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# Macro-financial stability frameworks: experience and challenges<sup>1</sup>

Claudio Borio, Ilhyock Shim and Hyun Song Shin<sup>2</sup>

## Abstract

Since the 2008–9 Great Financial Crisis, major advanced economies (AEs) have used monetary and macroprudential policies to achieve macroeconomic and financial stability. Emerging market economies (EMEs) have, in addition, combined interest rate tools with FX intervention, macroprudential policy and, sometimes, capital flow management measures (CFMs) to address the challenges from capital flow and exchange rate volatility. This paper provides an overview of the use of monetary, macroprudential and exchange rate policies, sometimes alongside CFMs, both in AEs and EMEs. It also assesses the extent to which the use of these policies constitutes a holistic macro-financial stability framework (MFSF). We reach three conclusions. First, combining tools has succeeded in improving policy trade-offs, notably by mitigating the risks to domestic stability arising from external influences. Second, a holistic MFSF is still a work in progress. Finally, more efforts need to be made to better understand the channels of international spillovers and spillbacks.

Keywords: capital flow, exchange rate policy, macro-financial stability framework, macroprudential measure, monetary policy.

JEL classification: E44, E52, F38, G28.

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## Introduction

Macro stabilisation policy since at least the Great Financial Crisis (GFC) of 2008–9 has increasingly emphasised the importance of a macroprudential orientation in policy frameworks. The term “macroprudential” originated from and was then largely developed at the Bank for International Settlements (BIS).<sup>3</sup> In his seminal paper, Crockett (2000) defines macroprudential perspectives and dimensions of financial stability. Major advanced economies (AEs) have expanded their policy toolkit to achieve their goals of macroeconomic and financial stability, in part driven by the need to use macroprudential tools to offset some of the side-effects of unusually strong and prolonged monetary easing. Meanwhile, emerging market economies (EMEs) have been exposed to larger swings in capital flows and exchange rates, reflecting in part those monetary policy settings.

A special chapter in the 2019 BIS Annual Economic Report builds on these themes, but from an EME perspective by focusing on the monetary policy frameworks in EMEs that incorporate a financial stability orientation on top of the traditional focus on inflation targeting with flexible exchange rates (BIS (2019)). It notes that practice has moved ahead of theory – akin to the way advanced open economies had adopted inflation targeting in the early 1990s. It explains why and how EMEs have combined conventional interest rate tools with FX intervention, macroprudential policy and, in some cases, capital flow management measures (CFMs) to better address the challenges raised by capital flows and associated exchange rate fluctuations.<sup>4</sup> The IMF has made related efforts to develop so called integrated policy frameworks (Adrian and Gopinath (2020) and IMF (2020)).

Against this backdrop, the objective of this paper is twofold. First, it is to provide an overview of the use of monetary, macroprudential and exchange rate policies, sometimes alongside CFMs, both in EMEs and AEs. Particular attention is paid to policies that aim to moderate the impact of external financial conditions and to the effectiveness of macroprudential tools – the most novel set of instruments. Second, it is to assess the extent to which the use of these various policies constitutes a *holistic* macro-financial stability framework (MFSF),<sup>5</sup> rather than a collection of disparate policy tools. The concept of a MFSF has a long history at the BIS, since the mid-2000s. Chapter VIII of BIS Annual Report 2008 stresses that such a comprehensive framework is needed to address the inherent procyclicality of the financial system, domestically and internationally, so as to better reconcile price with financial, and hence macroeconomic, stability.<sup>6</sup>

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<sup>3</sup> For a discussion of the evolution of the “macroprudential” concept, see Clement (2010) and Baker (2020).

<sup>4</sup> The G20 Eminent Persons’ Group report published in October 2018 prominently mentioned macro-financial stability. In particular, the report recommended that receiving countries assess the impact of global factors affecting capital flows to EMEs and policy options available to EMEs in maintaining macro-financial stability when faced with such challenges. It also recommended that sending countries develop a policy framework that enables sending countries to adopt policies to meet their domestic objectives while avoiding large adverse spillovers to receiving countries.

<sup>5</sup> A MFSF covers the joint operation of monetary (including FX intervention), micro/macroprudential and fiscal policies to stabilise the economy, based on solid foundations ensured by structural policies (Borio (2018)). While the original concept of a MFSF does not include CFMs, in this chapter we consider them as well given their prominence in certain asset classes, as a complement to other policies designed to address the influence of external financial conditions.

<sup>6</sup> For a comprehensive discussion of the procyclicality of the financial system, see Borio et al (2001).

We reach three main conclusions. First, combining tools has succeeded in improving policy trade-offs. In particular, EMEs have benefited from the joint use of the various policies to mitigate successfully the risks to domestic stability arising from external influences.

Second, a holistic MFSF is still a work in progress (Borio (2014)). A number of challenges stand out. Fiscal policy has not been properly integrated so far. There is still a lot of controversy over the role of monetary policy in relation to macroprudential policy. Operationally, the different frequencies of business, domestic and global financial cycles set limits to the realistic degree of integration of the various policies. And analytical tools still have some way to catch up with practice so as to better support policy.<sup>7</sup>

Finally, taking a global perspective, more still needs to be done both to understand better the channels of international spillovers and spillbacks and to incorporate them into a holistic MFSF. Global financial conditions can sometimes transcend balance of payment boundaries and the nomenclature of “sending” countries and “recipient” countries. The currency dimension looms large in this context, as exchange rate movements have real economy impact through changes in external financial conditions that affect domestic outcomes. These channels of transmission mean that the traditional current account-based narratives of adjustment need to be complemented with broader global overlays of risk-taking and financial conditions.

The structure of this paper is as follows. The first section describes the economic backdrop, explaining why the evolution of the global economy has heightened the need for a MFSF and putting the various issues in perspective. The second describes the deployment of macroprudential policies and CFMs. The third discusses the combination of policies in AEs and EMEs, focusing on that of macroprudential and monetary policies in AEs and on how to address capital flows and exchange rate fluctuations in EMEs. The fourth section considers the impact of exchange rate fluctuations on foreign investors’ purchase of EME government bonds. The fifth section reviews the evidence on the effectiveness of the measures. Finally, the sixth section discusses the challenges outstanding.

## 1. A MFSF: why its increasing relevance?

The task of macroeconomic policy has always been to stabilise economic fluctuations and ensure low inflation. For much of the post-war period, the main concern was how to address inflation. But starting around the mid-1980s, financial instability became an increasingly important concern. In this context, financial instability should not just be interpreted narrowly as banking and financial crises, but more broadly as the major financial amplification of business fluctuations. Put differently, if until the mid-1980s it was sufficient to talk about “macroeconomic stability frameworks”, since then it has been hard not to add the qualification “financial” to “stability”. Since then, both price and financial stability have been necessary conditions for macroeconomic stability.

The reason for this evolution has been a number of far-reaching changes in the nature of business fluctuations (Graph 1). Until the mid-1980s, the typical recession reflected tighter monetary policy to fight rising inflation. Since then, by and large,

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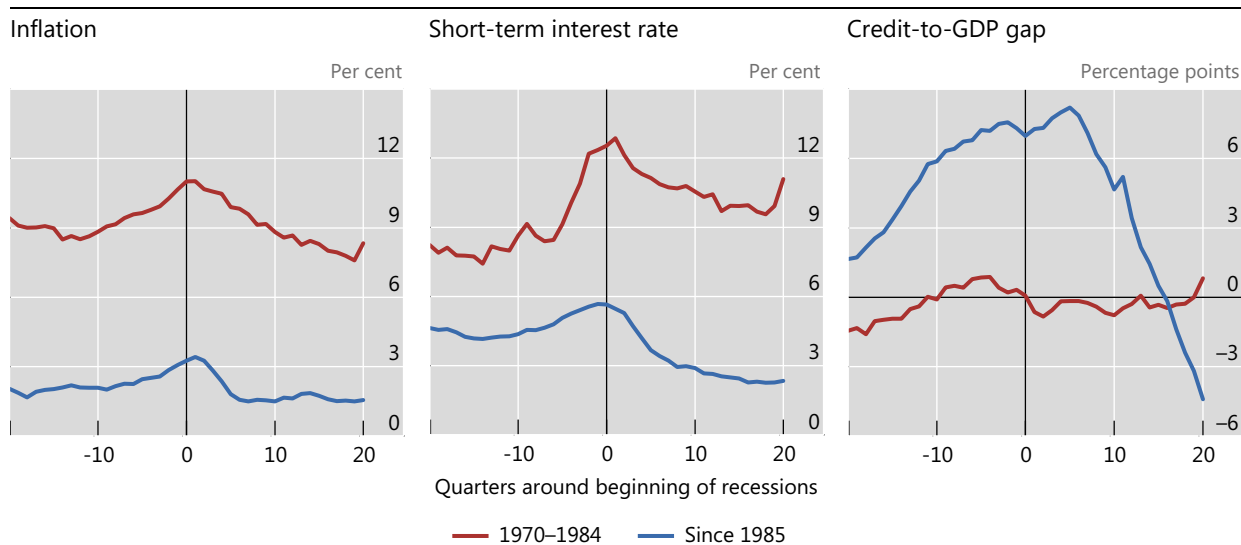
<sup>7</sup> An important aspect of a holistic MFSF is macro-financial linkages, that is, the two-way interactions between the real economy and the financial sector. Claessens and Kose (2018) provide a systematic review of the literature on macro-financial linkages.

inflation has been low and stable, and recessions have been ushered in by the build-up and unwinding of financial imbalances – proxied by the behaviour of the credit gap (the deviation of the credit-to-GDP ratio from a slow-moving trend) in Graph 1. Even in those EMEs that have faced inflationary conditions, the most serious contractions have been greatly amplified by financial forces, both internal and external. Hence, there have been a succession of banking crises, including those in Latin America in the early 1980s and mid-1990s; the Nordic and Japanese crises in the late 1980s and early 1990s; the Asian financial crisis in 1997, and the GFC in 2007–8. Obviously, the most recent pandemic-induced recession is *sui generis*, as it reflects non-economic, exogenous factors.

## The changing nature of the business cycle<sup>1</sup>

Average of the variables indicated over the selected periods

Graph 1



<sup>1</sup> The horizontal axis denotes quarters around recessions in the business cycles, with the peak date set at zero (vertical lines). Lines show the median evolution across 16 advanced economies and events from 1985 to 2017. 16 advanced economies are Australia, Belgium\*, Canada, Finland\*, France, Germany, Ireland\*, Italy, Japan, Netherlands\*, Norway\*, Spain, Sweden, Switzerland, the United Kingdom and the United States. For countries denoted with \*, business cycles are dated with a business cycle-dating algorithm. The recession dates are taken from the National Bureau of Economic Research or the Economic Cycle Research Institute.

Sources: National data; adapted from Graph 2 in Borio, Drehmann and Xia (2018); authors' calculations.

Two structural factors have arguably played a key role in the evolution of the business cycle. First and foremost, financial liberalisation, domestic and international – across borders and currencies. This has provided much greater scope for financial forces to play a role, typically in the form of self-reinforcing interactions between funding constraints, risk-taking and asset prices, within and across economies. Second, the conquest of inflation, as a result of a mix of more disciplined monetary policy and real-side structural factors, such as globalisation and technology.

Financial factors have been playing a growing role both domestically and internationally. Hence there have been efforts to capture their most important features in a parsimonious way.

Domestically, a popular notion has been that of the *domestic financial cycle*.<sup>8</sup> This denotes the joint expansions and contractions in credit and asset prices that tend to amplify business fluctuations. The measure that has been found to be most useful in this context combines increases in credit and property prices. There is agreement that

<sup>8</sup> For a comprehensive discussion of the domestic financial cycle and its properties, see Borio (2014).

the financial cycle tends to be longer than the business cycle, traditionally measured as 14–18 years rather than up to 8 years (Graph 2, left-hand panel). Banking crises, and the deepest recessions, tend to occur close to the peak of the cycle.<sup>9</sup> And recent empirical evidence indicates that financial cycle proxies tend to be among the best predictors of recessions across both AEs and EMEs (eg, Borio et al (2021)).

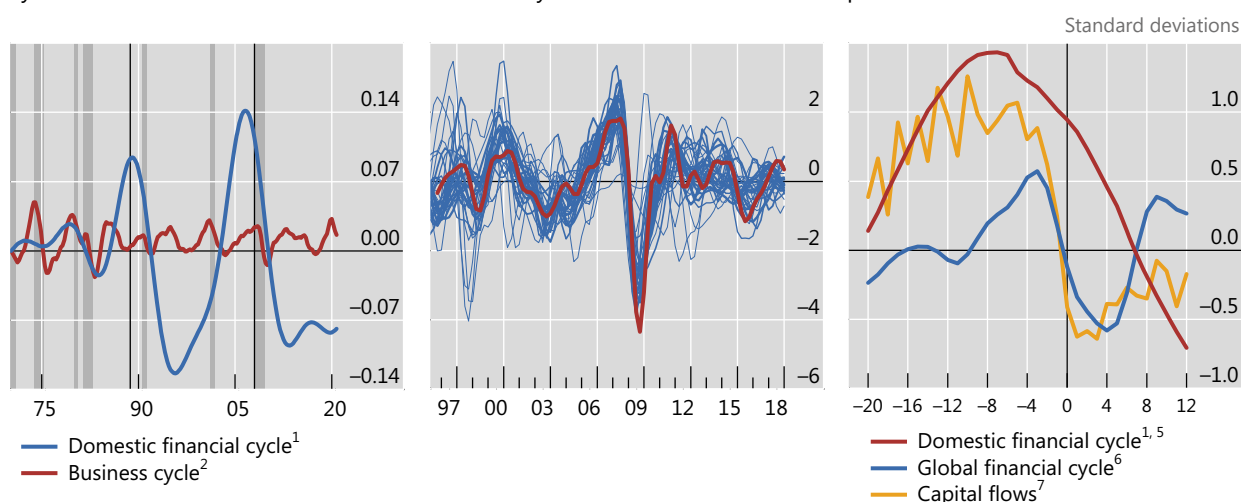
Business cycles, domestic financial cycles and global financial cycles

Graph 2

The domestic financial and business cycles in the United States

Global financial cycle moves with business cycles<sup>3</sup>

Financial cycles and capital flows peak ahead of crises<sup>4</sup>



The shaded areas in the left-hand panel indicate recessions; the solid black lines indicate the start of a banking crisis as defined by Laeven and Valencia (2018).

