

The background of the cover features a close-up, slightly blurred image of several stacks of coins, likely Euro coins, arranged in a way that creates a sense of depth. The coins are in shades of gold, silver, and copper. In the background, a city skyline with illuminated buildings is visible, suggesting a financial or urban setting. The overall color palette is dominated by blues and greys, with the coins providing a warm, metallic contrast.

Integrated inflation targeting

Another perspective
from the developing world

Pierre-Richard Agénor and Luiz A Pereira da Silva

February 2019

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Abstract

This book provides a thorough assessment of recent experiences with inflation targeting (IT), the challenges it has faced since the global financial crisis, and ways in which these challenges have been, or should be, addressed. The discussion is conducted from the perspective of middle-income countries (MICs). As background for the analysis, Chapter 1 provides a review of key features of the financial system (with a focus on the role of bank credit) and the regulatory environment in MICs, the extent to which exposure to short-term capital flows affects economic stability in these countries, and the link between excessive credit growth and financial crises. Chapter 2 outlines the main characteristics of IT regimes, compared to other monetary policy regimes. Chapter 3 provides a detailed review of the evidence on the performance of these regimes in MICs. Both formal and informal evidence is considered. Chapter 4 discusses a number of challenges that IT has faced, including imperfect policy credibility, fiscal dominance, exchange rate volatility and the fear of floating, and the role of financial stability considerations in conducting monetary policy. The issue of whether monetary policy and macroprudential regulation are complements or substitutes, in a setting where both macroeconomic and financial stability matter, is taken up in Chapter 5. The analysis suggests that there are robust arguments to support the view that, in the context of an integrated inflation targeting (IIT) regime where central banks are concerned with achieving and maintaining both price and financial stability, monetary and macroprudential policies are complements. Issues associated with the design and practical implementation of IIT regimes are addressed in Chapter 6. The discussion emphasises the need to calibrate monetary and macroprudential policies jointly. Chapter 7 summarises the main policy lessons that can be drawn from the analysis.

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Foreword

In this book, Pierre-Richard Agénor and Luiz A Pereira da Silva provide a comprehensive assessment of the experience of middle-income countries (MICs) with inflation targeting (IT) regimes and the major challenges these regimes have faced, especially since the global financial crisis (GFC). Workhorse macro models used as the basis for these regimes provide an elegantly simple framework, but in practice central banks have been forced to balance many competing objectives. In some ways, the prescriptions of the models have been more honoured in their breach than in their observance.

Foremost among the challenges has been to find a better balance between guiding inflation and real macro variables from one month to the next and maintaining resilience of the system as a whole to booms and busts which play out over a longer horizon, and which are susceptible to fluctuations in external financial conditions. These challenges (which in many cases predate the GFC) have sometimes resulted in imperfect policy credibility, fiscal dominance, exchange rate volatility, fear of floating, and a role for financial stability considerations in conducting monetary policy.

In particular, a key issue that the GFC has brought to the fore is whether monetary policy and macroprudential regulation are complements or substitutes, in a setting where policymakers aim to attain both macroeconomic and financial stability objectives. This book discusses these issues and considers – without presuming that we know the full answer – ways in which these challenges have been, or can be, addressed. Some of the topics examined here relate to many themes that have been debated at the BIS in recent years – including, in particular, the effectiveness of policy frameworks that combine macroprudential and monetary policies.

In standard models that underpin flexible IT policy frameworks at most central banks, the financial sector does not play a large role in deriving the monetary policy conclusions. Financial markets operate in a frictionless way, and asset prices serve to equilibrate the system as a whole. Despite debates about the credit channel of monetary policy, the role of asset prices, leverage, and the value of collateral, during the “Great Moderation” most IT frameworks were managed without paying much attention to the build-up of financial systemic risk, as my colleagues at the BIS have emphasised.

However, the GFC reminded us of the consequences of insufficiently restrained financial systemic risk. The crisis was an effective reminder that simultaneously achieving two objectives, such as macroeconomic and financial stability, was a complex task and required the usage and coordination of two instruments. Moreover, the GFC also produced unprecedented levels of volatility and massive capital flows across countries. The spillovers associated with these flows magnified threats to financial stability, especially in MICs with an IT regime. This prompted a review of their IT policy frameworks, in particular regarding the role of interventions in foreign exchange markets to smooth volatility, policies to maintain financial stability, and the combined utilisation of both macroprudential and monetary policy. The authors suggest that, in a context where central banks and regulators are concerned with achieving and maintaining both price and financial stability, monetary and macroprudential policies are largely complements. The technical discussion in the book emphasises that because both policies work through the same transmission mechanism in the economy, they need to be calibrated jointly to produce optimal results. They label this proposed framework *integrated inflation targeting* (IIT). The book also discusses many other issues associated with the design and practical implementation of IIT regimes, such as the institutional mandates that should be delegated to policy entities and the need for consistency of the overall macroeconomic policy framework.

While this book does not prescribe any specific course of action, it covers an extensive literature and provides an excellent summary of the major analytical and policy debates that central bankers in MICs confront today when reflecting on the challenges facing their IT regimes. Its main policy lessons may also prove useful for some advanced economies, especially those subject to large capital movements. For the benefit of its diverse constituency and as part of its new medium-term Innovation 2025 strategy, the BIS will continue to promote the analytical and policy debate on the design and performance of monetary policy frameworks.

Agustín Carstens
BIS General Manager

Introduction and overview

The global financial crisis (GFC) triggered by the collapse of the subprime mortgage market in the United States in 2007–08 led to a vigorous debate about both the nature and the effectiveness of financial regulation, and whether central banks should consider explicitly financial stability objectives in the conduct of monetary policy. Indeed, several observers have argued that, when setting interest rates, central banks should consider more systematically the potential trade-offs that may arise between the goals of price stability – defined as maintaining a low and stable rate of inflation – and financial stability. A common argument to support this view is that the very achievement of price stability may be associated with an increased risk of financial instability: by fuelling overly optimistic expectations about future economic prospects, or by increasing incentives of lenders and borrowers to take on more risk, low and stable rates of inflation may foster the development of asset price bubbles and magnify financial vulnerabilities. Thus, price stability may not be a sufficient condition for financial stability. Monetary policy may need to internalise potential risks to economic stability and act pre-emptively, instead of “mopping up” after a crisis has erupted.¹

Inflation targeting (IT) has been the monetary regime of choice in a growing number of countries during the past two decades. The debate on the role of monetary policy in the aftermath of the GFC has therefore naturally taken place in the broader context of the debate on the performance of these regimes – in developed and developing economies alike. The risks that IT – even in the flexible form in which it has been applied in most countries from the very beginning – could pose to economic stability if central banks ignore potential asset price bubbles and the build-up of financial imbalances are well described by Woodford (2012, p 8), for instance:²

... the [global financial] crisis does justify reconsideration of at least one aspect of the inflation targeting doctrine that had developed over the previous two decades. This is the thesis that a central bank with an inflation target need not pay attention to financial developments – such as a credit-financed real estate boom – except to the extent that such developments affect the outlook for inflation (or perhaps, either for inflation or for real activity). While this thesis is not ... a central, definitional aspect of an inflation targeting regime, it was undoubtedly a common view among proponents of inflation targeting prior to the crisis. It is therefore important to reconsider both the extent to which such a view is defensible, and the extent to which it is a necessary element of a coherent approach to inflation targeting. Can this previously conventional view still be maintained, after recent experience? And if not, would this require abandonment of inflation targeting as well?

