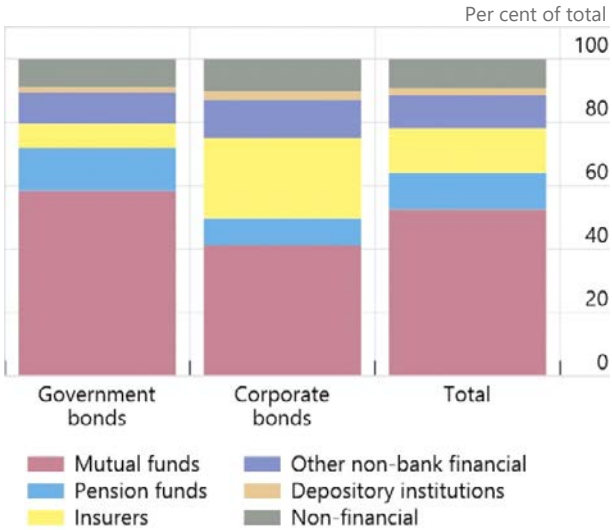
However not all economies provide this information, so there are some gaps in the CPIS data. First, the sum of the data provided by the investing countries typically only covers a fraction of the total liabilities of an EM country. Secondly, it is only possible to construct the sector breakdown for six of the large EMEs using the CPIS. While this means that the CPIS cannot be used as the main source of information on the sector of non-resident investors, the data can be used to estimate the small amount of investment in EMEs from the non-financial sector in other economies. These non-financial sector holdings are estimated as a percentage of total portfolio liabilities in each large EME, with the percentage taken from the CPIS data (or the average of available large EMEs for those EMEs not covered by the CPIS).

Non-bank financial intermediary investment in emerging market economies **Graph 1.1**

1. Comparison of estimated NBFIs' holdings with partial data from the CPIS, 2015-20[1]



2. US investor holdings of long-term emerging market bonds, December 2020



[1] CPIS data shows NBFIs' holdings in the available data as a proportion of total holdings in the available data. Each dot is the proportion of holdings by NBFIs for one jurisdiction in one year, using annual data from 2015-2020. The regression line is for all jurisdictions other than India and Russia. The chart uses information reported by the top 10 CPIS reporting countries plus all other G20 economies that report the required data.

Source: BIS; IMF Coordinated Portfolio Investment Survey; US TIC data; FSB calculations.

NBFIs' investment is then calculated as total portfolio liabilities of an EME, less data from the BIS on non-resident bank holdings of debt and the estimate of non-financial sector holdings. While this means that NBFIs' investment is estimated by residual, the estimates are similar to data on NBFIs' investment available from the CPIS (Graph 1.1, left panel). There are some differences between the CPIS and the estimated data for India and Russia, but even if one takes the minimum data points from the CPIS, NBFIs' holdings are at least 65 per cent of total investment. The estimates can also be corroborated by US Treasury International Capital (TIC) data. While these data are only for US investors, they suggest that NBFIs make up more than 80% of total US investment in emerging market economy long-term debt (Graph 1.1, right panel).

BIS locational banking statistics provide data on non-resident bank loans to the large EMEs, part of other investment liabilities of the EMEs.

Breakdown by currency

The method for estimating the currency breakdown of portfolio liabilities is similar to that used in Bénétrix et al (2019). The starting point is the BIS international debt statistics, which shows the denomination of international bonds. However, these statistics do not include non-resident holdings of domestic bonds. The proportion of these domestically issued government bonds that are denominated in local currency is estimated from the updated dataset that accompanies Arslanalp & Tsuda (2014). Local currency bonds issued outside the government sector are estimated by applying the proportion of local currency debt in the international debt statistics to the level of non-government portfolio debt.

Total foreign currency bonds are then calculated as total portfolio debt less local currency bonds. The breakdown of foreign currency bonds into USD and other foreign currency is estimated by applying the proportions in the international debt statistics to the level of foreign currency bonds. The currency breakdown of NBFIs' debt holdings is then estimated by applying the proportions of local currency, USD and other foreign currency portfolio debt to the level of NBFIs' debt assets.