<sup>1</sup> The domestic financial cycle as measured by a bandpass filter capturing medium-term cycles in real credit, the credit-to-GDP ratio and real house prices. <sup>2</sup> The business cycle as measured by a bandpass filter capturing fluctuations in real GDP over a possible window from one to eight years. <sup>3</sup> The red line is a composite global financial factor from Aldasoro et al (2020) based on a large cross section of asset prices and gross capital flows. The blue lines are individual business cycles of 29 countries. Both sets of lines are constructed based on a bandpass filter capturing fluctuations over a possible window from 5 to 32 quarters. The global financial factor is lagged by two quarters. <sup>4</sup> The horizontal axis denotes quarters around crises, with the start date set at zero (vertical lines). The average of the relevant variable is taken at the specific quarter across all crisis episodes available for the respective indicators. <sup>5</sup> Normalised by country-specific mean and standard deviation. <sup>6</sup> The composite global factor combines the price-based global financial factor of Miranda-Agrippino and Rey (2015) with a quantity-based factor based on total external flows to 31 countries. <sup>7</sup> Gross capital inflows, scaled by GDP, normalised by country-specific mean and standard deviation.

Sources: IMF, *Balance of Payments*; Aldasoro et al (2020); S Miranda-Agrippino and H Rey, "US Monetary Policy and the Global Financial Cycle", *NBER Working Papers*, no 21722, November 2015; national data; authors' calculations.

Internationally, ebbs and flows in capital and the associated fluctuations in exchange rates have been the focus of much academic and policy work. Terms such as sudden stops (Calvo (1996)) or capital flow bonanzas (Reinhart and Reinhart (2008)) have become very popular in the literature. More recently, the concept of a *global financial cycle* has gained prominence as a summary measure of global financial conditions (see, eg, Scheubel et al (2019)).<sup>10</sup> In all of these characterisations, the main force behind capital flows has been "push" factors, of a global nature and largely driven by US policy, given the unchallenged supremacy of the US dollar as an international currency.

While quite distinct, the domestic and global financial cycles are related (Aldasoro et al (2020)). They are distinct in so far as they involve only a partly overlapping set of

<sup>9</sup> There is a large literature showing that financial-cycle proxies are among the most reliable leading indicators of banking crises; eg Borio and Drehmann (2009), Gourinchas and Obstfeld (2011) and Schularick et al (2012).

<sup>10</sup> Rey (2013) has used the term and measured it based on asset prices only; see Aldasoro et al (2020) for a detailed comparison of the notions of the two cycles, domestic and global.

asset prices and quantities, but also because they evolve at different frequencies: high-frequency risk-on/risk-off phases aside, the global financial cycle tends to evolve at business cycle frequencies and co-moves with them (Graph 2, centre panel). That said, the two cycles tend to come together around crises and big recessions (right-hand panel). This has implications for the degree and shape of the integration of the various policies that make up a MFSF (see below).

Regardless of whether the global financial cycle is considered a useful summary measure,<sup>11</sup> the channels through which external influences have made themselves felt on domestic financial conditions have changed over time. Three developments merit particular attention, notably as regards EMEs. First, at least ever since the Asian financial crisis, a shift from foreign currency to local currency borrowing in EMEs (see, eg, Hofmann et al (2020a)). The shift has affected mainly governments and far less the corporate sector. Second, especially since the GFC, a move away from bank credit to market-based financing – what has been termed the “second phase of global liquidity” (Shin (2013)). Third, and closely related, a growing participation of foreign investors in domestic currency bond markets, with their investments largely on an unhedged basis in order to enhance yield – a form of carry trade (Avdjiev et al (2018)).

These shifts have affected, in particular, the role of the exchange rate as an amplifying mechanism through currency mismatches. Simply put, mismatches have tended to migrate from *borrowers’* to *investors’* balance sheets – what has been referred to as a shift from “original sin” to “original sin redux”.<sup>12</sup> As a result, while the development of local currency bond markets has helped shield EMEs from the ebbs and flows of global financial conditions, it has not insulated them altogether. Increases in local currency bond yields and domestic currency exchange rate depreciations tend to go hand-in-hand when financial conditions tighten. This means that investors incur a double whammy, which can in turn amplify their retrenchment. All these have highlighted further the role of the US dollar as a global risk factor for EMEs, operating through not just borrowers’ but also investors’ balance sheets.<sup>13</sup>

The growing relevance of domestic and external financial factors explains the evolution of policy frameworks. Domestically, central banks have increasingly complemented monetary policy with macroprudential tools as a means of better reconciling the pursuit of price and financial stability over longer horizons, and better handling the intertemporal trade-offs involved. Externally, central banks have increasingly resorted to FX intervention and, occasionally, to CFMs to achieve the same goals. Here, FX intervention can play a dual, quasi-macroprudential role (BIS (2018)). FX accumulation during capital flow surges builds up buffers for use when the tide turns. And, by relieving some of the pressure to reduce interest rates in order to contain the currency appreciation, it can dampen the corresponding easing of domestic financial conditions (Borio (2014)).

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<sup>11</sup> For a sceptical view, see Cerutti et al (2019).

<sup>12</sup> The term “original sin redux” was coined by Carstens and Shin (2019).

<sup>13</sup> The discussion highlights another insight that sheds light on MFSF – the need to shift the focus from net financial flows (eg, the current account) to gross financial flows and balance sheets (Adrian and Shin (2010), Borio and Disyatat (2011), Lane and Milesi-Ferretti (2001) and Obstfeld (2010), following in the early footsteps of Kindleberger (1956)). This is the natural result of shifting attention from inflation and traditional macro-stabilisation to financial stability. Moreover, the focus transcends the “triple coincidence of the unit of analysis, decision-making unit and currency area”, as firms and currencies straddle borders in a globalised world (Avdjiev, McCauley and Shin (2016)). It is only in the context of interlocking and multiple-currency balance sheets that such behaviour and risks can be properly assessed.



Beyond common elements, there are substantial differences in the deployment of tools across countries. All have been increasingly relying on macroprudential measures. But the role of FX intervention, let alone CFMs, differs markedly. In AEs, FX intervention has been employed more sparingly and only largely to offset the impact on inflation and output of exchange rate pass-through to prices and exports. In EMEs, the impact of capital flows and exchange rate fluctuations on domestic financial conditions – the financial channel – has played an important role. This partly reflects structural differences in financial systems, as those in EMEs are not as developed and hedging opportunities there are more limited. Moreover, even EMEs themselves differ individually in terms of the extent to which they rely on FX intervention and CFMs. Beyond country-specific structural and institutional features, this reflects different views concerning the merits of floating exchange rates (BIS (2020, 2021)).

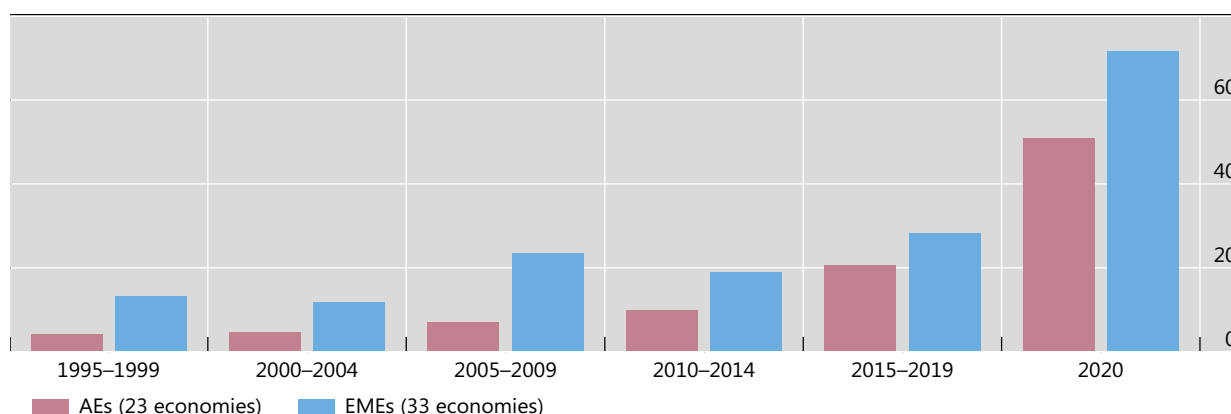
## 2. MFSFs: deployment of macroprudential and capital flow management measures

By far, the most distinctive new tool in the policy toolkit used to reconcile price and financial stability has been macroprudential measures.<sup>14</sup> Their use has grown rapidly in AEs and EMEs alike (Graph 3).<sup>15</sup> Many EMEs have also used CFMs to deal with challenges from excessive capital flow volatility. In this section, we provide an overview of macroprudential measures deployed by AEs and EMEs over 1995–2020 and also a summary of CFMs taken in 2000–19 by nine EMEs.<sup>16</sup>

### Increased use of macroprudential measures

Average number of actions per year per 10 countries

Graph 3



Sources: Budnik and Kleibl (2018); Reinhart and Sowerbutts (2016); Shim et al (2013); FSB Covid-19 policy action database; IMF, Integrated Macroprudential Policy (iMaPP) Database, originally constructed by Alam et al (2019); national data; authors' calculations.

<sup>14</sup> To be sure, many of these measures had been used in the past *before* being termed “macroprudential”. In fact, some harked back to the credit controls popular in the 1960s and 1970s, during the era of financial repression and when central banks paid more attention to credit aggregates. That said, their deployment as part of a more systematic effort to address *financial* stability is of more recent vintage.

<sup>15</sup> The sample includes 56 economies, of which 33 are EMEs and 23 AEs, since 1995. It covers a total of 1,502 macroprudential measures as well as 913 additional monetary or regulatory measures seemingly used from a macroprudential perspective (eg, reserve requirements intended to restrain credit expansion). In this second case, of course, the line is blurred.

<sup>16</sup> Country experiences in deploying macro-financial policy tools in the nine EMEs were presented at the Asian Monetary Policy Forum 2021 Special Edition and MAS-BIS conference held in May 2021.

## 2.1. Experience of using macroprudential measures between 1995 and 2020

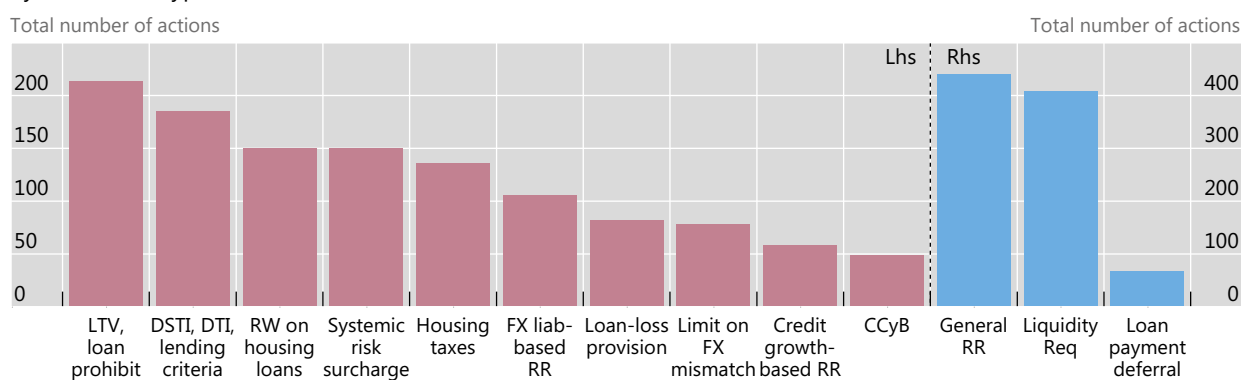
Graph 4 provides an overview of how 56 AEs and EMEs used macroprudential measures targeting different types of credit between 1995 and 2020. Among different types of monetary, prudential and fiscal instruments, “loan-to-value (LTV) limits and loan prohibitions” and “debt service-to-income (DSTI) limits, debt-to-income (DTI) limits and other lending criteria” targeting housing, consumer or household credit were used most frequently by the 56 economies over the sample period (Graph 4, upper panel). The sample economies also frequently used “non-cyclical (structural) systemic risk capital surcharges (such as domestic systemically important bank surcharges, other systemically important institution surcharges and systemic risk buffers)”, “risk weights on housing or consumer loans” and “housing-related taxes”.