At the same time, other observers have argued that IT has by and large delivered price stability and should continue to focus solely on that objective; to prevent the emergence of asset price bubbles, contain financial imbalances, and ensure the stability of the financial system as a whole, policy authorities should use prudential (especially *macroprudential*) regulation and other tools at their disposal. The underlying view is that trying to stabilise asset prices, for instance, is problematic for a number of reasons. In particular, given the forward-looking nature of these prices, it is very difficult to know whether observed fluctuations in asset values result from changes in the economy’s underlying fundamentals,

¹ This debate actually predates the GFC and initially focused on the extent to which monetary policy should respond to (or *lean against*) perceived misalignments in asset prices, such as real estate and equity prices, as opposed to *cleaning up after*. In this vein, early contributions by Cecchetti et al (2000) and Kontonikas and Ioannidis (2005) find that overall economic volatility can indeed be reduced with a (mild) reaction of interest rates to asset price misalignments from fundamentals (see Wadhvani (2008) for a review of this early literature). As is made clear later, the focus in this book is on monetary aggregates, not asset prices.

² Mishkin (2011, p 32) expresses a similar view.

non-fundamental factors, or both. Consequently, central banks should focus instead on the *implications* of asset price movements for credit growth and aggregate demand, and thus inflationary pressures.

This book provides an in-depth analysis of the challenges that IT regimes face today, and ways in which they have been (or should be) addressed. In doing so the analysis goes well beyond the debate on whether monetary policy should incorporate a financial stability objective, as discussed earlier, and addresses a host of other issues that are important in assessing the relevance and performance of IT regimes in the past two decades. Our focus is on a representative group of 11 upper middle-income countries (MICs) in Africa, Asia and Latin America, as well as Turkey, that have adopted an IT regime for monetary policy (Brazil, Chile, Colombia, Ghana, Indonesia, Korea, Mexico, Nigeria, South Africa, Thailand and Turkey).³ Among the reasons for this choice are the facts that IT regimes in MICs face specific operational and credibility issues, and that the financial system and regulatory environment in these countries have characteristics that differ significantly from those of advanced economies (AEs). Moreover, because of their greater vulnerability to external shocks (including changes in monetary policy in AEs), financial stability in MICs is more dependent on the financial conditions prevailing in international capital markets.

We find that in the context of MICs there is much merit, in setting policy interest rates, in adding an adequate measure of the credit growth gap, defined as the difference between the actual growth rate of that variable and a reference or equilibrium growth rate – derived from a formal economic model rather than a pure statistical method. By doing so monetary policy (which can address only the time dimension of systemic risk) would help to counter accelerator mechanisms that generate excessive growth in credit and asset price pressures, which are common manifestations of financial imbalances. Indeed, a large body of evidence has documented that excessive credit growth tends to go hand in hand with a deterioration in lending origination standards. In turn, the weakening of lending standards tends to worsen credit quality and to increase financial fragility during a downturn. At the same time, monetary and macroprudential policies are complements in terms of achieving price stability and financial stability in its time series dimension. From an operational perspective, these policies should react countercyclically, and in a state-contingent fashion, to an adequate measure of the credit growth gap to address cyclical risks to the financial system and promote price stability. To inform policy decisions they should be calibrated jointly, using macroeconomic models that account for the type of credit market imperfections observed in MICs and for the two-way interaction between the monetary transmission mechanism and the macroprudential regime. To mitigate exchange rate volatility, and adverse effects on both the real and financial sectors – and, consequently, on price and financial stability – this policy mix should be combined with sterilised foreign exchange market intervention aimed at stabilising exchange rate fluctuations that are unrelated to economic fundamentals. In that sense, foreign exchange market intervention may be motivated by financial stability considerations. To prevent large and erratic movements in short-term capital flows, temporary capital controls may also be needed under some circumstances. This policy regime is referred to as *integrated inflation targeting* (IIT). In addition, we also argue that in commodity-exporting MICs, fiscal rules should be complemented by a stabilisation fund to provide more flexibility to the budget, ensure that fiscal policy operates as a complement to monetary policy in managing aggregate demand pressures, and improve the overall macroeconomic performance of IIT.

The remainder of the book proceeds as follows. To set the stage for the analysis, Chapter 1 provides a background on financial systems and the regulatory environment in MICs, the degree of synchronicity between the business cycle and the financial cycle, the link between capital flows and (macroeconomic and financial) volatility, and the link between credit growth and financial crises in these countries. Chapter 2 considers the main characteristics of IT regimes (as initially defined in the literature) and discusses the fundamental trade-off between credibility and flexibility that these regimes face. A brief

³ Statistically, “upper middle-income countries” are defined in accordance with World Bank classifications by income groups, as given in <http://data.worldbank.org/about/country-classifications>. Although technically Chile and Korea are high-income countries, we include them in some of the discussions given the relevance for MICs of their experience as IT countries.

comparison with two alternative monetary policy regimes (price level targeting and nominal income targeting) is also provided. Chapter 3 provides a thorough review of the performance of IT regimes in MICs during the past two decades, starting first with an informal review of the data and subsequently focusing on a wide range of econometric studies. Chapter 4 discusses the main challenges to IT at the present time: building and maintaining credibility; the risk of fiscal dominance, related in part to future budgetary liabilities; the management of terms-of-trade shocks in a volatile international environment; exchange rate volatility and the *fear of floating*; and whether (as discussed earlier) central banks should account explicitly for financial stability considerations in setting monetary policy. The last issue is taken up in greater detail in the next two chapters.

Chapter 5 focuses squarely on how to address financial stability challenges in an IT regime. It discusses whether reliance on macroprudential policy is sufficient to mitigate perceived risks to the financial system or if instead central banks should be more proactive in responding to these risks – above and beyond their conventional objectives of price and output stability – and whether monetary policy and countercyclical regulatory rules are complements or substitutes; that is, whether, and to what extent, they should be combined to jointly ensure macroeconomic and financial stability. Some observers have argued that a *leaning-against-the-wind* strategy – tightening monetary policy in response to heightened risks to financial stability – provides little or no benefits in terms of inflation or output stability, or that even if there is scope for leaning against the wind, doing so would entail non-trivial risks to the real economy. This analysis has been taken to support a sort of *separation principle*, according to which monetary policy should deal exclusively with near-term output and inflation (the business cycle, for short) while macroprudential policy should deal on its own with risks to financial stability (the financial cycle). Others, by contrast, have argued that when central banks are concerned with achieving and maintaining both price and financial stability, monetary and macroprudential policies are complements. Our analysis supports that view; it suggests the implementation of an IIT regime, in which both of these policies react countercyclically, and in a state-contingent fashion, to a credit gap measure to address cyclical financial risks and maintain price stability. Moreover, this policy mix must be combined with sterilised intervention aimed at stabilising exchange rate fluctuations that are unrelated to economic fundamentals. To mitigate large and erratic movements in short-term capital flows, temporary capital controls may also be needed under some circumstances.

Chapter 6 addresses design and implementation issues associated with IIT. It emphasises the importance of joint calibration of monetary and macroprudential policy rules, in the context of macroeconomic models that account for the type of financial frictions observed in MICs, given the close interactions between the transmission mechanisms of both policies. Indeed, macroprudential regimes may affect the monetary transmission mechanism in significant ways, while at the same time the way monetary policy responds to financial shocks may determine the effectiveness of macroprudential regulation. The chapter also argues that, in commodity-exporting IT countries, the implementation of a stabilisation fund may be an important step towards improving the overall macroeconomic performance of an IIT regime. The final chapter brings together the main policy lessons of our analysis and offers some concluding remarks.