BIS locational banking statistics have a breakdown of bank loans by currency. This breakdown is used to estimate the currency breakdown of other investment liabilities, again using a similar approach to Bénétrix et al (2019).

B. Breakdown of flows

As it is more difficult to decompose flows using the proportional estimates discussed above, there is less detail on portfolio liabilities flows than on levels. Flows of the non-financial private sector are estimated by applying the same proportion used to estimate the level to total portfolio flows. NBFIs' flows are then calculated as total portfolio flows less bank debt flows (taken from BIS data) and the estimated non-financial private sector flows.

While there are no estimates for the currency breakdown of total portfolio flows, BIS international debt statistics provide flows of international bonds, broken down into local currency, USD and other foreign currency. BIS locational banking statistics have a breakdown of the flow of bank loans by currency.

Annex 2: Regression analysis

This annex provides more details of the analysis is referred to in this report.

A. Analysis of capital flows and the USD

A first regression analysis supports the correlation between an outflow of funds from EM institutions and the appreciation of the USD. The analysis is based on quarterly data from 2010:Q1 to 2020:Q4 and is run for the sample of core EMEs covered in this report.

The negative coefficients on the portfolio debt flows and portfolio equity flows imply that outflows were associated with a strengthening in the USD (Table 2.1). The same is true for NBFIs and bank loans.

Furthermore, over time additional outflows from EME institutions appeared to create a further appreciation in the USD. As the lag is positive and the coefficient on the lag is positive, the dependent variable gets bigger over time as long as outflows persists.

Table 2.1. Regression analysis on EME capital flows and the USD[1,2]

Regressor	1. OLS	1. Fixed	1. VAR	2. OLS	2. Fixed	2. VAR	3. OLS	3. Fixed	3. VAR
Portfolio debt flow	- .00004**	-.00006*	-.00003						
Portfolio equity flow	- .00002	-.00009	-.00004						
Bank debt flows				-.00003**	-.00015**	-.00007***			
NBFIs' equity & debt flows				-.00005	-.00005	-.00003			
Bank loan flows [Foreign Currency]							-.00002*	-.00003*	-.00002
2nd Lag of USD index			.5063***			.5048***			.5255***
Constant	2.996***	1.0318***	.9863***	2.724***	1.0007***	.9723***	.9171*	.66322**	.7352***
Observations	42	588	574	42	588	574	43	602	588
Number of groups		14	14		14	14		14	14
R^2	37%	10.64%	54.1%	36.5%	5.37%	54.2%	14.5%	1.65%	50%

[1] The dependent variable is the first difference of the Trade Weighted US Dollar Index for EMEs. [2] Fixed-effects columns are for the 14 EMEs.
Source: FRED.

B. Analysis of spillovers from sales of US treasuries

This analysis is used to look at possible spillovers from strains in EMEs to sales of US treasuries (USTs) by those EMEs. The sample used in this work is all countries classified as EMEs by the IMF that held more than $100 million of US treasuries in January 2020 (based on Treasury International Capital, TIC, data). A larger sample is used to allow us to better understand the role of commodity prices, and especially oil, in the economic stress faced by EMEs in March 2020. Countries are classified as fuel exporters according to the 2019 UNCTAD report on State of Commodity Dependence. Ecuador and Egypt are also classified as fuel exporters in this analysis as fuel exports generate a significant fraction of critical foreign currency revenues. As is discussed in Section 3, fuel exporters accounted for nearly 40% of all US treasury sales in March and April 2020, despite accounting for less than 15% of EME holdings of US treasuries in January 2020.