### Use of macroprudential measures by 56 advanced and emerging market economies

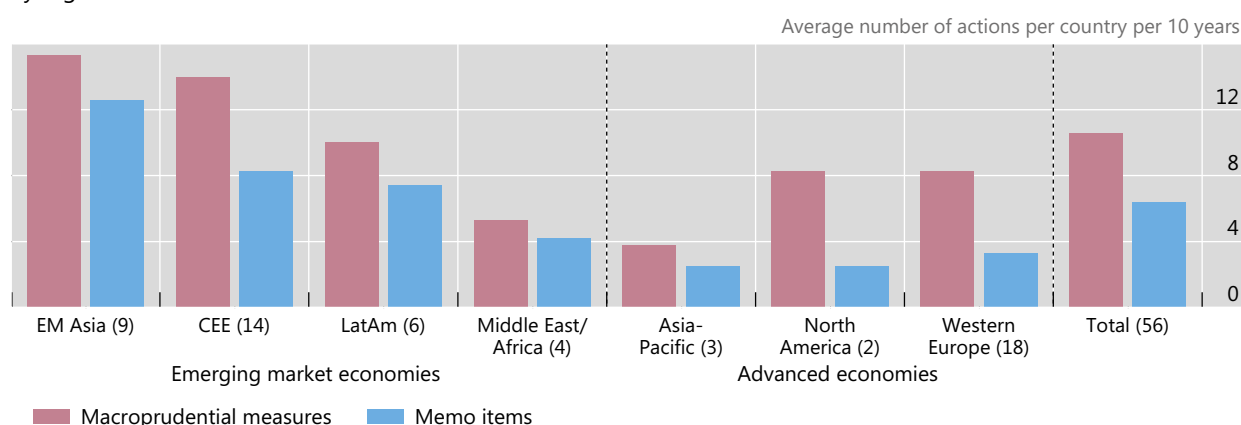
Number of policy actions, January 1995–December 2020

Graph 4

By instrument type<sup>1</sup>



By region<sup>2</sup>



<sup>1</sup> LTV means the maximum loan-to-value ratio. DSTI means the maximum debt service-to-income ratio. DTI means the maximum debt-to-income ratio. Systemic risk surcharges are non-cyclical (structural) systemic risk capital surcharges such as domestic systemically important bank surcharge, other systemically important institution surcharge and systemic risk buffers. RR means reserve requirements. CCyB means countercyclical capital buffer. Liquidity requirements include the minimum liquidity coverage ratio, the minimum net stable funding ratio, the minimum liquid asset ratio and the maximum loan-to-deposit ratio. <sup>2</sup> The figures in brackets on the horizontal axis indicate the number of economies in each region.

Sources: Budnik and Kleibl (2018); Reinhardt and Sowerbutts (2016); Shim et al (2013); FSB Covid-19 policy action database; IMF, Integrated Macroprudential Policy (iMaPP) Database, originally constructed by Alam et al (2019); national data; authors' calculations.

Overall, EMEs were more active in using macroprudential measures than AEs. Among the EMEs, 14 central and eastern European countries took the largest number of policy measures during 1995–2020, followed by nine emerging Asian economies.

However, when we calculate the average number of macroprudential actions per country per 10 years, nine emerging Asian economies were the most active users of macroprudential tools among the seven AE and EME regions, followed by central and eastern European countries and Latin American countries (Graph 4, lower panel). Among AEs, western European countries were the most active users in terms of both the total number of actions and the average number of actions per country per 10 years.

There are also regional differences in preferred instruments. Latin American economies relied mostly on reserve requirements targeting general credit or FX-denominated loans, partly because many central banks in the region did not have the power to adjust prudential instruments. By contrast, emerging Asian economies actively deployed prudential tools targeting housing, consumer or household loans such as LTV and DSTI limits, risk weights and loan-loss provisioning rules. Central and eastern European economies were more balanced in their use of macroprudential instruments. Among AEs, western European countries relied predominantly on prudential tools, especially on capital requirements such as systemic risk capital surcharges and other surcharges, risk weights on specific types of loans and countercyclical capital buffers. Finally, one key difference between AEs and EMEs in the use of macroprudential instruments is that EMEs used various FX-related instruments (such as FX-denominated liability-based reserve requirements, limits on currency mismatch, FX positions and FX-denominated loans, and FX liquidity requirements), while AEs rarely used such instruments.

Now we consider how frequently the macroprudential measures were used over the 26 years. Graph 3 shows that both AEs and EMEs steadily increased their use of macroprudential measures between 1995 and 2019. During the period, EMEs took more actions per year than AEs, but the gap became smaller over time and reached a comparable level in 2015–19. Facing unprecedented shocks in 2020 due to the Covid-19 pandemic, both AEs and EMEs deployed a wide range of policy instruments to prop up credit provision to and reduce the burden of households, firms and the financial sector. As a result, both AEs and EMEs took more than twice the number of macroprudential actions per year in 2020, than during the period of 2015–19.<sup>17</sup>

Graph 5 shows how the 56 AEs and EMEs took tightening and loosening actions over the cycles between 1995 and 2020. During normal times, and especially in the run-up to the GFC as well as between the GFC and the Covid-19 crisis, the sample economies took far more tightening actions than loosening ones. By contrast, during crisis years such as the Asian financial crisis in 1997, the GFC in 2008–9, and the Covid-19 crisis in 2020, both AEs and EMEs took more loosening actions than tightening actions to support economic recovery. It should be noted that, as shown in Graph 3, the surge in tightening actions between 2015 and 2019 is mainly explained by the implementation of capital requirements by both AEs and EMEs, in line with Basel III rules such as capital surcharges on domestic systemically important banks (D-SIBs) and countercyclical capital buffers. Most economies loosened such capital requirements in 2020, when faced with the Covid-19 shock.

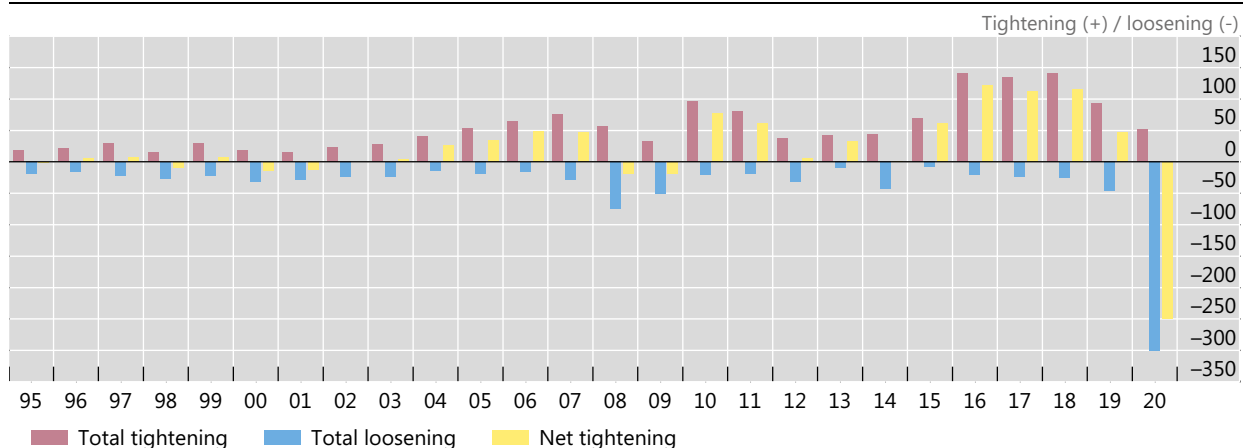
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<sup>17</sup> Notably, almost all economies covered in the sample introduced temporary loan payment deferral/suspension or moratorium in March–May 2020, to support the household and corporate sectors during the Covid-19 crisis. Box 1 provides a more detailed analysis on various types of policy measures introduced after the outbreak of the Covid-19 pandemic.

## Tightening and loosening actions over time

Number of macroprudential policy actions by 56 advanced and emerging market economies

Graph 5



Sources: Budnik and Kleibl (2018); Reinhardt and Sowerbutts (2016); Shim et al (2013); FSB Covid-19 policy action database; IMF, Integrated Macroprudential Policy (iMaPP) Database, originally constructed by Alam et al (2019); national data; authors' calculations.

## 2.2. Experience of selected EMEs using CFMs between 2000 and 2019

In addition to macroprudential measures, many EMEs used CFMs targeting banking, bond, equity, real estate, direct investment and other flows. Some AEs such as Australia and Canada also used CFMs targeting real estate flows. In this section, we focus on CFMs used by the following nine EMEs whose country experiences were presented at the Asian Monetary Policy Forum 2021 Special Edition and MAS-BIS conference held in May 2021: China, Hong Kong SAR, India, Indonesia, Korea, Singapore; Brazil, Mexico; and Croatia. Among the 653 CFMs taken by the nine economies, 61% (399 actions) targeted residents, 32% (207 actions) non-residents, and 7% (47 actions) both residents and non-residents.

Table 1 gives an overview of the use of CFMs by the nine EMEs between 2000 and 2019 in terms of the direction of target flows (inflows versus outflows) and the direction of actions (tightening or loosening), and thus their overall impact on domestic credit (decrease or increase credit). The number of CFMs loosening inflows and that of CFMs tightening inflows are more or less balanced in most economies. One exception is India which continuously liberalised its banking and portfolio inflows over the past two decades. As a result, over the sample period, India deployed five times more actions of loosening capital inflows than those of tightening capital inflows (that is, 24 CFMs tightening inflows vs 124 CFMs loosening inflows). A few other economies also exhibited some imbalances between tightening and loosening actions. In particular, Croatia used more CFMs loosening inflows than those tightening inflows, partly because of its accession to the euro area and the resulting liberalisation of various restrictions on capital accounts. By contrast, Hong Kong SAR and Singapore took more CFMs tightening inflows (mostly real estate inflows by using housing-related taxes) than those loosening inflows, mainly out of their concerns over too much foreign capital flowing into their property markets. Finally, we observe far more actions of loosening capital outflows than of tightening them, mainly because many of these EMEs were in the process of liberalising capital account restrictions on residents' outflows over the sample period.

Capital flow management measures taken by nine selected EMEs, 2000–19

Table 1

	CN	HK	IN	ID	KR	SG	BR	MX	HR	Total <sup>1</sup>
Total number of CFMs	129	10	212	31	84	8	72	18	69	633
Decrease domestic credit	78	7	80	21	61	8	41	7	30	333
Tightening inflows	36	7	24	17	28	7	31	5	17	172
Loosening outflows	42	0	56	4	33	1	10	2	13	161
Increase domestic credit	51	3	132	10	23	0	31	11	39	300
Loosening inflows	46	3	124	7	23	0	22	8	32	265
Tightening outflows	5	0	8	3	0	0	9	3	7	35

<sup>1</sup> Among the 653 actions in the dataset, 20 actions affect both capital inflows and outflows at the same time. Since it is difficult to classify these actions in terms of tightening or loosening flows, we do not include them in this table.

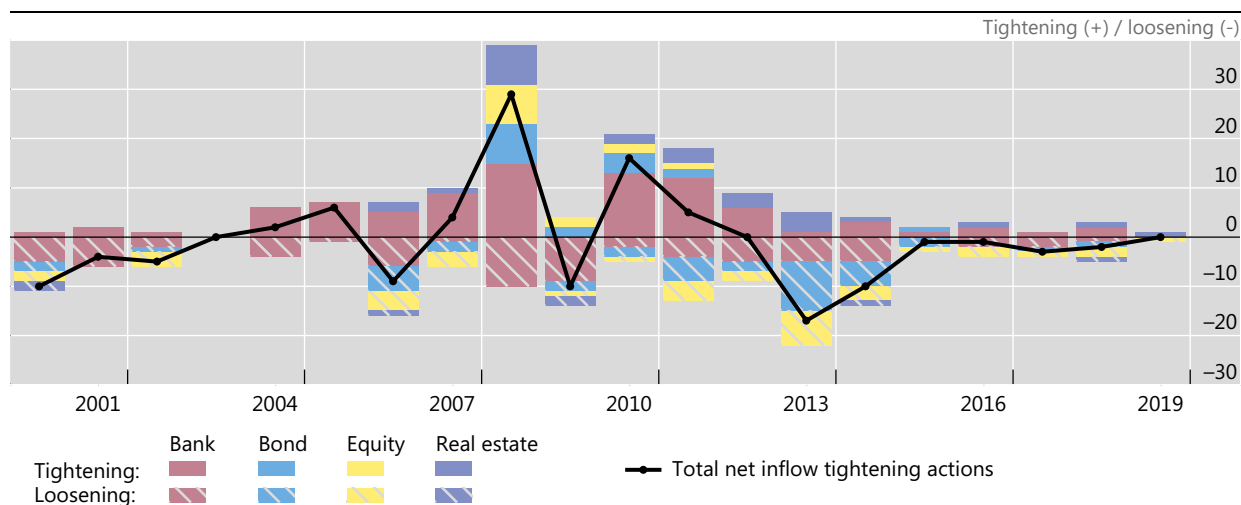
Sources: CFM database in Chantapacdepong and Shim (2015); IMF, Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) 2001–19; national sources; authors' calculations.

Now, we focus on how the EMEs used financial stability-motivated (that is, countercyclical) CFMs between 2000 and 2019. In particular, we consider 298 CFMs aiming to tighten or loosen banking, bond, equity and real estate inflows from foreign banks and investors, to EMEs. Here, we consider eight EMEs excluding India since most of the CFMs taken by India were motivated by structural reasons such as capital account liberalisation. The black line in Graph 6 shows that the eight EMEs on net took policy actions to tighten banking and real estate inflows in the years leading up to the GFC (from 2004 to 2008), and then loosened them in 2009 after the GFC. Between 2010 and 2012, facing strong capital flows from AEs, EMEs on net tightened CFMs, before they loosened the measures in 2013 and 2014 during and after the taper tantrum. Such patterns of tightening and loosening actions match well with capital flow and exchange rate dynamics and the incidence of crises: EMEs on net tightened CFMs during strong capital inflow periods and loosened them during strong capital outflow periods, generally in a countercyclical manner.