Chapter 1. Background

To set the stage for the subsequent analysis, this chapter begins with a brief review of the main characteristics of the financial system and the regulatory environment in MICs. It then considers the degree of synchronicity between the business cycle and the financial cycle in these countries, the link between financial openness, capital flows, and volatility, and the empirical evidence on the relation between credit growth and financial crises.

1.1 Financial systems, supervision and regulation

With some notable exceptions, financial markets in many MICs remain underdeveloped compared to high-income countries. Commercial banks continue to dominate the financial system. Equity issues remain limited, despite progress in the past two decades in terms of a deepening of capital markets and changes in the ownership structure of firms. Capital markets remain thin; local currency bond markets are not well developed in many economies and do not represent significant alternatives to bank lending. According to IMF data for 2017, as a share of GDP, stock market capitalisation amounted to 66.3%, private debt securities for 83.9%, and bank assets for 288.8% for the euro area, and 153.5%, 113.9%, and 114.0%, respectively, for the United States. The corresponding figures for Latin America and the Caribbean were 34.4%, 25.4%, and 106.1%, and for Asia 68.3%, 58.2%, and 243.9%, respectively. Although these numbers are not specific to the major MICs in each of these two regions, they are fairly representative of their situation as well.

The nature of banking operations and their degree of sophistication in many MICs have been transformed in recent years by privatisation and cross-border acquisitions. However, the financial systems in most of these countries continue to lag behind. In particular, and despite some exceptions, the expansion of non-bank financial intermediaries (including hedge funds, commodities funds, private equity groups, and money market funds), the shift towards the “originate and distribute” model of banking, and the development of off-balance sheet instruments, have not reached the same level of importance as they have in AEs. Indeed, apart from in a few countries, non-bank financial intermediaries are not highly developed. Data compiled by Ghosh et al (2012), for instance, on the size of shadow banking activities in MICs show that the sector is large only in a few countries, such as Mexico, Chile and Turkey, where it represents about 55%, 42% and 27%, respectively, of overall deposits.⁴

The role of bank credit in MICs is well captured by the ratio of loans to the private sector to GDP. As shown in Figure 1.1, these ratios remain on average well below those observed in AEs. In particular, the credit-to-GDP ratio for MICs currently implementing inflation targeting (IT-MICs hereafter) represented about 75% on average over the period 2008–17, compared to the observed ratio of 190% for AEs currently implementing inflation targeting (IT-AEs hereafter). In addition, while this ratio has increased significantly in IT-AEs between 1990 and 1999 and 2008 and 2017, it has remained largely unchanged in IT-MICs. One exception is Brazil, where, as a result of greater financial inclusion, the credit-to-GDP ratio rose from 26%

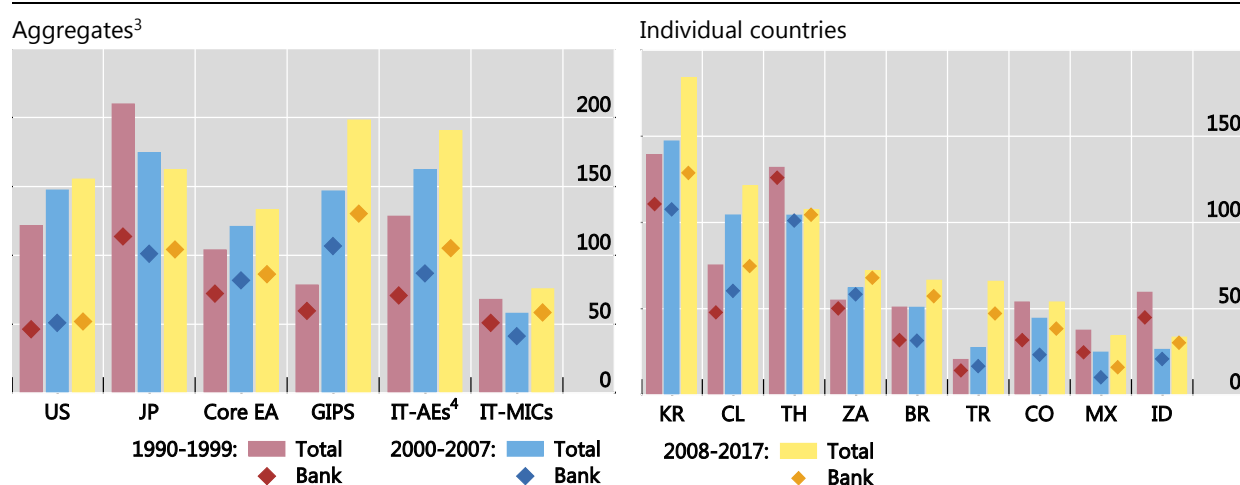
⁴ Shadow banking comprises a set of activities, markets, contracts and institutions that operate partially (or fully) outside the traditional commercial banking sector and, as such, are either lightly regulated or not regulated at all (see Institute of International Finance (2012) and Pozsar et al (2013)). In AEs, alternatives to conventional bank finance include invoice factoring or discounting (where a business borrows money against its invoices), asset-based financing (where money is borrowed against assets such as a plant or machinery), peer-to-peer and consumer-to-business lending (in which individuals agree to lend money to each other or to businesses through an online money exchange). New lending models also involve providing cash advances to businesses (such as restaurants and hotels) that derive much of their income from credit card sales. However, these new lending models have not yet reached a mass of borrowers that is critical enough to be considered serious alternatives to bank finance.

in 2004 to more than 65% in 2017. Others include Chile and Turkey although, in the latter case, from a fairly low base initially. In countries with stable fundamentals, one factor that may have hampered the expansion of credit in MICs may be inadequate disclosure and transparency requirements for corporate firms.⁵ With poor regulation of corporate governance and weak financial accounting transparency, firms indeed have limited incentives to consider equity issuance as an alternative source of funding – preferring instead to rely on either internal funds or borrowing from banks with which they have established close relations. The difficulty of seizing collateral (as discussed next) may also represent a significant constraint on the ability of banks to expand credit.

Domestic credit to private sector, 1990–2017^{1,2}

As a percentage of GDP

Figure 1.1



Core EA = Core euro area: Germany, France and Italy; GIPS = Greece, Ireland, Portugal, Spain; IT-AEs = Advanced economies which are inflation targeters: Australia, Canada, New Zealand, Norway⁴, Sweden, United Kingdom; IT-MICs = Middle-income countries which are inflation targeters: Brazil, Chile, Colombia, Indonesia, Korea, Mexico, South Africa, Thailand, Turkey.

BR = Brazil; CL = Chile; CO = Colombia; ID = Indonesia; JP = Japan; KR = Korea; MX = Mexico; TH = Thailand; TR = Turkey; US = United States; ZA = South Africa.

¹ Simple averages over the indicated period. ² Non-resident banks may be included in the total domestic credit to private sector; hence non-resident banks could be included in the non-bank share of domestic credit. ³ Weighted averages based on rolling GDP and PPP exchange rates. ⁴ IT-AEs group only includes Norway from 2000–07 period onwards.

Sources: National data; authors' calculations.

In many (although not all) MICs, supervisory capacity remains weak and the ability to enforce prudential regulations limited. As noted by FSB (2011), bank supervisors in these countries often lack the ability to assess the effectiveness of banks' risk management practices, especially the adequacy of capital in relation to the risks they undertake. This lack of expertise is especially problematic for those countries that have approved the use of the advanced approaches in Basel II and III, which allow banks to rely on internal models for the determination of credit risk estimates and capital requirements (see BCBS (2004)). Lack of supervisory capacity also affects the ability to assess other risks, such as market and interest rate risks.