A separate analysis is used to look at the link between US treasury sales and EME vulnerabilities. This analysis finds a relationship between external short-term debt and treasury sales. When net purchases of US Treasuries in March and April 2020 as a share of January 2020 holdings are regressed on a dummy for EMEs with USD pegs, a dummy for EMEs that are fuel exporters, gross portfolio inflows in 2020:Q1 relative to GDP, and the ratio of 2019 external short-term debt (defined as debt with less than one year until maturity on a remaining maturity basis) to GDP, the coefficient on external short-term debt is negative and statistically and economically significant (Table 2.2). A one-standard deviation increase in the ratio of external short-term debt to GDP predicts additional sales of US Treasuries equal to 4.6 percent of an EME's pre-COVID holdings. In other words, EMEs with more external short-term debt had higher net sales (or fewer net purchases) of US Treasuries in spring 2020.

Table 2.2. Results of analysis between EME strains and sales of US treasuries

	Treasury Sales	Treasury Sales + FRBNY Cash
Portfolio Inflows	3.41* (1.96)	1.50 (2.43)
External ST Debt/GDP	-0.34** (0.16)	-0.44*** (0.15)
Adjusted R^2	0.31	0.10
Sample size	45	45

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, *p<0.10.

Additionally, when net purchases of Treasuries are combined with changes in cash positions at FRBNY – to obtain a measure of total liquidity demand – and then regressed on the same variables as above, external short-term debt remains an important predictor (Table 2.2). This is a possible indicator that EMEs with higher levels of external short-term debt sold Treasuries to provide immediate USD liquidity to corporates and households.

Finally, external short-term debt remains a significant predictor of both net purchases of US Treasuries and net purchases of US Treasuries plus changes in cash positions at FRBNY when controlling for other macroeconomic vulnerabilities and drivers of reserve accumulation (Table 2.3). The average ratio of the current account balance to GDP from 2015-2019, the ratio of government debt to GDP in 2019, the ratio reserves to external short-term debt in 2019, the ratio of broad money to GDP in 2019, and the value of the Chinn-Ito capital account openness in 2019 are added as additional regressors to the two specifications discussed above. External short-term debt is the only significant predictor of both sales of US Treasuries and sales of US Treasuries plus changes in cash balances at the New York Fed, with the coefficient little changed from the more parsimonious specifications shown in Table 2.2.

Table 2.3. Results of amended analysis between EME strains and sales of US treasuries

	Treasury Sales	Treasury Sales + FRBNY Cash
External ST Debt/GDP	-0.39** (0.20)	-0.44*** (0.21)
Adjusted R^2	0.27	0.01
Sample size	45	45

Note: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, *p<0.10.

C. Analysis of the determinants of bond fund flows

Differences in the degree to which individual EMEs relied on certain investment funds for their external financing may have also contributed to the degree of portfolio outflows across jurisdictions. While investment fund assets under management account for about one quarter of total external bonds on average, the degree of reliance varies significantly across economies, from just under 15% to more than 30% (Table 2.4). There are also differences across jurisdictions in the type of investment funds providing financing. Global funds represent 3-28% of total funds across individual EMEs, while the share for passive funds is 15-27% across jurisdictions.

Table 2.4. Reliance on bond funds across jurisdictions, 2019

Per cent

Economy	Reliance on investment funds[1]	Geographic scope		Management		Investor base	
		Global funds[2]	Others	Active	Passive	Retail	Institutional
Brazil	29	28	72	81	19	36	64
China	13	17	83	74	26	41	59
Hungary	29	12	88	82	18	30	70
India	22	16	84	85	15	49	51
Indonesia	27	13	87	83	17	35	64
Malaysia	25	16	84	74	26	40	60
Mexico	17	28	72	77	23	34	66
Poland	18	17	83	73	27	36	64
Russia	33	16	84	82	18	31	69
Saudi Arabia	16	3	97	82	18	27	73
South Africa	32	20	80	75	25	33	67
Thailand	31	13	87	79	21	34	66
Turkey	21	20	80	81	19	31	68
Average	24	17	83	79	21	35	65

[1] The reliance on investment funds is calculated as bond fund assets under management in the EPFR database as a proportion of total external portfolio bond liabilities. [2] Global funds are those classified in the EPFR database as with global, or global excluding US. Other funds are all other categories in the EPFR database.