## Financial stability-motivated CFMs: tightenings and loosening

Number of CFM measures on capital inflows by eight selected EMEs

Graph 6



EMEs = BR, CN, HK, HR, ID, KR, MX and SG.

Sources: CFM database in Chantapacdepong and Shim (2015); IMF, Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) 2001–19; national sources; authors' calculations.

Finally, in terms of the types of instruments, we can broadly classify instruments used for CFMs into the following four categories: (1) quantitative limits, (2) qualitative restrictions, (3) taxes, and (4) minimum holding periods. Around half of CFMs in our database involve quantitative limits on capital inflows or outflows, while around two-fifths of CFMs involve qualitative changes such as allowing certain types of investors to enter certain segments of markets. In addition, jurisdictions such as Brazil, Hong Kong SAR, India, Indonesia, Korea and Singapore imposed or adjusted taxes on financial transactions involving borrowing from non-residents or foreign investment in domestic financial assets and real estate. Finally, countries such as China, India and Indonesia tightened or loosened minimum holding period requirements for foreign investment in domestic bonds, equities and real estate as well as minimum maturity requirements for external borrowing by residents.

### 3. MFSFs in practice

#### 3.1. Combining monetary policy and macroprudential measures in AEs

In this section, we investigate how AEs have jointly used monetary and macroprudential policies. In particular, we focus on how several major AEs kept monetary policy loose and tightened macroprudential policy between the GFC and the Covid-19 crisis in early 2020,<sup>18</sup> and show how macroprudential buffers built up since 2015 paid off in 2020.

Graph 7 shows the policy rates, long-term government bond yields as a proxy for quantitative easing policy, and the use of macroprudential measures for the United States, four selected Eurozone countries, Japan, the United Kingdom and Canada. We find that most major AEs kept monetary policy loose or continued to loosen their monetary policy after 2010, while generally tightening macroprudential policy. Such a policy mix by AEs is in line with the situation highlighted in Borio and Shim (2007) who stress that when the scope for monetary policy to lean against the build-up of financial imbalances is constrained by the backdrop of low and stable inflation, macroprudential measures designed to restrain the build-up of such imbalances can make the financial system better able to withstand the unwinding of the imbalances. It should be noted that macroprudential measures taken by AEs during this period consist mainly of structural systemic risk-related capital buffers and housing credit/market targeting measures such as LTV and DSTI limits.

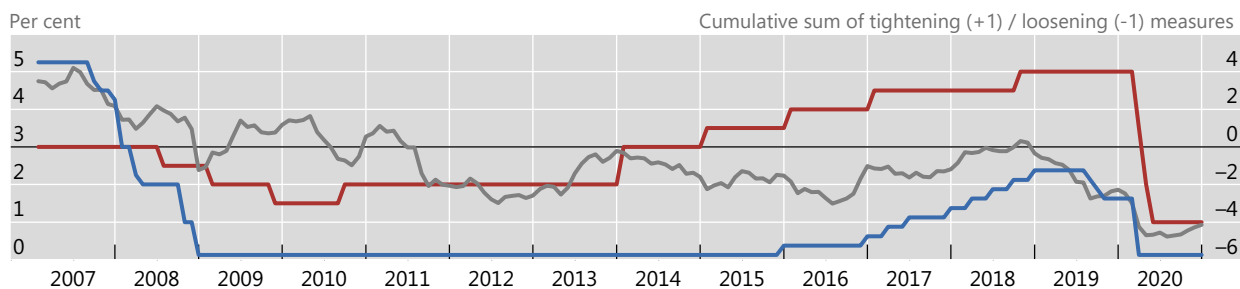
A relevant issue for AEs is how far they should use monetary policy to deal with domestic financial imbalances, rather than relying exclusively on macroprudential measures. During the period of low interest rates and gradual economic recovery, major AEs kept their monetary policy loose and tightened macroprudential policy to avoid building up financial imbalances. By contrast, when they faced a severe financial or real shock such as the GFC in 2008–9 or the Covid-19 crisis in 2020, major AEs found greater value from jointly loosening monetary and macroprudential policies. More generally, when the business and financial cycles coincide, AEs are more inclined to tighten or loosen monetary and macroprudential policies at the same time, in the same direction.

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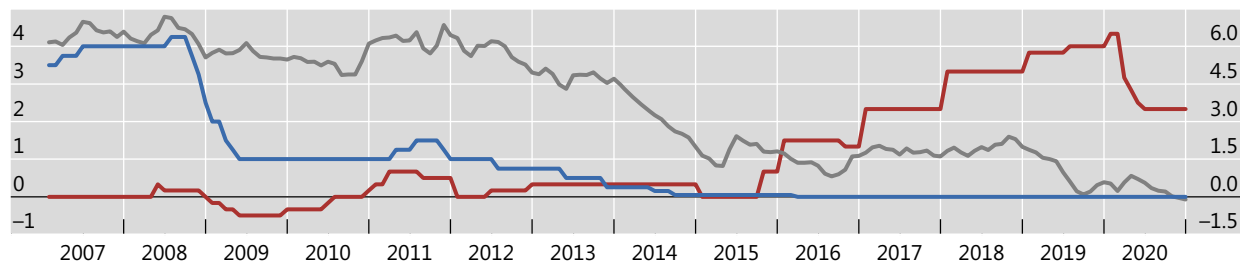
<sup>18</sup> Facing strong foreign investor inflows to their domestic real estate markets, AEs such as Canada also used tax measures targeting foreign investors. In this section, we focus on AEs' use of domestically oriented macroprudential measures.

Policy rates, long-term yields and macroprudential measures in advanced economies Graph 7

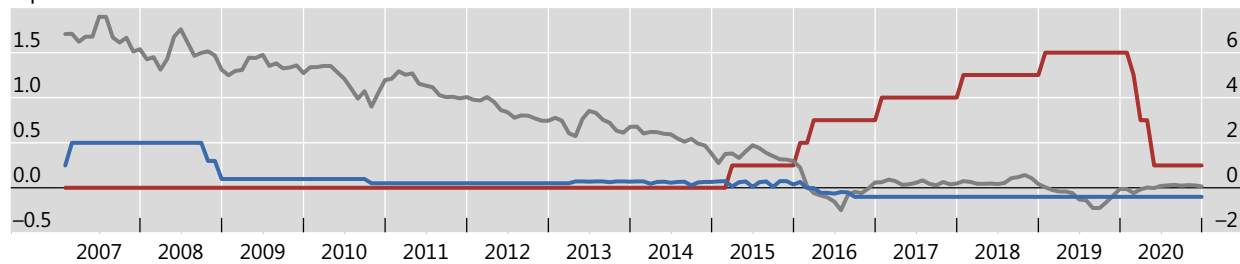
United States



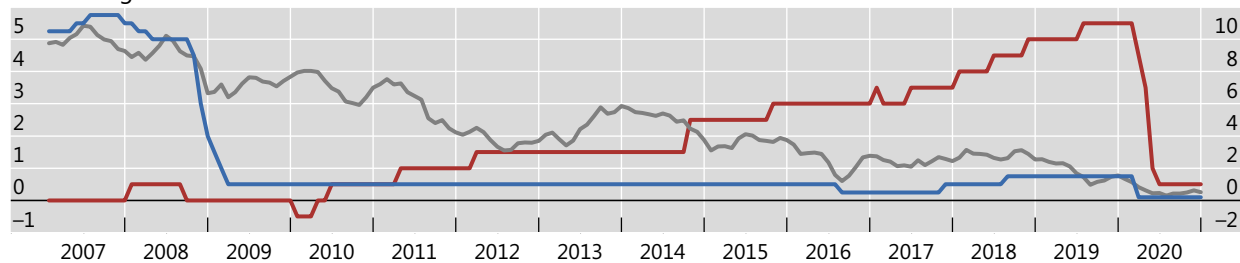
Selected euro area economies<sup>1</sup>



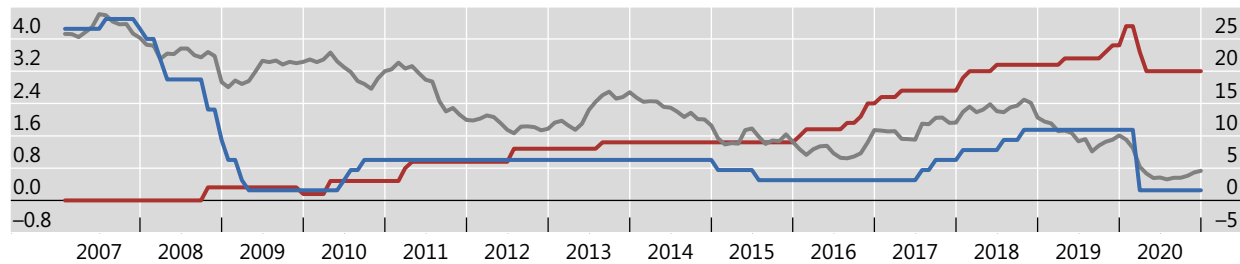
Japan



United Kingdom



Canada



Lhs: — Policy rate — 10-year government bond yield Rhs: — Cumulative macroprudential policy action<sup>2</sup>

<sup>1</sup> Simple average of DE, ES, FR and IT. <sup>2</sup> Cumulative sum of tightening (+1) and loosening (-1) actions. For the four euro area countries, the average value of the cumulative sum for each country.

Sources: Budnik and Kleibl (2018); Reinhart and Sowerbutts (2016); Shim et al (2013); FSB Covid-19 policy action database; IMF, Integrated Macroprudential Policy (iMaPP) Database, originally constructed by Alam et al (2019); Bloomberg; national data; authors' calculations.

### 3.2. Special relevance of external financial conditions in EMEs

Unlike major AEs, most EMEs aim to achieve macroeconomic, domestic financial and external stability by using monetary policy, domestically oriented macroprudential measures, financial stability-motivated CFM measures and FX interventions. Graph 8 shows when EMEs used various instruments jointly to deal with periods of domestic financial imbalances and external imbalances such as volatile capital flows and exchange rates.

Generally speaking, EMEs found greater value from the joint use of monetary policy, domestically oriented macroprudential measures, financial stability-motivated CFM measures and FX interventions in the same direction, when they faced strong capital outflows and excessive volatility in exchange rates. In this section, we consider 17 EMEs in Africa, Asia, Latin America and the Middle East. Graph 8 shows how the 17 EMEs changed policy rates, took macroprudential measures and conducted FX intervention between 2003 and 2020.

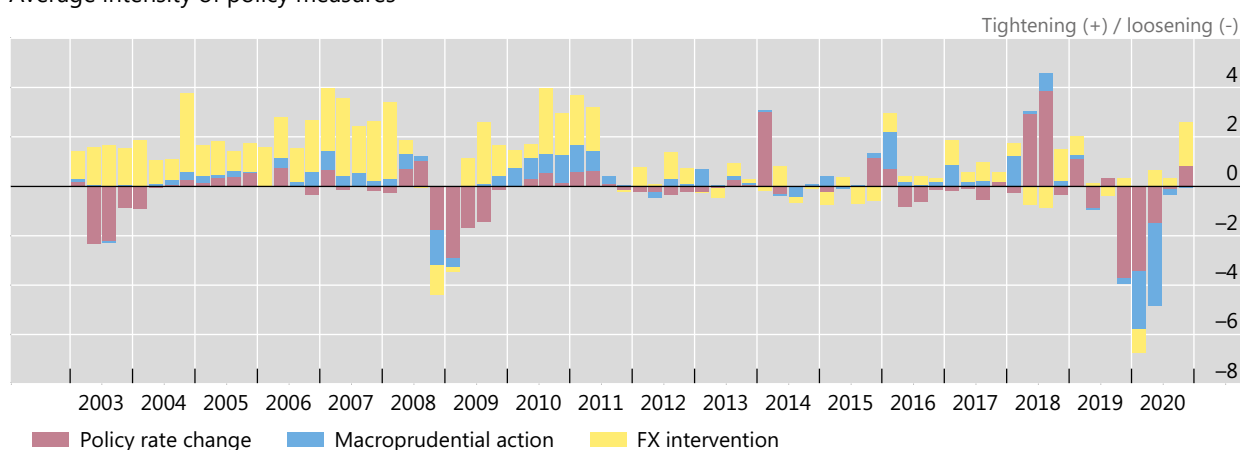
The upper panel of Graph 8 shows the average change in the policy rate, the average number of macroprudential tightening or loosening measures and the average normalised change in FX reserves in per cent on a quarterly frequency. During the peak of the GFC in Q4 2008 and Q1 2009 as well as during the peak of the Covid-19 crisis in Q1–Q2 2020, all three types of policies were loosened on a relatively large scale, to cope with economic downturns and stem exchange rate depreciations. Even during normal times, especially a few years before and after the GFC, the opposite was true: EMEs on average increased policy rates, tightened macroprudential instruments and increased FX reserves to avoid overheating of the economy and excessive appreciation of their local currencies.