In some cases, inadequate supervision and porous regulations are the legacy of heavy public sector involvement in the banking system, which weakens enforcement incentives, and an inadequate pay structure, which makes it difficult to lure well qualified individuals (who may be in limited supply to begin

⁵ See, for instance, Black et al (2010) for Brazil.

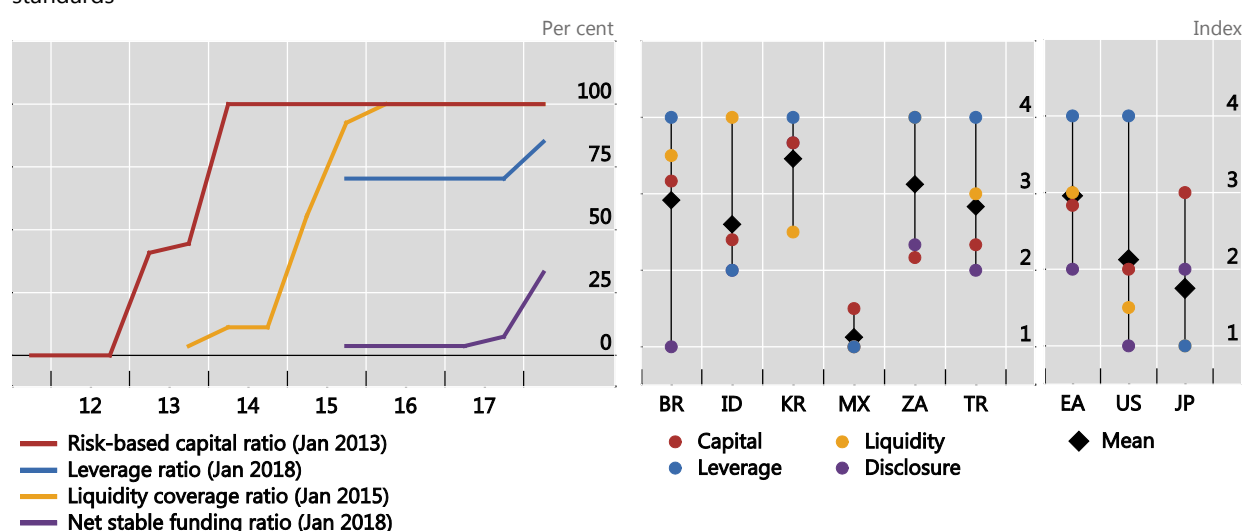
with) away from more lucrative private activities. As documented by Demirgüç-Kunt et al (2008), for instance, the quality of bank supervision – as measured by the overall compliance index with the Basel Core Principles for Effective Banking Supervision, which include a number of recommendations on prudential regulation and requirements – tends to be lower for developing countries, especially those of Latin America. In addition, although there has been progress in recent years, especially with respect to implementing risk-based capital ratios and liquidity coverage ratios, compliance with the Core Principles varies significantly across MICs, including IT-MICs (Figure 1.2). In turn, a weak regulatory environment may lead to *regulatory capture*, whereby regulatory agencies tend to act in the interest of special groups, and may create perverse incentives for banks to engage in overly risky activities. This in turn may weaken banking institutions, which may translate into high proportions of non-performing loans. As shown in Figure 1.3, while some IT-MICs (such as Brazil, Chile, Colombia and Mexico) have banks that are well provisioned against this type of loan, others (including Ghana, Indonesia, Nigeria, Thailand, Turkey and South Africa) do not. This makes banks in these countries particularly vulnerable to a slump in economic activity.⁶

Compliance with Basel standards, 2012–18^{1,2}

Figure 1.2

Continued progress in implementing major Basel standards³

Country-level compliance index



BR = Brazil; ID = Indonesia; KR = Korea; MX = Mexico; TR = Turkey; ZA = South Africa. EA = Core euro area: Germany, France and Italy; JP = Japan; US = United States.

¹ Index varies between 1 and 4. The closer to 4 a country is, the more compliant. ² The index is the ratio of country regulations' level of compliance with the following Basel standards: capital, leverage, SIB, liquidity, disclosure. These compliance levels are themselves constructed from the country regulations' level of compliance with the different requirements of each of the categories demanded as of January 2018. ³ Percentage of BCBS member jurisdictions in which each standard is in force; agreed implementation dates in parentheses.

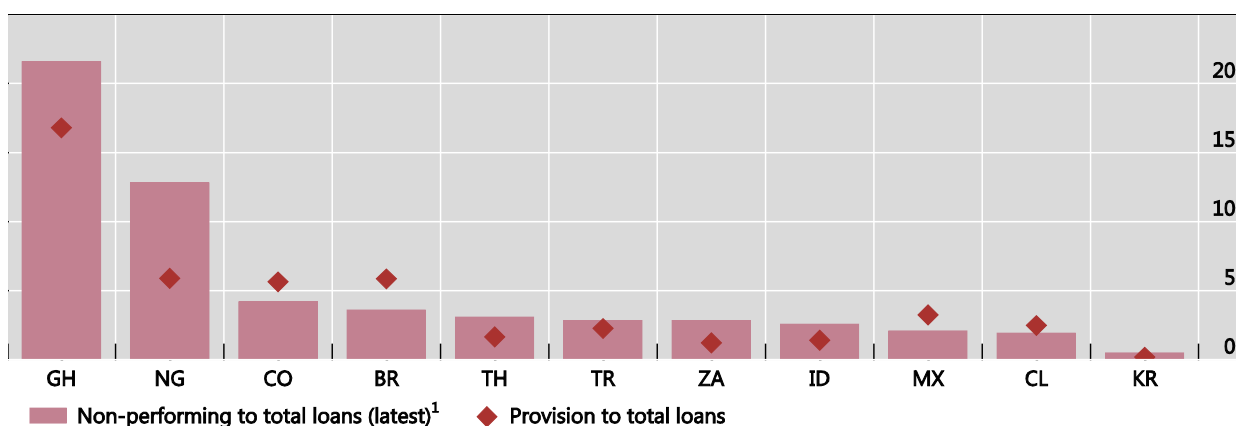
Sources: Basel Committee monitoring reports on the adoption of Basel standards; BCBS; authors' calculations.

⁶ Vazquez et al (2012), for instance, find a significant negative relationship between non-performing loans and (lagged) GDP growth in Brazil.

Bank provisioning and non-performing loans, selected years

As a percentage of total loans

Figure 1.3



BR = Brazil; CL = Chile; CO = Colombia; GH = Ghana; ID = Indonesia; KR = Korea; MX = Mexico; NG = Nigeria; TH = Thailand; TR = Turkey; ZA = South Africa.

¹ For Korea, 2014; for Chile, Nigeria, South Africa, Thailand and Turkey, 2016; for all others, 2017.

Source: IMF, Financial Soundness Indicators.

Finally, in many MICs property rights are weak and the legal system is highly inefficient or subject to abuse of power, thereby making contract enforcement difficult or very costly. In particular, bankruptcy laws typically provide little creditor protection and bankruptcy procedures for liquidating the assets of firms in default are rarely enforced, which results in low recovery rates for creditors.⁷ This in turn translates into weak financial intermediation, a high cost of borrowing, high rates of collateralised lending, and outright credit rationing – which often disproportionately affects small and medium-sized firms, whose ability to pledge collateral is weaker to begin with.

1.2 Credit market imperfections

Credit markets in MICs are often characterised by limited competition among banks. This has led to monopolistic or oligopolistic pricing practices, market segmentation, and efficiency losses. In recent years, there has been some improvement in that regard, in large part as a result of large-scale privatisation and bank restructuring. In Latin American MICs, for instance, this has helped to promote competition and generate efficiency gains in banking (see Williams (2012a)).⁸ Nevertheless, lack of competition continues to prevail in many countries and this has important implications for the monetary transmission mechanism, as discussed later.