Sources: EPFR; IMF; FSB calculations.

In order to investigate the sensitiveness of bond inflows to the reliance to specific fund types during the COVID-19 crisis, we run regressions (Table 2.5) on the determinants on monthly bond inflows for 12 EMs, accounting for pull (industrial production, ratings, monetary policy rates) and push factors (standardized).

By interacting the latter with the degree of reliance to investment funds at country level, we try to verify whether the impact of the global shock to bond inflows was larger in countries relatively more exposed to investment funds, distinguishing between fund types. The results (column 1) show the importance of country economic conditions (industrial production), exchange rate depreciation, and the VIX. The interactions suggest that the impact of global shock induced by the pandemic in terms of bond outflows (as indicated by the negative sign of the coefficients), was enhanced for countries relying relatively more on global and passive funds (columns 3 and 4).

Table 2.5. Regression analysis on the determinants of bond flows in 2020

VARIABLES	(1) no interaction	(2) VIX#IFs	(3) VIX#Global funds	(4) VIX#Passive funds	(5) VIX#Retail funds
Industrial production	0.00294*	0.00312*	0.00229	0.00294*	0.00311*
	(0.00156)	(0.00164)	(0.00157)	(0.00164)	(0.00167)
Rating	0.00869	0.0186	0.0343*	0.0140	0.0205
	(0.00815)	(0.0116)	(0.0185)	(0.0107)	(0.0126)
MP rate	0.00450	0.0119	0.0155	0.0109	0.0147
	(0.00907)	(0.0112)	(0.0132)	(0.0120)	(0.0129)
ER change	-2.326***	-2.396***	-2.270***	-2.367***	-2.403***
	(0.568)	(0.566)	(0.555)	(0.567)	(0.573)
VIX	-0.0824***	-0.0909	0.0363	0.0487	-0.0403
	(0.0283)	(0.0789)	(0.0563)	(0.0566)	(0.0774)
IFs		0.394			
		(0.873)			
VIX # IFs		0.0412			
		(0.339)			
Global			12.29***		
			(3.759)		
VIX # Global			-2.788***		
			(0.939)		
Passive				8.949***	
				(3.223)	
VIX # Passive				-2.524**	
				(1.173)	
Retail					3.542
					(2.470)
VIX # Retail					-0.465
					(0.862)
Constant	-0.205	-0.487	-1.061**	-0.765**	-0.733
	(0.257)	(0.371)	(0.529)	(0.382)	(0.469)
Observations	144	144	144	144	144
R-squared	0.291	0.297	0.331	0.311	0.305

Note: The dependent variable is the size of monthly country bond inflows as percentage of GDP. Columns 2 to 5 include among the explanatory variables the interaction term between the VIX and the index of reliance to all investment funds reporting in the EPFR database (2), global funds (3), passive funds (4) and retail funds (5), at the end of 2019. The country sample includes Brazil, India, Indonesia, Hungary, Malaysia, Mexico, Poland, Russia, South Africa, Thailand, Turkey. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

A regression analysis using weekly EPFR data confirms that investment funds behaved pro-cyclically during the pandemic (Table 2.6): the coefficient of the VIX (standardized) is negative and strongly significant, as investment funds reduced EM bond holdings following the outbreak of the pandemic. The sensitivity to the VIX is higher for passive funds, in particular for Exchange Trade Funds (ETFs). Moreover, the coefficient of the dummy “dash”, which identifies the weeks during the dash for cash period, is also negative and strongly significant, suggesting that in that period funds reduced their EM bond holdings more than what implied by the increase in risk aversion. Also in this respect, the response of passive funds, in particular ETFs, looks stronger relative to active funds.

In most of the monthly and weekly regressions, the coefficient on the credit rating is not significant. This is perhaps because the analysis looks at the level of the rating and is for all large EMEs together. The analysis on credit ratings in Section 3.3 of the report suggests that downgrades – rather than the level of the rating – may have added to pressures, particularly when a country lost its investment grade rating.