The middle panel of Graph 8 looks at the same feature from the point of view of whether many EMEs tend to tighten or loosen different policy instruments at the same time. In particular, each bar in the panel shows the number of EMEs that tighten a type of policy minus the number of EMEs that loosen the policy type, every quarter. Each bar therefore can take a value of between –17 and 17. When a bar for a policy points upward (that is, takes a positive value), more EMEs tightened rather than loosened the specific policy type. A longer bar means that more EMEs on net tightened or loosened the specific policy at the same time. Similar to the upper panel, a relatively large number of EMEs took coordinated loosening actions during crisis periods, while EMEs more often than not tightened all three policies during normal periods. Finally, during normal times with steady capital inflows, the number of EMEs increasing FX reserves was larger than that of EMEs increasing policy rates or tightening macroprudential instruments. Especially in several quarters in 2004–8 and 2010–11, all or almost all the 17 EMEs increased FX reserves at the same time.

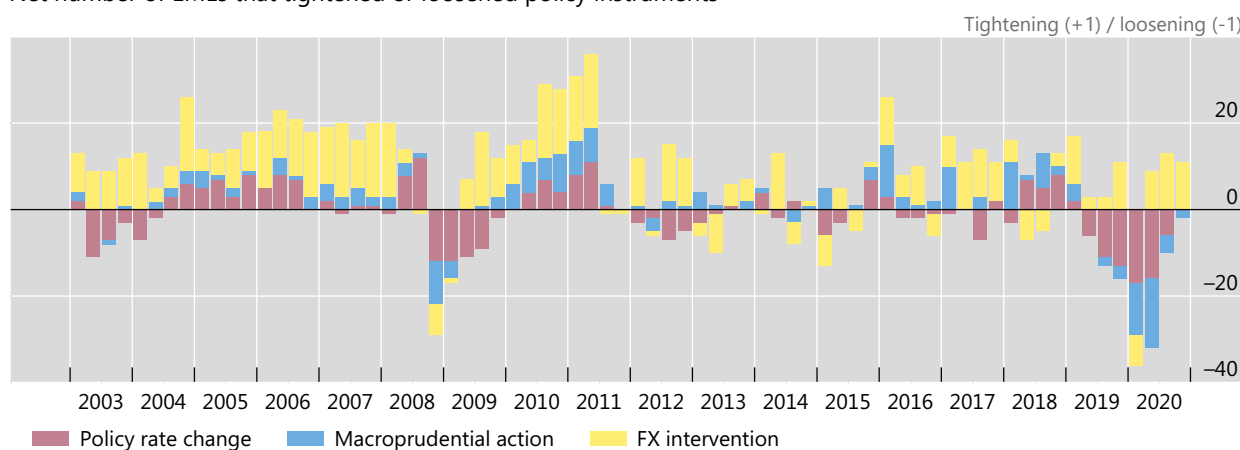
In addition, it should be noted that we need to differentiate between macroprudential measures that specifically target external sources of vulnerabilities (eg the global financial cycle and capital flow surges/stops) and those that target domestic financial imbalances and the domestic financial cycle. An issue here is the different frequencies of the two cycles (domestic vs global), and hence the assignment of the various tools.



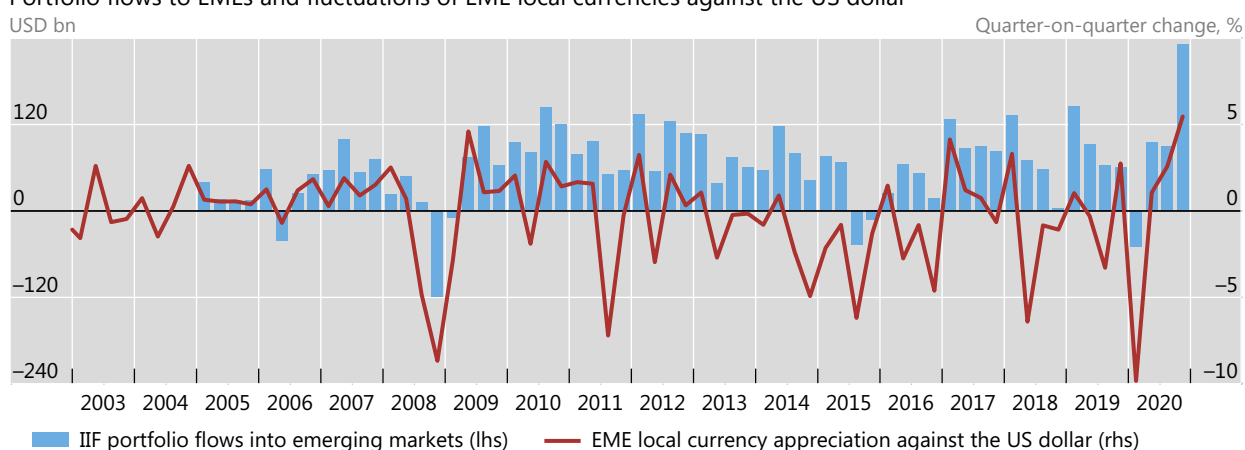
Average intensity of policy measures<sup>2</sup>



Net number of EMEs that tightened or loosened policy instruments<sup>3</sup>



Portfolio flows to EMEs and fluctuations of EME local currencies against the US dollar



<sup>1</sup> 17 EMEs: AR, BR, CL, CN, CO, HK, ID, IN, KR, MX, MY, PE, PH, SG, TH, TR and ZA. <sup>2</sup> Policy rate change = average quarterly change in the policy rate in percentage points across 17 EMEs divided by 50 basis points; macroprudential action = sum of tightening (+1) or loosening (-1) actions by an EME, averaged across 17 EMEs; FX intervention = average value of the percentage change in total FX reserve assets in US dollars excluding gold across 17 EMEs normalised by its standard deviation, where a positive value means purchasing foreign currency and selling local currency, and a negative value selling foreign currency and purchasing local currency. <sup>3</sup> Policy rate change = the number of EMEs that increased the policy rate (+1) over a quarter, minus the number of EMEs that decreased the policy rate (-1) over the same quarter; macroprudential action = the number of EMEs that tightened macroprudential policy on net (+1) over a quarter, minus the number of EMEs that loosened macroprudential policy on net (-1) over the same quarter; FX intervention = the number of EMEs that increased FX reserve assets (+1) over a quarter, minus the number of EMEs that decreased FX reserve assets (-1) over the same quarter.

Sources: Budnik and Kleibl (2018); Reinhart and Sowerbutts (2016); Shim et al (2013); FSB Covid-19 policy action database; IMF, Integrated Macroprudential Policy (iMaPP) Database, originally constructed by Alam et al (2019); IMF, *International Financial Statistics*; Datastream; national data; authors' calculations.

## 4. Original sin, original sin redux and policy implications for EMEs

In EMEs, capital flows and exchange rate changes affect domestic conditions via various financial channels. In 1990s, currency mismatches were prevalent in EMEs, because foreign borrowing by EMEs was mostly international banks' US dollar loans. Several financial crises of EMEs in the 1990s involved sudden stop of international banks' US dollar loans to EMEs. Since then, many EMEs have shifted their external financing from banks to bond markets. Importantly, external bond financing is increasingly denominated in domestic currency, although currency mismatches still exist in the balance sheets of governments and corporates in EMEs (for details, see Hofmann et al (2020a, 2020b) and Hördahl and Shim (2020)).

Original sin refers to an economy not being able to borrow in its domestic currency, as pointed out by Eichengreen and Hausmann (1999), driven by currency mismatches on the borrowers' balance sheet (often combined with maturity mismatches). It manifests itself through the interaction of exchange rate fluctuations, capital flows and government/corporate borrowing via loans and bonds denominated in foreign currencies (mainly in the US dollar). For example, Avdjiev et al (2016) show the strong relationship between the strength of the US dollar and cross-border bank lending in US dollars.

By contrast, original sin redux, driven by currency mismatches on foreign investors' (or lenders') balance sheet, focuses on the impact of exchange rate fluctuations on EME local currency bond markets via bond inflows. Original sin redux was especially relevant when EMEs witnessed strong portfolio capital outflows from their bond markets in March and April 2020, during the peak of the Covid-19 crisis. In response, many EME central banks introduced bond purchase programmes partly to stabilise their bond markets and fill the gap created by foreign investors' sale of local currency bonds, and partly to support fiscal policy needed to revive the economy hit by the Covid-19 pandemic.

In this section, we first consider original sin in terms of the impact of exchange rate fluctuations on foreign investors' purchase of EME foreign currency-denominated government bonds. We then provide evidence of original sin redux by estimating the impact of exchange rate fluctuations on foreign investors' purchase of EME local currency government bonds. Finally, we discuss the policy implications.

Recent BIS research provides evidence that the US dollar works as a gauge of global investors' risk appetite and especially as an EME risk factor (see, eg, Avdjiev et al (2018) and Hofmann and Park (2020)). We show evidence that the broad US dollar index explains foreign investors' purchase of local and foreign currency bonds generally better than the bilateral US dollar exchange rate against an EME's currency. The broad US dollar index can be viewed as a proxy for global investors' risk appetite, while the bilateral exchange rate captures both the strength of the US dollar as a global factor and the strength of an EME's local currency as a local factor.

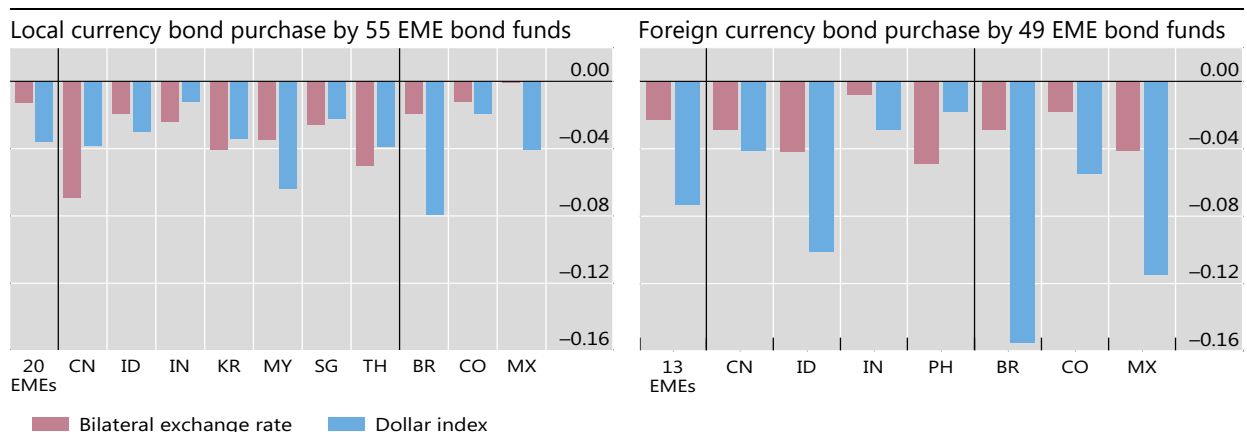
### 4.1. Original sin redux in EME local currency bond markets

Recent studies such as Hofmann et al (2020b) show that EME local currency bond spreads and the exchange rate of EME currency against the US dollar move in lockstep. To explain a channel through which exchange rate fluctuations affect local currency bond yields or spreads, we consider the impact of fluctuations in the bilateral US

dollar exchange rate or the broad US dollar index on EME bond purchases by an individual EME bond fund. In addition, we compare the relative strength of the two exchange rates in explaining EME bond purchases and changes in EME local currency bond spread.

The left-hand panel of Graph 9 shows that, when we consider 20 EMEs for which data on local currency bond yields are available, a 1% appreciation (or depreciation) of the broad dollar index has about three times stronger effects on a mutual fund's sale (or purchase) of an EME's local currency government bonds divided by total net assets (TNA) of the fund than a 1% appreciation (or depreciation) of the bilateral exchange rate of the EME currency against the US dollar has. In terms of economic magnitude, the results imply that when the broad dollar index appreciates by 5% this month (ie, other currencies depreciate against the US dollar), a global EME local currency bond fund sells an EME's local currency bonds by 20bps of the fund's TNA over the next month. If the fund is holding the EME's bonds worth 2% of TNA, then it decreases its holdings of the EME's bonds from 2% to 1.8%.

Impact of a 1% appreciation of the US dollar on EME bond purchases Graph 9



Twenty EMEs in the left-hand panel include CN, IN, ID, KR, MY, PH, SG, TH; BR, CL, CO, MX, PE; CZ, HU, PO, RU; IL, TR, ZA. Thirteen EMEs in the right-hand panel include CN, IN, ID, PH; BR, CL, CO, MX, PE; HU, RU; TR, ZA.

Sources: Bloomberg; EPFR; BIS; authors' calculations based on Hofmann et al (2022).

When we consider seven individual economies in emerging Asia (Graph 9, left-hand panel), we find that a stronger dollar captured by both exchange rates (ie depreciation of an EME's currency) is associated with a sale of the EME's local currency government bonds by global EME bond funds. For the three Latin American economies in the panel, a 1% broad dollar index appreciation has a much stronger impact on the purchase of local currency bonds than a 1% bilateral exchange rate appreciation has.

## 4.2. Original sin in EME foreign currency bond markets

In many EMEs, foreign currency-denominated bonds are an important source of financing for governments and corporates. Compared to bank loans, long-term bonds are less subject to maturity mismatch, but still subject to currency mismatch on the balance sheet of borrowers whose assets are mainly denominated in the local currency. Given that the majority of EME foreign currency government bonds are issued offshore and held by foreign investors, to the extent that the funds obtained from foreign currency bond issuances are repatriated to an EME, the funds become a source of capital inflows to the EME. Therefore, it is important to understand how

sensitive foreign investors' purchases and sales of foreign currency-denominated bonds issued by EMEs are as a manifestation of original sin.