⁷ See Araujo and Funchal (2005) for the case of Latin America and Djankov et al (2008) for a general review of debt insolvency procedures in developing countries.

⁸ Whether improved competition helps or undermines financial stability remains a matter of debate. A common view is that greater competition forces banks to become more efficient and this mitigates financial fragility. However, increased competition in banking may also raise the risk of financial instability. First, it may raise systemic risk, as weak banks *gamble for resurrection* by increasing the riskiness of their loan portfolios. Second, rents created by imperfect competition may induce banks to monitor their borrowers better (because there is more at stake) and to expand efforts to mobilise deposits (because there are rents to be earned on them). Both the quality and the level of financial intermediation can therefore be higher than under financial liberalisation. This view is in line with the *financial restraint* argument discussed by Hellmann et al (1997). See, for instance, Degryse and Ongena (2008) for a general review of the evidence on the link between competition and bank stability and Ariss (2010) for a specific focus on developing countries.

Asymmetric information problems (related to adverse selection or moral hazard) tend also to be more severe in MICs than in AEs. This makes screening out good credit risks from bad ones difficult, and fosters collateralised lending, as noted earlier, and short-maturity loans. Moreover, and despite recent trends towards privatisation, governments in many countries continue to play a pervasive role in banking. While this involvement may have proved useful in the aftermath of the GFC – it made it easier to implement countercyclical demand policies in countries where systematic earmarking of expenditure and fiscal rules prevented fiscal policy from playing a stabilising role – it may exacerbate moral hazard problems, by promoting connected lending and regulatory forbearance.

Related to the lack of financial diversification discussed earlier, bank credit plays an important role in many MICs – it serves to finance not only longer-term investment projects but also working capital needs. Indeed, firms often borrow short term to finance their acquisition of labour inputs, raw materials, and so on, prior to the sale of output (see Agénor (2019)). As a result, monetary policy may have a direct impact on the supply side of the economy. But while an increase in the cost of loans for consumption or investment (induced by a contractionary monetary policy) tends to reduce both aggregate demand and inflationary pressures, an increase in the cost of working capital loans affects output and inflation in opposite directions: it tends to reduce output and to raise prices, as firms pass on the higher cost of borrowing to their customers. This creates the possibility of a *price puzzle*, which makes the transmission of monetary policy shocks to prices highly uncertain and may affect (as discussed later) the performance of IT regimes.

1.3 Business cycles and financial cycles

In addition to its implications for the impact of monetary policy, the relationship between short-term credit and output – with credit often preceding output at turning points – means that the business cycle and the financial cycle in MICs tend to be more closely synchronised than in AEs, as documented by Amador et al (2014), Calderón and Fuentes (2014) and Gonzalez et al (2015). In particular, Amador et al (2014) find that, even though on average credit cycles are longer in duration and larger in amplitude than output cycles, MICs in Latin America (including Brazil, Chile, Colombia, Mexico and Peru) tend to have cycles that are shorter (albeit deeper) than those exhibited by AEs. For Brazil alone, Gonzalez et al (2015) estimate the periodicity of the financial cycle at about six years, close to the mean frequency of the business cycle.

More generally, there are strong linkages between different phases of business and financial cycles. As documented by Claessens et al (2011a), based on a sample of 44 countries, recessions associated with financial disruption episodes (most notably a collapse in house prices) tend to be longer and deeper than other recessions, whereas recoveries associated with rapid growth in credit and increases in house prices (which often go hand in hand, due to the use of housing as collateral) tend to be stronger. Indeed, the correlation between the business cycle and the financial cycle stems essentially from the fact that risks to the financial system are typically built in the upswing of the financial cycle, when credit, asset prices, leverage and maturity mismatches all rise in a mutually reinforcing manner. In an upturn, expanding credit puts upward pressure on asset prices (especially housing prices in MICs), thereby strengthening balance sheets and collateral values, and prompting further credit growth. At the same time, credit growth is often magnified by a weakening of lending standards and reduced screening intensity by lenders during upturns.⁹ To the extent that decisions of individual financial institutions ignore these self-reinforcing effects, the upswing is characterised by an excessive expansion of credit and leverage. The opposite

⁹ See Dell'Ariccia and Marquez (2006) for a general discussion of the various channels through which credit booms may lead to a weakening of lending standards. Jiménez and Saurina (2006) provide evidence of a positive relationship between rapid credit growth and loan losses in Spain. The evidence for MICs is more limited but goes in the same direction, as discussed in various publications by the FSB Working Group on credit origination.

happens (often more abruptly) in the downswing, during which a vicious circle is unleashed between asset sales, sharp drops in asset prices, deteriorating lending portfolios, and rapid deleveraging.¹⁰

1.4 Financial openness, capital flows, and volatility

The process of global integration with world capital markets that started in the mid-1980s in many MICs has been accompanied by a substantial rise in private capital flows to these countries. The conventional distinction in terms of what drives capital flows is between “push” factors (macroeconomic and structural reforms that attract capital from abroad as a result of changes in regulation and improvements in the risk-return characteristics of assets issued by MICs) and “pull” factors (cyclical factors that affect the risk-return characteristics of assets issued by AEs). While foreign direct investment (FDI) is generally driven by longer-term prospects (push factors), short-term, cross-border capital flows are highly responsive to changes in relative rates of return, including movements in interest rates in AEs and changes in risk perception among global investors (pull factors). Indeed, fluctuations in short-term flows have become very sensitive to global cyclical factors.¹¹

There are substantial potential benefits associated with capital flows. These benefits include the possibility of international risk-sharing and consumption smoothing, a positive impact of capital flows (especially FDI) on domestic investment and growth, enhanced macroeconomic discipline, and increased efficiency, as well as greater stability, of the domestic financial system associated with foreign bank penetration.¹² However, as documented in a number of studies, the risk of volatility and abrupt reversals in short-term capital movements may represent a substantial cost. A wave of currency and banking crises during the past two decades, including most recently the GFC (and the liquidity policies that were followed by major AEs in its aftermath), have heightened concerns associated with such reversals. Figures 1.4a and 1.4b, for instance, show the behaviour of gross capital flows (and various components thereof) in Brazil and Thailand, respectively, during recent years. The data suggest that while FDI flows have remained relatively stable, episodes of quantitative easing in the United States (especially the initial episode (“QE1”), which lasted from December 2008 until March 2010, whereas QE2 took place between November 2010 and June 2011) have been accompanied by a sharp increase in equity-related flows – especially in Brazil. More formally, Tillmann (2016) for instance finds that quantitative easing had significant effects on financial conditions around the world and played a sizeable role in explaining international movements in capital, changes in equity prices and exchange rate fluctuations.

From the perspective of financial stability, the main source of concern is *gross*, rather than *net*, capital flows, because of the risk that these flows, intermediated directly or indirectly through the banking system, may lead or contribute to the formation of credit-fuelled bubbles. With greater international financial integration, these risks have become more potent. Forbes and Warnock (2012) find that in recent years the size and volatility of gross flows in many countries have increased, while net capital flows have been more stable. Broner et al (2013) also find that gross capital flows are very large and volatile, relative to net capital flows. In addition, their results indicate that gross capital flows tend to be procyclical relative to domestic conditions: during expansions, foreigners invest more domestically whereas domestic agents

¹⁰ See Demirgüç-Kunt and Detragiache (2005) and Agénor and Montiel (2015) for a review of the evidence for developing countries.