Table 2.6. Regression analysis on the determinants of bond flows with weekly data

VARIABLES	(1) All	(2) Active	(3) Passive	(4) Passive ETF
Rating	0.0804	0.0764	0.0759	0.0448
	(0.0818)	(0.0733)	(0.109)	(0.125)
MP rate	0.0161	0.0247	-0.0265	-0.0288
	(0.0200)	(0.0172)	(0.0258)	(0.0309)
ER change	-0.0123*	-0.00113	-0.0611***	-0.0851***
	(0.00601)	(0.00541)	(0.0124)	(0.0150)
VIX	-0.195***	-0.186***	-0.227***	-0.236***
	(0.00508)	(0.00598)	(0.0117)	(0.0155)
dash	-1.537***	-1.429***	-2.030***	-2.343***
	(0.0585)	(0.0822)	(0.105)	(0.140)
trend	0.0418***	0.0363***	0.0573**	0.0576**
	(0.0106)	(0.00789)	(0.0186)	(0.0215)
Constant	-0.847	-0.887	-0.338	0.103
	(1.212)	(1.059)	(1.685)	(1.931)
Observations	588	588	588	588
R-squared	0.793	0.798	0.618	0.593
Number of countries (n)	12	12	12	12

Note: The dependent variable is the ratio of weekly flows of country bonds over the stock of 4 weeks before, expressed in percentages. Panel regression with country fixed effects. The sample includes 12 EMs: Brazil, China, Hungary, India, Indonesia, Malaysia, Mexico, Poland, Russia, Thailand, Turkey and South Africa. "dash" is a dummy equal to 1 for the period March 11-23. Source: EPFR country flows.

D. Analysis of bond fund flows during the recovery period

As discussed in Section 4, EME portfolio outflows were short-lived and bond flows stabilized from May 2020. To explore the determinants of this recovery phase we run the same regressions as above for the sub-period May-December 2020 (Table 2.7). It turns out that ratings were strongly significant, suggesting that investors after the turmoil in March-April, started differentiating across countries according to their economic fundamentals, while the interaction terms related to the reliance on specific fund types, are in most cases not significant.

An addition regression, for the sub-period (May-December 2020), shows that the sensitiveness to the VIX decreased across all fund types, while country fundamentals became more important (Table 2.8). This suggests that investors paid more attention to country fundamentals in this period, no matter what type of investment fund was involved.

In both regressions the country sample is Brazil, India, Indonesia, Hungary, Malaysia, Mexico, Poland, Russia, South Africa, Thailand, Turkey.

Table 2.7. Regression analysis on bond fund flows (May-Dec 2020)

VARIABLES	(1) no interaction	(2) VIX#IFs	(3) VIX#Global funds	(4) VIX#Passive funds	(5) VIX#Retail funds
Industrial production	0.00459*	0.00508**	0.00360*	0.00476**	0.00500**
	(0.00233)	(0.00226)	(0.00214)	(0.00233)	(0.00233)
Rating	0.0158**	0.0275**	0.0396**	0.0250**	0.0282**
	(0.00787)	(0.0120)	(0.0189)	(0.0102)	(0.0123)
MP rate	-0.00748	0.000687	0.00516	0.00319	0.00270
	(0.00787)	(0.00884)	(0.0124)	(0.00950)	(0.00986)
ER change	-1.437**	-1.428**	-1.151*	-1.235**	-1.446**
	(0.639)	(0.639)	(0.585)	(0.614)	(0.641)
VIX	0.0380	-0.281	0.186	-0.150	-0.351
	(0.0835)	(0.225)	(0.194)	(0.200)	(0.232)
IFs		-2.774			
		(2.519)			
VIX # IFs		1.318			
		(0.970)			
Global			13.87		
			(9.147)		
VIX # Global			-3.806		
			(3.712)		
Passive				-5.894	
				(10.59)	
VIX # Passive				3.625	
				(4.166)	
Retail					-9.192
					(6.666)
VIX # Retail					4.534*
					(2.570)
Constant	-0.693	-0.258	-1.518**	-0.564	-0.151
	(0.420)	(0.748)	(0.656)	(0.616)	(0.781)
Observations	96	96	96	96	96
R-squared	0.125	0.156	0.156	0.163	0.176