The right-hand panel of Graph 9 shows that, when we consider 13 EMEs for which data on foreign currency bond yields are available, a 1% appreciation (or depreciation) of the broad dollar index has around three times stronger effects on a fund's sale (or purchase) of an EME's foreign currency government bonds over TNA than a 1% appreciation (or depreciation) of the bilateral exchange rate of the EME currency against the US dollar has. Considering four individual economies in emerging Asia, we find that a stronger dollar captured by both exchange rates (ie a depreciation of an EME's currency) is associated with a sale of the EME's foreign currency government bonds by global bond funds, and that the broad dollar index has a stronger impact on the purchase of all EMEs' government bonds than the bilateral exchange rate has, except for the Philippines.

### 4.3. Policy options to deal with original sin and original sin redux

As we show in Section 3, since the 1990s EMEs have deployed various types of policies to deal with exchange rate and capital flow volatility related to borrowing from foreign banks and investors. In particular, they used FX intervention to stabilise exchange rate fluctuations by addressing the source of the problem when their currencies appreciated or depreciated. Some regional central banks also used CFMs including prudential measures targeting FX exposure, together with FX intervention, to slow down strong capital inflows, albeit less frequently over time. Some other jurisdictions implemented macroprudential policy to build up buffers in the domestic financial system during good times and mitigate the build-up of financial imbalances such as excessive credit growth and asset price booms due to capital inflows. Finally, a smaller number of central banks in EMEs also adjusted their policy rate to help maintain external stability.

Specifically to deal with original sin involving foreign currency bond financing, central banks and other financial authorities in EMEs have taken policy measures to reduce currency mismatches or FX positions on the balance sheet of the borrowers (either governments or corporates), for example, by slowing down the issuance of foreign currency bonds by corporates during boom periods. By contrast, during periods of dollar funding stress, financial authorities have relaxed prudential regulation on FX borrowing. For example, China and Korea introduced such measures at the peak of the Covid-19 crisis in 2020.

In order to deal with original sin redux in the local currency bond market, central banks and other financial authorities need to monitor the extent of currency mismatch on the balance sheet of foreign investors (ie unhedged exposure of foreign investors to local currency assets) and conduct stress tests against severe outflow scenarios. Also, to make hedging more easily available and less expensive to foreign investors, policymakers can make efforts to develop onshore FX derivatives markets. During severe stress periods, central banks may consider intervening in bond markets or both the FX and bond markets at the same time to alleviate concerns of foreign portfolio investors. Finally, over the long run, EMEs will need to develop a domestic institutional investor base which is not subject to currency mismatch problems.

As empirical evidence provided in this section shows, collective investment vehicles domiciled and/or headquartered in Europe or the United States are important investors in EME local and foreign currency bond markets. Therefore, it will be important for national authorities to continue international discussions on the

possibility of introducing prudential rules or risk management guidelines on non-bank financial institutions, which are active in cross-border portfolio investment. In particular, national authorities may consider enhancing the microprudential liquidity risk management practice of collective investment vehicles, especially those investing in less liquid EME assets, for example, by promoting them to hold sufficient cash buffers in good times (see Schrimpf et al (2021)). An equally important point, in view of the tendency of EME mutual funds and ETFs simultaneously entering or exiting EME asset markets, is that it will be beneficial for financial authorities to consider the possibility of introducing macroprudential calibration of liquidity management rules for collective investment vehicles headquartered or domiciled in their jurisdictions.

## 5. MFSFs: the effectiveness of macro-financial policy measures

Since the GFC, many academic and policy papers have examined the impact of macroprudential measures on various types of domestic credit, asset prices, GDP and inflation. More recently, a growing literature looks at the cross-border impact of macroprudential policy.

Empirical evidence on the impact of macroprudential measures on overall bank risk suggests that macroprudential measures have been generally successful in strengthening the banking system's resilience. For example, Gambacorta and Murcia (2017) show that capital or reserve requirements on particular types of loans can change the relative price of different forms of credit, affect the composition of credit and thus reduce the overall riskiness of banks' loan portfolio. Recent econometric studies gauging the impact of macroprudential measures on bank risk (eg Aguirre and Repetto (2017), Altunbas et al (2018) and Gómez et al (2017)) suggest that such macroprudential measures contribute to a more resilient financial system.

There is a large literature showing that certain types of macroprudential measures have moderated financial booms. For example, Claessens et al (2013) use a sample of around 2,800 banks in 48 economies over the period of 2000–10 and find that maximum LTV and DSTI ratios as well as limits on credit growth and foreign currency lending tended to reduce bank leverage and asset growth during booms but that few policies stopped declines in bank leverage and assets during downturns. Kuttner and Shim (2016) use a sample of 57 economies over the period of 1980–2012 and investigate the effectiveness of nine non-interest rate policies on house prices and housing credit. They find that introductions of or reductions in the maximum DSTI ratio, and that increases in housing-related taxes, have significant negative effects on housing credit and house price growth. They also find that loosening the policy instruments is ineffective in increasing housing credit or house price growth.

Using the sample of macroprudential measures described in Graph 4, we run panel regressions across a broad set of AEs and EMEs and measure the impact of the most frequently used types of macroprudential measures on general credit to the non-financial sector and on housing credit extended by banks. In line with most other cross-country studies, we define three dummy variables: one for both tightening (+1) and loosening (–1) actions; another only for tightening (+1) actions; and the other only for loosening (+1) actions. Graph 10 shows the coefficients on five different macroprudential dummy variables in the general credit regressions, while Graph 11 shows those on five different macroprudential dummy variables in the housing credit regressions. Asterisks on the bars mean statistical significance of the coefficients.

Graph 10 shows the impact of all macroprudential measures targeting total credit (including reserve requirements on general liabilities, liquidity requirements and loan payment deferrals/moratorium on general credit in the memo items) on real general credit growth as well as the impact of the macroprudential measures using the following four types of instruments: (1) reserve requirements on capital inflows or FX liabilities; (2) loan-loss provisioning rules on general credit; (3) limits on FX mismatches or FX positions; and (4) general credit growth limits.

Limits on FX mismatches or FX positions and limits on general credit growth have economically significant impacts on general credit growth. The coefficients showing the 4-quarter effects of tightening or loosening both types of limits are statistically significant. In addition, a relaxation of loan-loss provisioning rules has positive effects on general credit growth in the next quarter. By contrast, policy actions which tighten or loosen capital flow- or FX liability-based reserve requirements are economically and statistically insignificant. Finally, when we consider all macroprudential measures targeting general credit, tightening actions significantly reduce general credit growth, but loosening actions do not significantly increase general credit growth.

We conduct a similar exercise on housing credit. Graph 11 shows the impact of all macroprudential measures targeting housing credit on real housing credit growth as well as the impact of the macroprudential measures using the following four types of instruments, which were most frequently used: (1) maximum LTV ratios and loan prohibitions; (2) maximum DSTI ratios and other lending criteria; (3) risk weights on housing loans; and (4) housing-related taxes. The results from housing credit regressions indicate that tightening LTV and DSTI limits and introducing or raising housing-related taxes helped slowing down housing credit growth.

We find that introductions of or decreases in (ie tightening) maximum LTV ratios, and introductions of or decreases in maximum DSTI ratios, have negative effects on housing credit growth. The coefficients showing the 1-quarter effects of tightening LTV limits, and the 1-quarter and 4-quarter effects of tightening DSTI limits, are also statistically significant. Housing-related taxes also have economically significant impacts on housing credit growth and the coefficient showing the 4-quarter effect of reducing housing-related taxes is statistically significant. By contrast, other types of macroprudential measures targeting housing credit have less discernible effects or even work in the wrong direction. In particular, policy actions which increase or decrease risk weights on housing loans are economically and statistically insignificant, and so are policy actions which loosen LTV and DSTI limits. These results are broadly in line with the findings of similar cross-country empirical studies.

## Impact of selected types of macroprudential measures on general credit growth

In percentage point

Graph 10



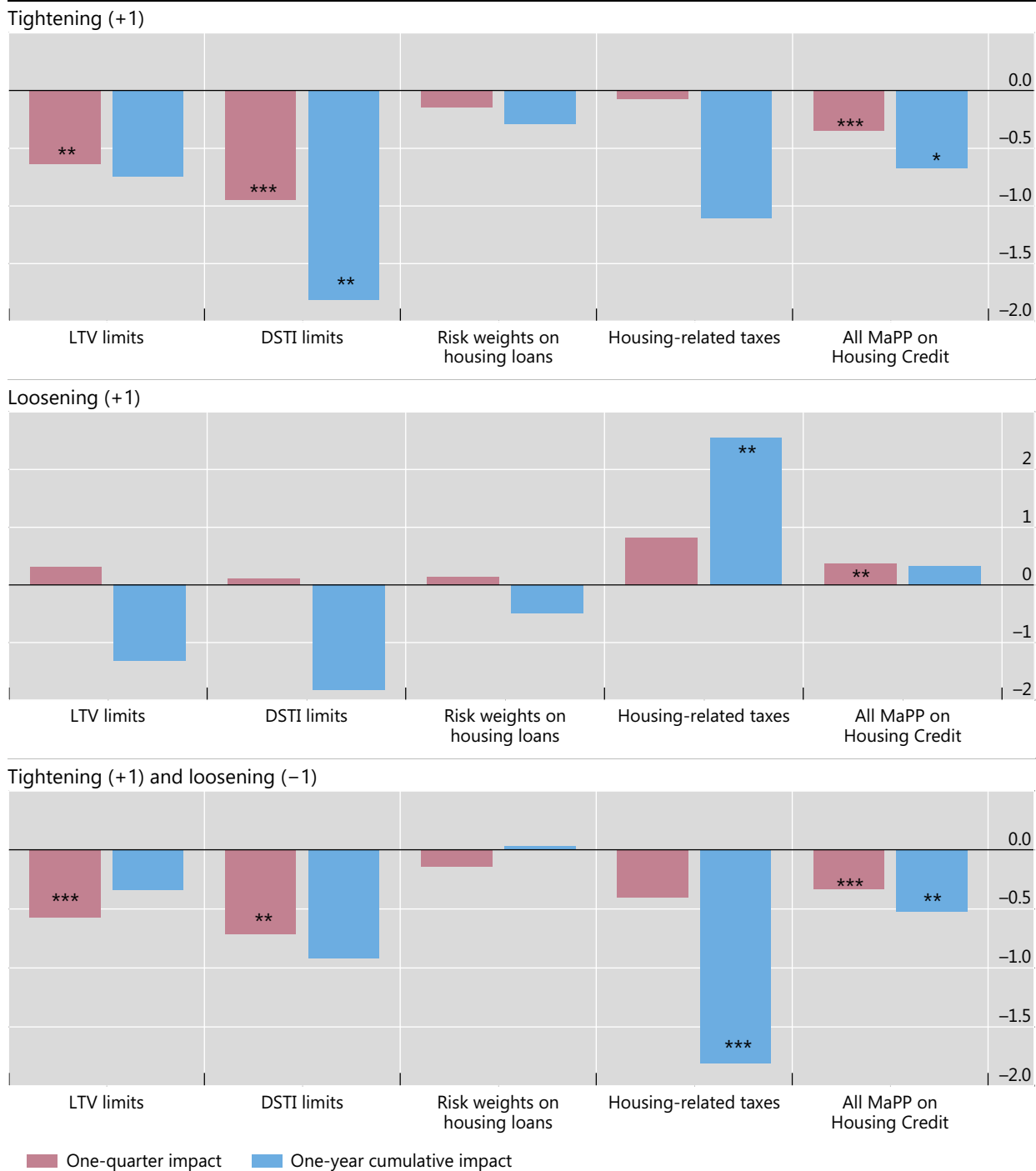
General credit data are for 43 economies, from BIS' data on total credit to the non-financial sector. The bars show the coefficients on the macroprudential policy dummy variables in panel regressions with country fixed-effects and the policy rate (2 lags) and real GDP growth (4 lags) used as control variables. The blue bar for loosening credit growth limits shows a 2-quarter cumulative impact. \*\*\*, \*\* and \* mean statistical significance at the 1%, 5% and 10% level, respectively.

Sources: Budnik and Kleibl (2018); Reinhart and Sowerbutts (2016); Shim et al (2013); FSB Covid-19 policy action database; IMF, Integrated Macroprudential Policy (iMaPP) Database, originally constructed by Alam et al (2019); CEIC; Datastream; BIS credit statistics; national data; authors' calculations.

## Impact of selected types of macroprudential measures on housing credit growth

In percentage point

Graph 11



Housing credit data are from national sources for 54 economies. The bars show the coefficients on the macroprudential policy dummy variables in panel regressions with country fixed-effects and the policy rate (2 lags) and real GDP growth (4 lags) used as control variables. \*\*\*, \*\* and \* mean statistical significance at the 1%, 5% and 10% level, respectively.

Sources: Budnik and Kleibl (2018); Reinhart and Sowerbutts (2016); Shim et al (2013); FSB Covid-19 policy action database; IMF, Integrated Macroprudential Policy (iMaPP) Database, originally constructed by Alam et al (2019); CEIC; Datastream; national data; authors' calculations.



Similar to monetary policy measures, macroprudential measures affect economic activity by changing the cost of borrowing or modifying households' or firms' access to finance. A relatively small number of studies such as Richter et al (2019) find that tightening macroprudential measures tends to reduce output growth, but evidence of their effect on inflation is mixed.