¹¹ See Forbes and Warnock (2012), Ghosh et al (2012), Ahmed and Zlate (2014), Herrmann and Mihaljek (2013) and Okada (2013) for an analysis of the role of global and domestic factors in explaining “waves” of international capital flows over large samples, and Fratzscher (2012) for a more specific study of the importance of push and pull factors before and after the GFC. See also Agénor and Montiel (2015, Chapter 13) for a review of the evidence on the determinants of capital flows to developing countries.

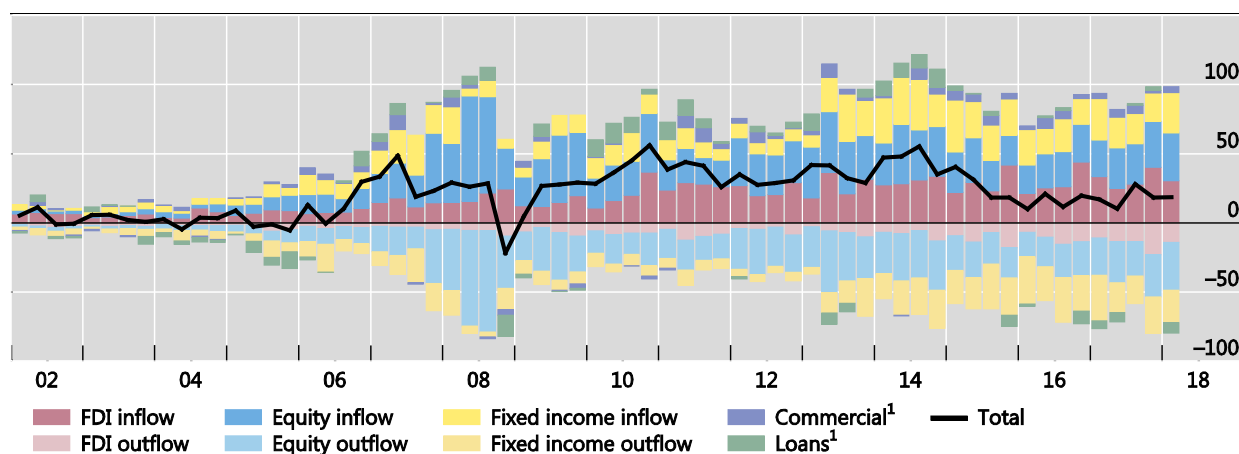
¹² See Kose et al (2006) and Agénor (2012) for a more detailed discussion. See also Korinek (2018) for a quantitative assessment of the benefit of FDI flows.

invest more abroad; by contrast, during crises, total gross flows collapse and there is a retrenchment in both inflows by foreigners and outflows by domestic agents.

Gross capital flows: Brazil, 2002–18

In billions of US dollars

Figure 1.4a



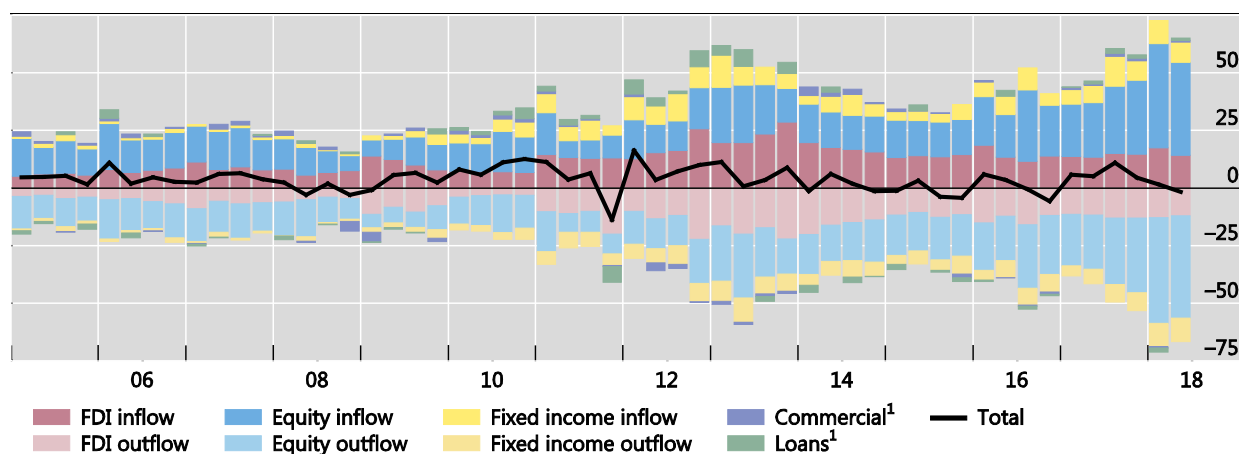
¹ Net flows.

Sources: Central Bank of Brazil; authors' calculations.

Gross capital flows: Thailand, 2005–18

In billions of US dollars

Figure 1.4b



¹ Net flows.

Sources: IMF, *BPM6*; Bank of Thailand; authors' calculations.

Among gross flows, bank-related flows are especially important, because of their potential direct impact on the provision of credit to domestic agents (as noted earlier) and their role in transmitting international shocks (see Claessens (2017), Agénor and Pereira da Silva (2018), and World Bank (2018)). For instance, deteriorations in the balance sheets of domestic banks can push them to sell assets held abroad or to recall external loans to comply with changes in domestic prudential regulation, such as capital

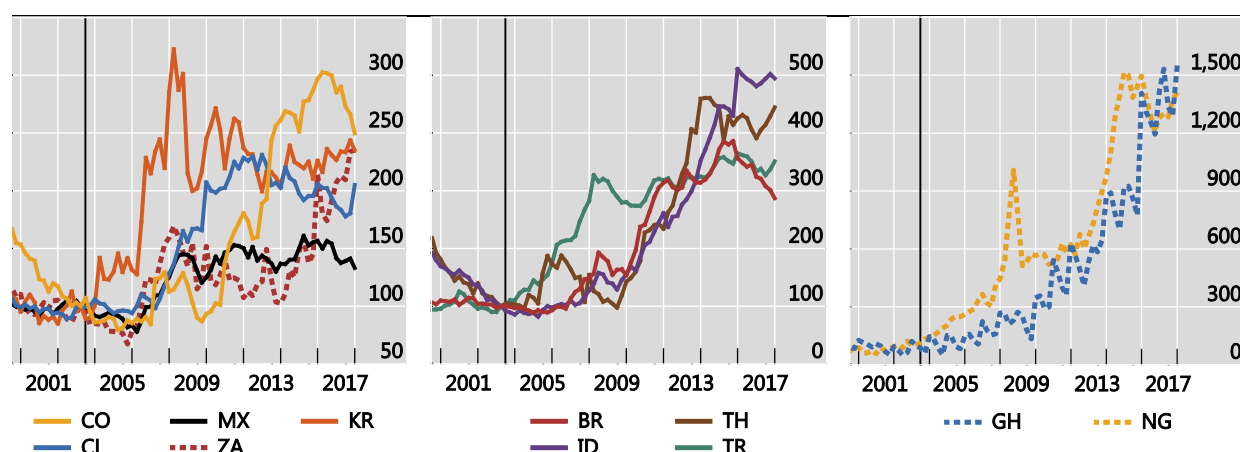
requirements or maximum leverage ratios.¹³ Indeed, there is now significant evidence that macroprudential policies are subject to leakages across countries and can generate significant credit spillover effects of their own, as a result of global banks shifting activities across countries in response to changes in prudential regulation where they are based, essentially outside the scope of the instrument's application and enforcement. These spillover effects can operate not only through direct lending to foreign-country borrowers (firms or households) but also through lending locally to foreign branches, as well as through a "rebooking" of loans – whereby credit is originated by subsidiaries, but then booked on the balance sheet of the parent institution.¹⁴

In the wave of capital flows that preceded the GFC, bank-related flows were particularly large. Figure 1.5 shows, in the form of an index normalised to 100 in the first quarter of 2003, claims of BIS reporting country banks on borrowers in the group of 11 IT-MICs that this book will focus on (Brazil, Chile, Colombia, Ghana, Indonesia, Korea, Mexico, Nigeria, South Africa, Thailand and Turkey), over the period 2001–17. The data show that all of these countries experienced a significant boom in cross-border lending in the years preceding the GFC.¹⁵ In most cases these flows tapered off in the immediate aftermath of the GFC (see Hoggarth et al (2010)), but overall banking globalisation has now resumed at a significant pace, with a few exceptions, such as Brazil, in terms of countries of destination (see McCauley et al (2017)).