Note: the dependent variable is the size of monthly country bond inflows as percentage of GDP. Columns 2 to 5 include the interaction term between the VIX and the index of reliance to all investment funds reporting in the EPFR database (2), global funds (3), passive funds (4) and retail funds (5) at the end of 2019. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 2.8. Additional regression analysis on bond fund flows (May-Dec 2020)

VARIABLES	(1) All funds	(2) Active funds	(3) Passive funds	(4) ETF	(5) Other passive funds
Industrial production	0.0155***	0.0104**	0.0168*	0.0500***	-0.0245**
	(0.00557)	(0.00513)	(0.00901)	(0.0148)	(0.0101)
Credit rating	0.198***	0.158***	0.186**	0.473***	-0.132**
	(0.0493)	(0.0435)	(0.0772)	(0.152)	(0.0556)
MP rate	0.0769***	0.0621***	0.112**	0.189**	0.0105
	(0.0265)	(0.0235)	(0.0496)	(0.0867)	(0.0399)
ER change	-0.0609***	-0.0475***	-0.0942***	-0.107***	-0.0572
	(0.0148)	(0.0148)	(0.0230)	(0.0376)	(0.0364)
VIX	-0.578***	-0.878***	0.581*	1.024*	-0.0810
	(0.216)	(0.208)	(0.330)	(0.586)	(0.260)
Constant	-2.207	-0.762	-3.682*	-11.79***	6.233***
	(1.396)	(1.313)	(1.946)	(3.693)	(1.702)
Observations	84	84	84	84	84
R-squared	0.466	0.449	0.270	0.368	0.148

Note: The dependent variable is the ratio between the monthly bond flows and the stock of bonds held by investment funds at the beginning of the month, aggregated at country level. Columns 1 to 5 refer respectively to all investment funds reporting in the EPFR database (1), active funds (2), passive funds (3), ETFs (4) and other passive funds (5). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

References

Arslanalp, Drakopoulos, Goel and Koepke, 2021, "Benchmark-Driven Investments in Emerging Market Bond Markets: Taking Stock", IMF Working Paper, WP/20/192.

Arslanalp and Tsuda, 2014, "Tracking Global Demand for Emerging Market Sovereign Debt", IMF Working Paper, WP/14/39.

Avdjiev, Gambacorta, Goldberg and Schiaffi, 2020, "The Shifting Drivers of Global Liquidity", *Journal of International Economics*, Volume 125.

Avdjiev, Eren and McGuire, 2020, "Dollar Funding Costs during the Covid-19 Crisis through the lens of the FX Swap Market", BIS Bulletin, No. 1, April.

Avdjiev, S., Du, W., Koch, C. and Shin, H.S., 2019. "The dollar, bank leverage, and deviations from covered interest parity". *American Economic Review: Insights*, *1*(2), pp.193-208.

Bank of England, 2015, The Bank of England's Response to the European Commission Green Paper: Building a Capital Markets Union, May.

Bank of England, 2020, The Bank of England's Supervision of Financial Market Infrastructures: Annual Report, December.

Bank of England, 2021, Liquidity management in UK open-ended funds, March.

Bank for International Settlements (BIS), 2018, "The Implications of Passive Investing for Securities Markets", Quarterly Review.

BIS, 2019, "Monetary Policy Frameworks in EMEs: Inflation Targeting, the Exchange Rate and Financial Stability", Annual Economic Report.

Barajas, M.A., Deghi, A., Raddatz, C., Seneviratne, M., Xie, P. and Xu, Y., 2020. "Global Banks' Dollar Funding: A Source of Financial Vulnerability". IMF Working Paper, WP/20/113.