In a financially integrated world, developments in one country may give rise to systemic risk in another. As low interest rates and unconventional monetary policy actions in the large AEs post-crisis result in large capital flows to EMEs and small open AEs, international spillovers may also result from macroprudential measures. For instance, Buch and Goldberg (2017), Reinhardt and Sowerbutts (2015) and Tripathy (2017) find that bank regulation of multinational banks in their home countries affects the banks' lending standards elsewhere. Also, Claessens et al (2021) show that a net tightening of domestic macroprudential measures increases non-bank financial institutions' (NBFIs) activities and decreases bank assets, raising the NBFIs share in total financial assets. They also find that a net tightening of macroprudential measures in foreign jurisdictions leads to a reduction of the NBFIs share, which indicates a decrease in NBFIs assets and an increase in banking activity domestically. Such findings of the presence of externalities and international spillovers of domestic macroprudential policies call for international coordination.

As shown in the previous section, CFMs used for prudential purposes can complement FX intervention in dealing with capital flows and thus financial imbalances. Recent empirical studies generally show that CFM tools are sometimes effective in slowing down targeted flows but that the effects tend to be temporary and leakages abound (see Bruno et al (2017)). Such CFM tools are often used when other types of tools do not successfully moderate capital flows.

There is no consensus on which types of CFM tools are macroprudential in nature and which are not, but recently a few papers have started to investigate the effectiveness of FX-related prudential measures. Frost et al (2020), in considering 83 countries over 2000–17, find that capital inflow volumes are lower where FX-based macroprudential measures have been activated, but that the imposition of capital controls does not have a significant effect on the volume or composition of capital inflows. Aguirre and Repetto (2017) assess the impact of capital- and currency-based macroprudential measures on credit growth at the bank-firm level, using credit registry data from Argentina for the period 2009–14. They find that a tightening of the capital buffer and the limits on foreign currency positions generally moderates the credit cycle, and that the currency-based measure appears to have a quantitatively more important impact.

**Box 1: Experience of EMEs using macro-financial policy measures during the Covid-19 crisis**

The Covid-19 crisis served as a stress test on macro-financial stability frameworks across EMEs. Facing an unprecedented shock, EMEs responded by combining a broad range of measures, including new ones, and weathered the shock successfully. In particular, most EME central banks used the full range of pre-crisis policy tools (so called, conventional monetary policy), often on a greater scale and with a wider scope than in the past. A small number of them adjusted CFMs to moderate capital outflows and support US dollar borrowing by domestic financial institutions. Some central banks also expanded liquidity provision including in US dollars to non-banks, conducted asset purchases and established lending programmes targeted at sustaining credit to the private non-financial sector (so called unconventional monetary policy).

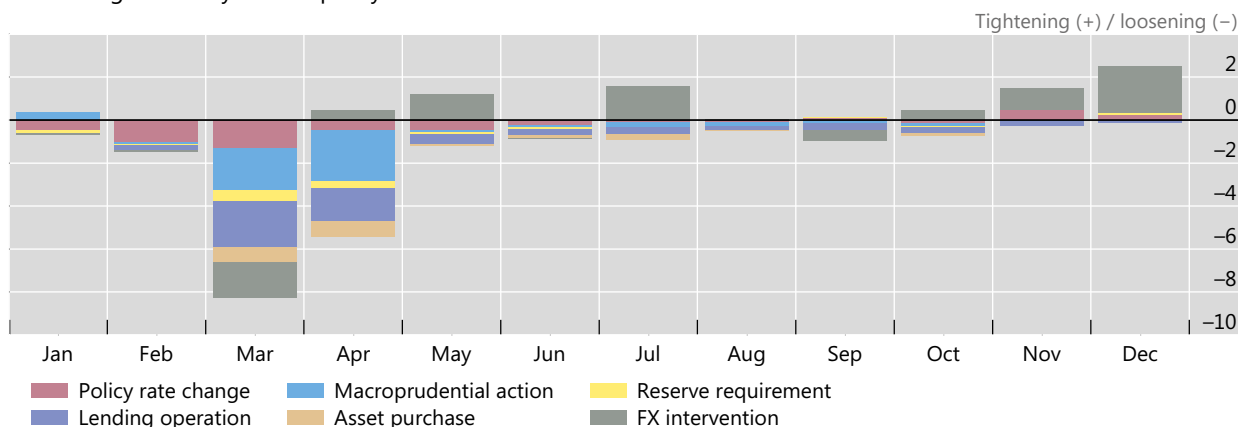
The top and middle panels of Graph 12 show how 24 EMEs used various monetary policy tools, macroprudential measures and FX intervention from January to December 2020, in terms of the average intensity of policy measures across the EMEs and the net number of EMEs that tightened or loosened each type of policy. For monetary policy, we focus on the following four types of instruments: policy rate, reserve requirement, lending operations and bond purchases. In particular, and in contrast to experience in AEs, bond purchases were not used to change the stance of policy but, overwhelmingly, to stabilise markets. For macroprudential policy, we consider all categories of instruments except reserve requirements. Finally, we measure FX intervention by monthly percentage change in FX reserves in US dollars. For data on lending operations and asset purchases by central banks, we use the Covid-19 monetary policy database in Cantú et al (2021). The stacked bars show monthly changes in policy rates, reserve requirements, lending operations and asset purchases, as well as macroprudential measures and FX intervention. If policy actions aim to decrease (increase) the amount of credit, they are viewed as tightening (loosening) actions. The bottom panel shows portfolio capital flows to EMEs and the EME-only US dollar index.

We find that some EMEs started to lower policy rates at the early stage of the Covid-19 crisis in February 2020, that almost all EMEs cut policy rates in March by an average size of 66 basis points, and that EMEs continued to cut rates until August or September. From September 2020, some EMEs started to raise policy rates gradually. The patterns were similar for reserve requirements. Central banks' purchases of government and corporate bonds started in March or April, and such purchases continued to increase on average until October. Finally, lending operations were introduced or expanded from February. Almost all EMEs in the sample announced either an introduction or expansion of lending operations, on average, 2.2 times in March and 1.5 times in April. Notably, EME central banks continued to expand lending operations until the end of 2020. These four types of monetary policy tools were used mainly to support economic recovery from the Covid-19 shock in 2020.

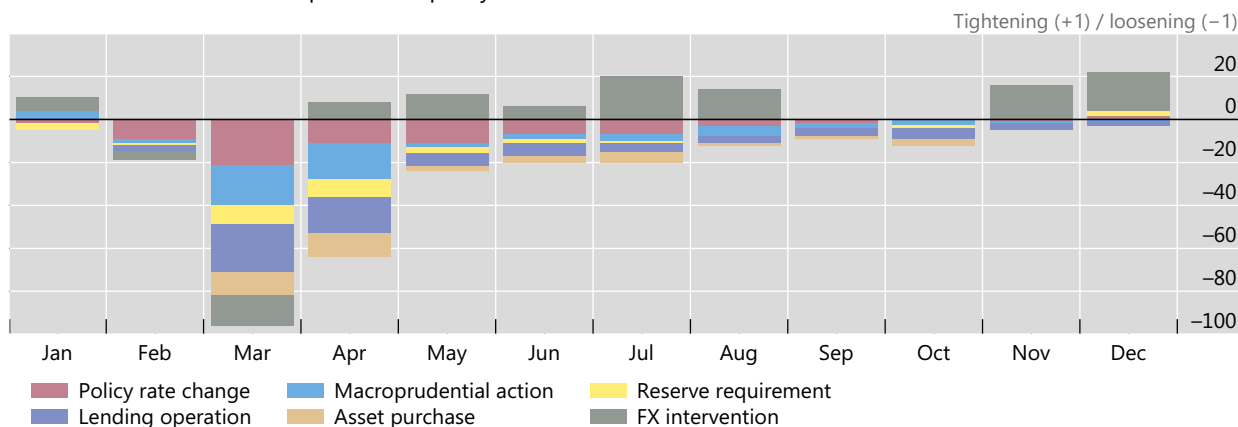
Macroprudential measures were relaxed alongside monetary policy from February to October 2020, indicating that the tools were used mainly to increase the capacity of domestic financial institutions to provide credit to the economy (ie to ease credit supply constraints and avoid deleveraging). In doing so, there was a need to strike a delicate balance between supporting economic activity and preserving banks' soundness (Borio and Restoy (2020)).

Use of monetary and macroprudential policies and FX intervention by EMEs in 2020 Graph 12

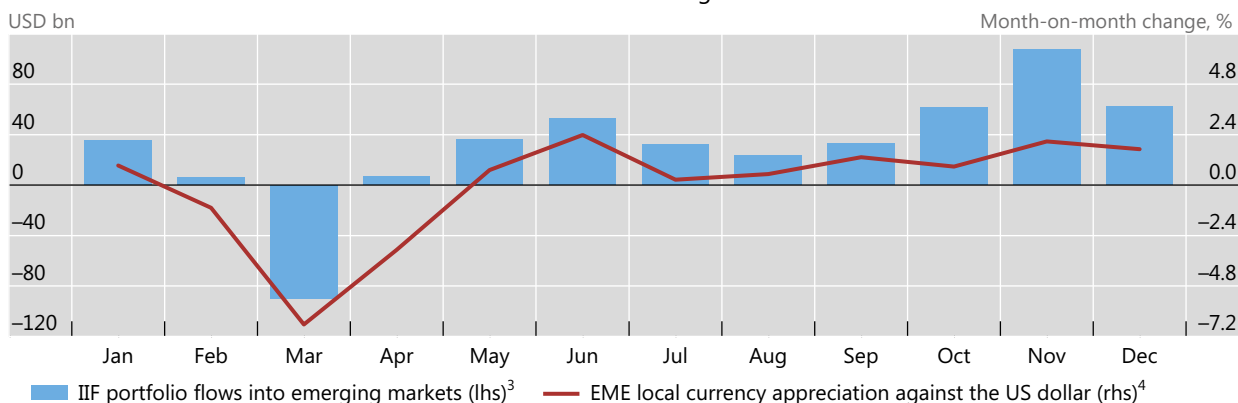
Net average intensity of EME policy actions<sup>1</sup>



Net number of EMEs that implemented policy actions<sup>2</sup>



Portfolio flows to EMEs and fluctuations of EME local currencies against the US dollar



24 EMEs = AE, AR, BR, CL, CN, CO, CZ, HK, HU, ID, IL, IN, KR, MX, MY, PE, PH, PL, RO, SA, SG, TH, TR and ZA.

<sup>1</sup> Policy rate change = percentage point changes divided by 50 basis points; macroprudential action, reserve requirement, lending operation and asset purchase = the number of tightening (+1) or loosening (-1) actions; FX intervention = percentage change of total foreign currency reserve assets excluding the gold across 24 EMEs normalised by its standard deviation, where a positive value means purchasing foreign currency and selling local currency, and a negative value selling foreign currency and purchasing local currency. <sup>2</sup> Policy rate change = the number of EMEs that increased the policy rate (+1) minus the number of EMEs that decreased the policy rate (-1); macroprudential action, reserve requirement, lending operation and asset purchase = the number of EMEs that tightened the policy on net (+1) minus the number of EMEs that loosened the policy on net (-1); FX intervention = the number of EMEs that increased FX reserve assets (+1) minus the number of EMEs that decreased FX reserve assets (-1). <sup>3</sup> From IIF Total Portfolio Flows Tracker. Sum of net non-resident purchases of stocks ("portfolio equity flows") and those of bonds ("portfolio debt flows") in EMEs. <sup>4</sup> Trade-weighted US dollar Index only including emerging market economies.

Sources: Budnik and Kleibl (2018); Cantú et al (2021); Reinhart and Sowerbutts (2016); Shim et al (2013); Board of Governors of the Federal Reserve System; BIS Covid-19 monetary policy database; FSB Covid-19 policy action database; IMF, Integrated Macroprudential Policy (iMaPP) Database, originally constructed by Alam et al (2019); Institute of International Finance; IMF, *International Financial Statistics*; Datastream; national data; authors' calculations.

## 6. Outstanding challenges

While the multifaceted policy frameworks have served EMEs well, there is still room for further reflection and improvement. Consider sequentially the range of policies, their integration, the analytical support and the international dimension.

One policy that has not yet been fully included in the framework is *fiscal policy*. To be sure, its relationship with inflation and external stability has been analysed extensively over the years. Likewise, there is a consensus that keeping fiscal policy on a sustainable path is essential for macroeconomic stability. That said, its relationship with financial stability, and the domestic financial cycle in particular, merits further attention. Moreover, the importance of this issue varies across countries, depending on how disciplined fiscal finances are. For instance, fiscal constraints have been very prominent in Latin America and less so in emerging Asia.

A couple of aspects stand out (Borio et al (2021)). First, domestic financial booms can hugely flatter the fiscal accounts. Financial booms lead to an overestimation of potential output and growth, are revenue-rich and hide the build-up of contingent liabilities, broadly defined, especially if the subsequent bust goes hand-in-hand with a banking crisis and a major recession. The ensuing increases in public debt have historically been over 20 percentage points of GDP and, in extreme cases, 100 percentage points or more (Laeven and Valencia (2018)). At a minimum, this weakens the creditworthiness of the sovereign and constrains its policy room for manoeuvre.<sup>19</sup> Second, the sovereign itself can be a source of banking stress. The sovereign-bank doom loop has attracted particular attention following the euro area crisis (CGFS (2011)), but such events were quite common in EMEs in the past, not least because of a large, albeit declining, portion of foreign-currency denominated debt (Velasco (1987), Calvo and Mendoza (1996) and Corsetti et al (1999)). Some diagnostic tools have been developed to measure cyclically adjusted fiscal balances and to capture contingent liabilities in real time (eg, Borio et al (2018) and Borio et al (2020)). But there is ample scope for improvement. Similarly, addressing the sovereign-bank nexus through regulation and supervision has proved very contentious (BCBS (2017)).