External claims (loan and deposit) of BIS reporting country banks on borrowers in selected countries, 2001–17

2003 Q1 = 100

Figure 1.5



BR = Brazil; CL = Chile; CO = Colombia; GH = Ghana; ID = Indonesia; KR = Korea; MX = Mexico; NG = Nigeria; TH = Thailand; TR = Turkey; ZA = South Africa.

Source: National data.

¹³ Krugman (2008) refers to such international financial contagion as the *international finance multiplier*; changes in asset prices are transmitted internationally through their effects on the balance sheets of banks and other highly leveraged financial institutions. See Herrmann and Mihajek (2013) for some formal evidence on the role of bank lending flows in transmitting financial shocks across borders and Buch and Goldberg (2015) for a broader review.

¹⁴ See Reinhardt and Riddiough (2014), Claessens (2017), and Agénor and Pereira da Silva (2018) for a discussion. Buch and Goldberg (2017) and World Bank (2018) provide a review of the evidence on the impact of cross-border lending by foreign banks on domestic credit.

¹⁵ As argued by Bruno and Shin (2015), the increase in cross-border lending reflected the interaction of the supply and demand for wholesale funding between global and local banks. When local and global banks interact in the market for wholesale bank funding, the liabilities of local banks serve as the assets of the global banks, and the lending by global banks is the supply of wholesale funding, while the borrowing by local banks is its demand.

The volatility associated with short-term capital flows is a major concern because the evidence shows that the financial system in MICs is often highly vulnerable to external disturbances – and even more so now to global financial cycles, as a result of increased international financial integration (see Box 1). Abrupt reversals in short-term capital movements tend to exacerbate financial volatility – particularly in countries with relatively fragile financial systems, weak regulatory and supervisory structures, and policy regimes that lack flexibility and credibility. A number of studies have indeed documented a positive relation between the increasing international capital flows due to greater integration with world financial markets and vulnerability to sudden reversals in capital flows. For instance, Broto et al (2011) find that since 2000 global factors have become increasingly significant relative to country-specific drivers in determining the volatility of capital inflows into several MICs, whereas Dufrénot et al (2011) find that stress indicators in US financial markets in the aftermath of the GFC caused abrupt changes in stock market volatility in several Latin American countries. In the same vein, Galindo et al (2010), using a cross-country data set covering 17 countries in Latin America between 1996 and 2008, find that financial integration, despite contributing to a deepening of domestic credit markets, amplified the impact of international financial shocks on domestic aggregate credit and interest rate fluctuations. A different, but largely complementary, perspective on global integration, capital flows and volatility is proposed by Agosin and Huaita (2012). They define a *sudden flood* (or capital boom, in their terminology) as an episode where (gross) capital inflows are larger than one standard deviation above the historical mean and represent at least 5 percentage points of GDP.¹⁶ Sudden stops are defined in symmetric fashion. Using a sample of mostly MICs over the period 1976–2003, they find that sudden floods are good predictors of subsequent sudden stops. Moreover, the probability of a sudden stop increases dramatically the longer the preceding capital boom.¹⁷ Thus, sudden stops may not be due only, or mainly, to a (current or expected) deterioration in domestic economic fundamentals – in the form of a deterioration of the current account deficit, an appreciation of the real exchange rate, an excessive rise in bank credit to the private sector, or a mismatch in the balance sheets of firms and banks that borrow in foreign currency; that is, a situation where foreign currency-denominated liabilities are large compared to foreign currency-denominated assets – or abrupt changes in risk perception on world capital markets, but could represent downward overreactions to previous periods of positive overreaction in capital flows. Put differently, sudden floods may be the very reason why sudden stops tend to occur.

Box 1

Capital flows: procyclicality, volatility, and macroeconomic effects

Research on the benefits and costs of international financial integration has highlighted the fact that access to resources on world capital markets may be asymmetric or procyclical: countries may be able to borrow only in good times, whereas in bad times they may face credit constraints. As a result, agents (public or private) may be unable to borrow to smooth consumption in the face of temporary adverse shocks – precisely when insurance is needed the most.

There are essentially two sets of factors that may explain the procyclical behaviour of short-term capital flows (see Agénor (2012)). The first is quite general: asymmetric information problems may trigger herding behaviour because partially informed investors may rush to withdraw their capital en masse, in response to an adverse shock whose economic consequences for the country are not fully understood. The second is more specific to MICs, where economic

¹⁶ This is a rather stringent definition. In IMF (2011a) for instance, a sudden flood (or capital inflow surge) is identified as a period when net inflows exceed the historical trend by one standard deviation and are larger than 1.5% of GDP only. In Balakrishnan et al (2012), an episode of large net private capital flows is defined as a period of two or more quarters during which these flows, as a share of GDP, are larger (by one standard deviation) than their historical trend – taken to be an eight-quarter moving average – or above the 75th percentile of their distribution over the whole sample.

¹⁷ Related results are established by Benigno et al (2015).

shocks tend to be larger and more frequent, reflecting their relatively narrow production base and (for some of them, including a number of IT-MICs) their greater dependence on primary commodity exports. A common adverse shock to a group of countries may lead to a deterioration in creditworthiness as a result of abrupt changes in risk perception. This can lead to a situation where borrowers who are only marginally creditworthy lose access to world capital markets. Moreover, perceived risk may increase more in response to a large adverse shock than in response to a small shock, and it may increase more in response to a negative shock than it declines in response to a positive shock of the same magnitude.

A key consequence of procyclicality is that it may exacerbate macroeconomic instability: by attracting large capital inflows, favourable shocks encourage consumption and spending at levels that are unsustainable in the longer term, forcing countries to over-adjust when an adverse shock hits and access to capital markets is curtailed.¹⁸

More generally, a high degree of financial openness may be conducive to a high degree of volatility in capital movements, resulting in large reversals in short-term flows associated with speculative pressures on the domestic currency. This possibility raises the risk that borrowers may face costly *liquidity runs*, as discussed for instance by Chang and Velasco (2000). The higher the level of short-term debt relative to the borrowing country's international reserves, the greater the risk of such runs. High levels of short-term liabilities intermediated by the financial system also create risks of bank runs and systemic financial crises. Large capital inflows and excessive liquidity can lead to the development of bubbles as well, particularly in the real estate sector.

Volatility in capital inflows may also translate into exchange rate volatility (under flexible exchange rates, in the absence of intervention by the central bank) or large fluctuations in official reserves (under a pegged exchange rate regime), as well as volatility in domestic equity markets. Financial volatility may have costly real effects as well – nominal exchange rate volatility, in particular, may hamper the expansion of exports if appropriate hedging instruments are not available to domestic producers (see Baak et al (2007), for instance).