Basel Committee on Banking Supervision (BCBS), Committee on Payments and Market Infrastructures (CPMI) and Board of the International Organization of Securities Commissions (IOSCO), 2021, Review of Margining Practices, Consultative Report, October.

BCBS-IOSCO, 2013, Margin Requirements for Non-Centrally Cleared Derivatives, September.

Bénétrix, Guatam, Juvenal and Schmitz, 2019, "Cross-Border Currency Exposures. New Evidence Based on an Enhanced Dataset", IMF Working Paper, WP/19/299.

Benos, Ferrara and Ranaldo, 2022, "Margin Procyclicality and the Collateral Cycle", Bank of England Staff Working Paper, No 966, March.

Bertaut, Bruno and Shin, 2021, "Original Sin Redux", SSRN Working Paper, April.

Board of Governors of the Federal Reserve System, 2021, "The Role of Foreign Investors in the March 2020 Turmoil in the US Treasury Market", Financial Stability Report, November.

Borio, 2020, "The Prudential Response to the Covid-19 Crisis", speech on the occasion of the Bank's Annual General Meeting, 2020 BIS AGM, June.

Cantu, Cavallino, De Fiore and Yetman, 2021, "A Global Database on Central Banks' Monetary Responses to Covid-19", BIS Working Papers, no 934.

Cantu and Chui, 2020, "Financial Market Development and Financial Stability", BIS Papers, No 113.

Carney, 2019, "Pull, Push, Pipes: Sustainable Capital Flows for a New World Order", Bank of England speech at the Institute of International Finance Spring Membership Meeting, June.

Carstens and Shin, 2019, "Emerging Markets Aren't Out of the Woods Yet", Foreign Affairs, March.

Cetorelli, N, Goldberg, L. S. and Ravazzolo, F., 2020, "Have the Fed Swap Lines Reduced Dollar Funding Strains during the COVID-19 Outbreak?," Federal Reserve Bank of New York *Liberty Street Economics*.

Choi, M., Goldberg, L.S., Lerman, R.I. and Ravazzolo, F., 2021, "COVID Response: The Fed's Central Bank Swap Lines and FIMA Repo Facility", Federal Reserve Bank of New York Staff Report, (983).

Committee on Payment and Settlement Systems (CPSS) and Board of the International Organization of Securities Commissions (IOSCO), 2012, Principles for Financial Market Infrastructures, December.

Committee on the Global Financial System (CGFS), 2021, "Changing Patterns of Capital Flows", CGFS Papers, No 66, May.

Cortes and Sanfilippo, 2020, "Do Multi-Sector Bond Funds Pose Risks to Emerging Markets?", IMF Working Paper, WP/20/152, August.

Cortes and Sanfilippo, 2021, "Multi-Sector Bond Funds in Emerging Markets—Easy Come, Easy Go", IMF Global Financial Stability Notes, No 2021/05, December.

Financial Stability Board (FSB), 2010, Principles for Reducing Reliance on CRA Ratings, October.

FSB, 2020, Holistic Review of the March Market Turmoil, November.

FSB, 2021, Enhancing the Resilience of Non-Bank Financial Intermediation: Progress report, November.

Goel and Papageorgiou, 2021, "Drivers of Emerging Market Bond Flows and Prices", IMF Global Financial Stability Notes, No 2021/04, December.

Goldberg and Ravazzolo, (2021), "The Fed's International Dollar Liquidity Facilities: new Evidence on Effects", Federal Reserve Bank of New York Staff Reports, No 997, December.

Hofmann and Park, (2020), "The Broad Dollar Exchange Rate as an EME Risk Factor", BIS Quarterly Review, December.

Hördahl and Shim, (2020), "EME Bond Portfolio Flows and Long-Term Interest Rates during the Covid-19 Pandemic", BIS Bulletin, No. 18, May.

Ikeda, Kerry, Lewrick and Schmieder, 2021, "Covid-19 and Bank Resilience: Where do we stand?", BIS Bulletin, No. 44, July.