Growing experience with the deployment of *macroprudential tools* has clarified their strengths and weaknesses. By construction, the tools can boost resilience, by increasing the size of buffers in the financial system. To varying degrees, they can also constrain the build-up of domestic financial imbalances. Even so, there is a risk of overestimating their effectiveness. It may be quite difficult to deploy them with sufficient stringency and timeliness: political economy considerations loom large, inducing a certain “inaction bias”.<sup>20</sup> In addition, the tools operate largely through banks: the tools have not as yet been designed for the growing non-bank financial intermediation sector. In fact, even in countries where they have been deployed aggressively, the tools have not always prevented the emergence of traditional signs of financial imbalances (Graph 13).

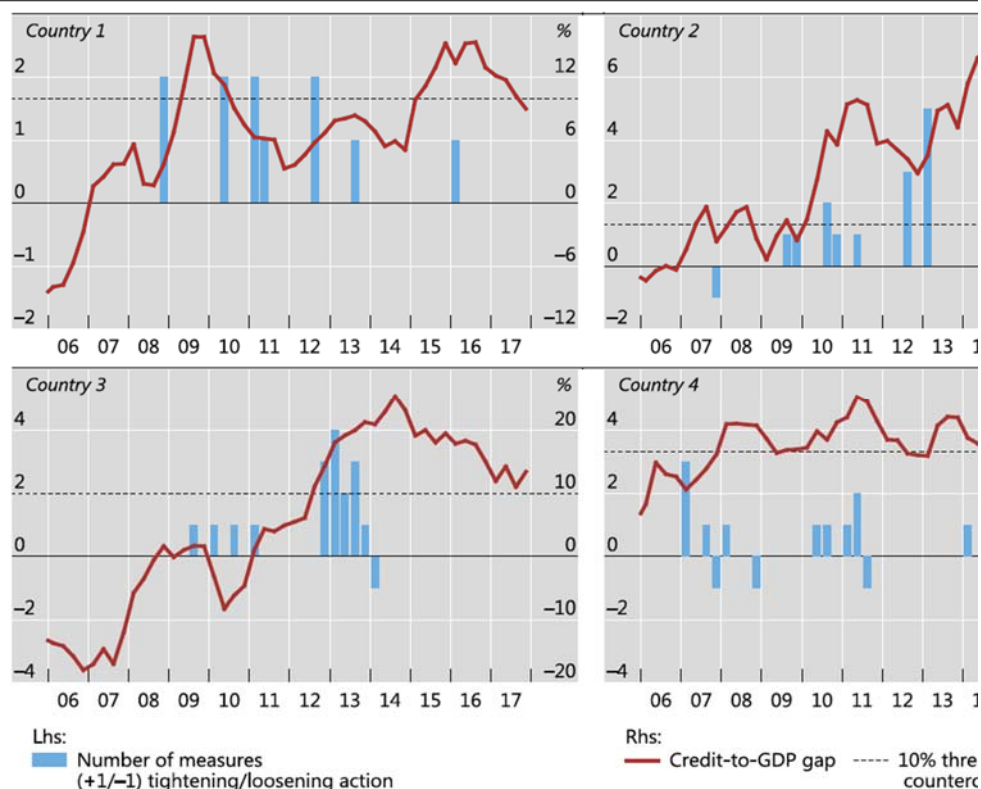
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<sup>19</sup> The cases of Ireland and Spain stand out. Both countries were held up as examples of fiscal probity during the financial expansion: they ran apparent “fiscal surpluses” and their debt-to-GDP ratios were falling. Once the banking crisis broke out, both also faced a sovereign crisis.

<sup>20</sup> One way of addressing the bias is to rely more on the structural, not necessarily time-varying, aspects of the tools, eg setting low but state-invariant LTV or DSTI limits, relying on non-market values to measure them, etc. Lower levels reduce the extent to which higher asset prices or incomes can elicit additional credit; see Borio et al (2001) for a more extensive discussion.

Some signs of financial imbalances even where measures are used actively

Graph 13



Source: Borio (2018).

Given the limitations of macroprudential tools, it stands to reason that *monetary policy* could play a complementary role. After all, monetary policy sets the universal price of leverage in a given currency area and operates fundamentally by influencing financial conditions – the very factors that shape financial expansions. There is a consensus that keeping interest rates low for long contributes to risk-taking and the build-up of financial vulnerabilities as well as having broader side effects. And it is becoming increasingly clear that the issue is not so much “leaning against the wind” once signs of financial imbalances become apparent – by then it is too late – but adopting a policy that takes financial factors systematically into account.<sup>21</sup> That said, it is not yet clear how best to operationalise such a strategy – a serious problem especially for those central banks with monetary policy mandates that explicitly include financial stability. As of now, there is agreement only on the need to lengthen the horizon over which to control inflation, thereby gaining some flexibility.

This points to another issue – the effective *degree of integration* of the various tools in policy implementation (Borio and Disyatat (2021)). It is sometimes assumed, at least in the formal models designed to shed light on policy, that all instruments are deployed simultaneously. But in implementing policy, this is neither feasible nor desirable. As the business cycle, financial cycles (domestic and global) and day-to-day external market conditions evolve at different speeds, so does the arrival of useful information (Table 2). For instance, since financial vulnerabilities build-up only very

<sup>21</sup> As Stein (2013) has aptly put it, it is not a question of “leaning against the wind” as monetary policy “is the wind”. For a concrete example of such a systematic strategy, in the form of an augmented Taylor rule, see Borio et al (2019).

slowly, a quarterly frequency may be reasonable for monetary policy decisions, but not for macroprudential ones, which are in fact taken at longer intervals. Similarly, the flexibility of the tools varies: at one end, adjustments to macroprudential policies or CFMs generally involve a long process; at the other end, FX intervention and, possibly, changes in interest rates can be done with little or no decision lag.

Temporal dimensions of policy tools

Table 2

<b>Tools</b>	<b>Underlying determinants</b>				<b>Policy process</b>	
	<b>Frequency of economic process</b>	<b>Transmission lags</b>	<b>Implementation lags</b>	<b>Reputation costs</b>	<b>Policy horizon</b>	<b>Frequency of adjustment of tools</b>
Macroprudential measures	Low	Long	Large	High	Long	Infrequent
FX intervention	High/Medium <sup>1</sup>	Negligible	Negligible	Low	Short/Medium	(Very) Frequent
Monetary policy	Medium	Medium <sup>2</sup>	Negligible	Moderate	Medium/Long	Frequent
Capital flow management measures	Medium/Low <sup>3</sup>	Short/Medium	Medium/Large	High	Short/Medium	Infrequent

<sup>1</sup> High in the case of concerns about excessive market volatility; medium in the case of potential exchange rate misalignments <sup>2</sup> Defined with respect to output and inflation objectives. In the case of financial market objectives, such as the exchange rate, the transmission lags would be much shorter, while for financial stability concerns, the transmission lags would be much longer. <sup>3</sup> Concerns about impact of capital flows on financial conditions tend to revolve around their consequence for output, and hence medium frequency. Concerns about impact on financial vulnerabilities are primarily low frequency. That said, policy concerns at times could be quite immediate, such as in the case of forestalling abrupt capital outflows.

Source: Borio and Disyatat (2021).

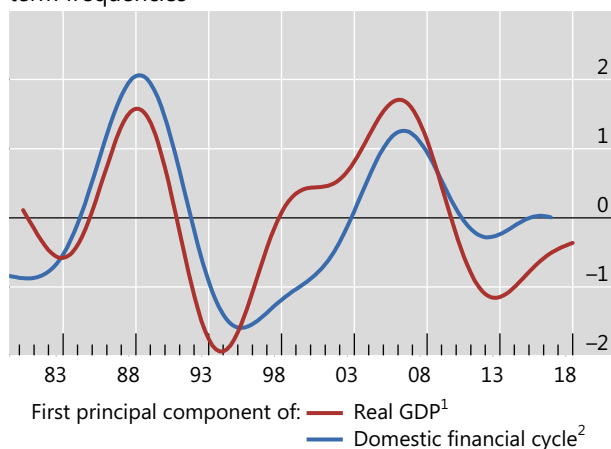
This means that there is a natural hierarchy of policies and an unfortunate tendency to consider them in isolation. Macroprudential and CFM measures are a kind of fix point for the rest. FX intervention is carried out on an as-needed (or formula-based) basis, possibly several times a day. And adjustments in interest rates fall in between.<sup>22</sup> It seems possible to articulate a more integrated framework. For instance, distinguishing clearly between strategic and tactical FX intervention – the former at frequencies closer to the global financial cycle and the business cycle; the latter at a higher frequency more in line with day-to-day changes in market conditions. But in the end, the main adjustment margin is in monetary policy, which can take a broader view and incorporate the other influences. Here, the policy horizon is indeed critical. In fact, at medium-term frequencies, the business and domestic financial cycles tend to co-move closely (Graph 14). And it is the medium-term component of the business cycle that accounts for a larger fraction of output fluctuations. This suggests that a longer horizon for monetary policy would be necessary and justified for this policy to play a more active role.

This takes us to the role of *analytical tools*. Analytical tools are necessary to support policy. They provide a frame of reference and help to quantify trade-offs. All policies, including run-of-the-mill monetary policy, rely on a suite of models. And, indeed, models are being rapidly developed to serve as references for macro-financial stability frameworks.<sup>23</sup> But what is specific in this domain is that no single satisfactory model as yet exists to forecast and carry out counterfactual policy exercises.

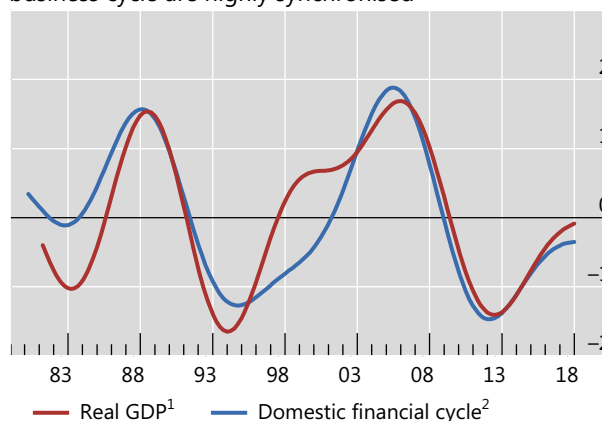
<sup>22</sup> This characterisation does not apply to Singapore, where FX intervention is used to enforce an (undisclosed) exchange rate band. In fact, one can think of changes in the gradient of the band as the key tool, akin to the interest rate in a Taylor rule.

<sup>23</sup> For examples of BIS' recent modelling efforts, see Agénor and Pereira da Silva (2021), Cavallino and Sandri (2019), Cavallino and Hofmann (2022) and Hofmann et al (2022).

Domestic financial cycle and business cycle at medium-term frequencies



United States domestic financial cycle and medium-term business cycle are highly synchronised



<sup>1</sup> Frequency-based (bandpass) filters capturing medium-term cycles (window: 32 to 120 quarters), plotted with a four-period lag. <sup>2</sup> Domestic financial cycles are measured by frequency-based (bandpass) filters capturing medium-term cycles in real credit, the credit-to-GDP ratio and real house prices.

Source: Aldasoro et al (2020).

One reason is that no practical model can meaningfully capture endogenous cycles, let alone cycles of structurally different frequencies. This reflects in part differences in intellectual perspectives: while central bank economists working in the financial stability area tend to take the financial cycle as the basis for their analysis, those advising on monetary policy largely ignore it. Moreover, both groups tend to rely on the shock-propagation-return to steady state macroeconomic paradigm: this rules out meaningful endogenous cycles, in which expansions sow the seeds of subsequent contractions. Cross-fertilisation has improved, but it has generally not yet narrowed the gap sufficiently. No doubt this area will see substantial progress in the years ahead; in the meantime, any analysis will have to be more partial and/or qualitative.

What about the *international policy dimension*? Historically, this has always been the hardest nut to crack. Spillovers and spillbacks take centre stage, alongside the different perspectives of individual countries. Further progress would need to proceed along two complementary lines (BIS (2015)). First, improving domestic MFSFs. If individual countries put in place effective domestic frameworks, the scope for disruptive spillovers diminishes. Second, addressing residual spillovers and spillbacks more systematically. This involves a range of possible approaches of increasing ambition: enlightened self-interest, in which individual countries seek to take spillovers and spillbacks into account – a particular responsibility for the largest jurisdictions with international currencies; occasional joint decisions, on both interest rates and foreign exchange intervention, beyond well-honed crisis responses; and possibly new global rules of the game to help instil greater discipline in national policies (eg Rajan (2016)).

Progress has been uneven so far. Microprudential regulation and supervision has a long tradition of close coordination; Basel III is just the latest example. Because of the macroprudential overlays in the agreement, co-ordination has now been extended to macroprudential tools, notably the countercyclical capital buffer. Its design seeks to align the incentives of home and host jurisdictions, with a view to limiting negative spillovers and regulatory arbitrage. It can set an example for other tools, whenever cross-border spillovers are a cause for concern. In the monetary

policy domain, there is less of a tradition of co-ordination and obstacles to tighter co-operation are higher. That said, over the last decade or so, there has been a keener recognition of spillovers and spillbacks. And central banks have strengthened their co-operation at times of stress, as illustrated by the more extensive use of central bank FX swap arrangements. All of these steps are most welcome, but also highlight the scope for further progress.



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