International Monetary Fund (IMF), 2012, "The Liberalization and Management of Capital Flows: An Institutional View", Staff Report, November.

IMF, 2016, "Guidance Note on the Assessment of Reserves Adequacy and Related Considerations", Staff Report, June.

IMF, 2019, "Vulnerabilities in a Maturing Credit Cycle", Global Financial Stability Report, Chapter 1, April.

IMF, 2020, "Toward an Integrated Policy Framework", IMF Policy Paper, October.

IMF, 2021a, "Investment Funds and Financial Stability: Policy Considerations", Monetary and Capital Markets Department Paper, DP/2021/018.

IMF, 2021b, "Asset Purchases and Direct Financing: Guiding Principles for Emerging Markets and Developing Economies During Covid-19 and Beyond", Monetary and Capital Markets Department Paper, DP/2021/023.

IMF and World Bank, 2021, "Guidance Note for Developing Government Local Currency Bond Markets", March.

IOSCO, 2022, Investment Funds Statistics Report

Jin, Kacperczyk, Kahraman and Suntheim, 2021, "Swing Pricing and Fragility in Open-end Mutual Funds", The Review of Financial Studies

King, Nesmith, Paulson and Prono, 2020, "Central Clearing and Systemic Liquidity Risk", Board of Governors of the Federal Reserve System Finance and Economics Discussion Series, January,

Lepers and Mercado, 2021, "Sectoral capital flows: Covariates, co-movements, and controls", Journal of International Financial Markets, Institutions and Money, Vol 75, November.

Lewrick and Claessens, 2021, "Open-ended Bond Funds: Systemic Risks and Policy Implications", BIS Quarterly Review, December.

Lewrick and Schanz, 2017, "Is the price right? Swing pricing and investor redemptions", BIS Working Papers 664, October

McGuire, Shim, Shin and Sushko, 2021, "Outward Portfolio Investment and Dollar Funding in Emerging Asia", BIS Quarterly Review, December.

Miyajima and Shim, 2014, "Asset Managers in Emerging Market Economies", BIS Quarterly Review, September.

Miyajima, Mohanty and Chan, 2012, "Emerging Market Local Currency Bonds: Diversification and Stability", BIS Working Papers, No 391.

Moro and Schiavone, (forthcoming), "The Role of Non-Bank Financial Institutions in the Intermediation of Capital Flows to Emerging Markets", Banca d'Italia Working Paper.

Raddatz, Schmukler and Williams, 2017, "International Asset Allocations and Capital Flows: The Benchmark Effect", Journal of International Economics, Vol 108, pp 413-30, September.

Schrimpf, Shim and Shin, 2021, "Liquidity Management and Asset Sales by Bond Funds in the Face of Investor Redemptions in March 2020", BIS Bulletin, No. 39, March.

Schrimpf, Shin and Sushko, 2020, "Leverage and Margin Spirals in Fixed Income Markets During the Covid-19 Crisis", BIS Bulletin, No. 2, April.

Seidner, Cantrill, Chan and Wilding, 2021, "Lessons from the March 2020 Market Turmoil", PIMCO Insights, February.

Tobal, 2018, "Currency Mismatch in the Banking Sector in Latin America and the Caribbean", International Journal of Central Banking, vol 14(1), January.

Abbreviations

AE	Advanced Economy
BIS	Bank for International Settlements
CCB	Cross-Currency Basis
EM	Emerging Market
EME	Emerging Market Economy
ETF	Exchange Traded Fund
FSB	Financial Stability Board
GFC	2008-9 Global Financial Crisis
FX	Foreign exchange
IMF	International Monetary Fund
LIBOR	London Interbank Offered Rate
MMF	Money Market Fund
NBFIs	Non-Bank Financial Intermediaries
NFC	Non-Financial Corporates
OEF	Open-Ended Fund
OPEC	Organization of the Petroleum Exporting Countries
OIS	Overnight Index Swap
USD	US dollar
WGBI	World Government Bond Index
WHO	World Health Organisation