In general, the degree of volatility of capital flows is related to both actual and perceived movements in domestic economic fundamentals, as well as external factors, such as movements in world interest rates or changes in risk appetite by international investors. The fact, for instance, that investor sentiment (particularly that of highly leveraged, speculative trading institutions, such as hedge funds) is constantly changing in response to new information creates the potential for markets to overshoot on a scale that can generate abrupt changes in capital flows and financial crises. Short-term portfolio flows, in particular, tend to be very sensitive to herding among investors and contagious factors. In turn, herding behaviour often translates into large movements into, and out of, certain types of assets, which exacerbate fluctuations in asset prices and capital movements. Investor herding, however, is not evidence of irrationality. On the contrary, herding can be a rational response in the presence of several factors (Devenow and Welch (1996)).

Volatility of capital flows can also result from contagion effects.¹⁹ Financial contagion may occur when a country suffers massive capital outflows triggered by a perceived increase in the vulnerability of a country's currency by international investors, or, more generally, a loss of confidence in the country's economic prospects as a result of developments elsewhere. It may also occur through two other channels, with indirect effects on the volatility of capital flows: terms-of-trade shocks or competitiveness effects. An example of the former is provided by the events that followed the Asian crisis in the late 1990s, which led to a sharp reduction in the demand for imports by crisis-stricken countries and a drop in world commodity prices. Terms-of-trade shocks, for their part, may translate into financial contagion by increasing the degree of uncertainty regarding the short-term economic outlook of a country.

Finally, volatility of capital flows may be the manifestation of a deeper problem of *underinsurance*, which translates into a bias towards short-term borrowing. As discussed by Caballero and Krishnamurthy (2004), underdeveloped domestic financial markets may lead to a distorted valuation of international resources, and this in turn may lead to external underinsurance. In their analysis, when domestic financial markets are underdeveloped – which they characterise as a situation where the domestic collateral value of projects is less than their expected

¹⁸ See, for instance, Agénor (2006) and Agénor and Montiel (2015, Chapter 13) for a formal analysis of the procyclical behaviour of capital flows in response to adverse shocks to world interest rates.

¹⁹ See Pericoli and Sbracia (2003) for a review of the various channels through which cross-border financial contagion may occur. Razin and Sadka (2004) illustrate how an exogenous shift in market sentiment (taking the form of an extraneous change in credit ratings) can move a country from a good equilibrium with high investment to a bad equilibrium with low investment – even with strong economic fundamentals.

revenues – then agents' external insurance decisions are distorted. Domestic agents in need of external resources cannot transfer the full surplus generated by these resources to other participants in domestic financial markets who do have access to scarce external funds. Thus, in equilibrium, the scarcity value of external resources is depressed and private decisions are biased against hoarding international liquidity, thereby insuring against these events. In practice, underinsurance with respect to external shocks can take many forms, such as excessive external borrowing during booms and a maturity structure of private debt that is distorted towards the short term.

Whatever the external source of volatility in capital flows, its effects can be magnified by domestic market distortions. To the extent that private capital flows are channelled to the domestic economy through commercial banks, credit market inefficiencies can magnify the effect of changes in, say, external interest rates, and lead to fluctuations in domestic output that may have feedback effects on capital flows (see Agénor and Aizenman (1999)).

Several studies have examined the degree of volatility (or, conversely, persistence) of cross-border capital flows during the past decades. A common result of these studies is that FDI tends to be less volatile than other forms of capital flows. For instance, in a study of 35 countries covering the period 1990–2003, Sula and Willett (2009) find that direct investment is by far the most stable category of capital flows.²⁰

The macroeconomic effects of capital flows have also been the subject of a large literature. One strand of the literature focuses mainly on exchange rate effects and includes Jongwanich (2010), Ibarra (2011), Sá et al (2011), Ben Naceur et al (2012), and Barroso et al (2016). In a study of a group of Asian countries over the period 2000–09, Jongwanich (2010) finds that capital inflows lead to a significant real appreciation. In the same vein, Ibarra (2011) analyses the long-run determinants of the Mexican peso's real exchange rate from 1988 to 2008. Controlling for various standard determinants, the study shows that all types of capital inflows are associated with an appreciation of the peso. In contrast to recent multi-country studies, it finds no evidence of a less harmful effect from FDI – on the contrary, FDI's appreciation effect can be particularly strong. Focusing on AEs, Sá et al (2011) find that shocks to capital flows have a significant impact on private sector credit. In a study focusing on a sample of 57 developing countries and a disaggregation of capital flows into six types, Ben Naceur et al (2012) find that portfolio investments and foreign borrowing are associated with a real appreciation, whereas remittances have disparate effects across regions. FDI, for its part, has no effect on the real exchange rate. Focusing on Brazil and on the period that followed the quantitative easing policies adopted by the Federal Reserve in the aftermath of the GFC, Barroso et al (2015) find that capital inflows led to a significant exchange rate appreciation (as well as increases in stock market prices and a credit boom). The effect on inflation was less robust, as it was partly mitigated by currency appreciation. These results are consistent with the model-based analytical predictions in Agénor et al (2014, 2018).

A second strand of the literature focuses on the effects on asset prices and includes Balakrishnan et al (2012) and Olaberría (2012). Balakrishnan et al (2012) provide evidence of sustained pressures on property prices in Asian MICs during episodes of large capital inflows. Using a panel of 40 countries from 1990 to 2010, Olaberría finds that less advanced economies are more likely to experience booms in asset prices during periods of large capital inflows. At the same time, financial development, the quality of institutions, and the exchange rate regime can influence the association between capital inflows and booms in asset prices.

A third strand of the literature focuses on the effects of capital flows on domestic credit and includes Furceri et al (2011) and Amri et al (2016). Using a broader sample of countries over the period 1970–2007, Furceri et al (2011) find that in the two years following the beginning of a capital inflow episode, the credit-to-GDP ratio increases by about 2 percentage points. The study also finds that the short-term effect of capital inflow shocks on domestic credit depends on each country's macroeconomic policy stance. In particular, this effect is lower in countries with a higher degree of exchange rate flexibility. In a study using 14 different measures of capital surges (gross and net) and five different credit boom proxies over a sample of 46 countries (including a large number of MICs) from 1981 to 2010, Amri et al (2016)

²⁰ However, the finding that FDI flows tend to be more stable than other types of flows may need to be taken with some degree of caution. First, because FDI as conventionally measured includes the retained earnings of all previous FDI flows, it tends to display more inertia. Second, the classification of direct and portfolio flows in balance of payments statistics is somewhat arbitrary. Foreign investment in the equity of a company above a critical proportion (say, 10%) of outstanding equity is usually classified as FDI, whereas that below the critical threshold is classified as portfolio investment. However, small differences above or below the threshold do not necessarily represent any significant difference in the intentions of investors. Finally, even though physical capital (such as buildings and heavy equipment) cannot be easily moved out of a country at short notice, in practice reversals in FDI flows often occur through financial transactions. For instance, a foreign subsidiary in a host country can borrow domestically against its local assets and then transfer (lend) the funds to its parent company abroad.

also find a close correlation between capital surges and credit booms, although it appears to be weaker than in other studies. Indeed, a much higher proportion of credit booms were preceded by surges than surges were followed by credit booms. It is the latter that is most relevant for the question of how well countries are able to protect themselves against potential adverse effects associated with capital flows. Proportions of surges that were followed by booms fell somewhat in the 2000s. The lower correlation between surges and subsequent booms suggests that many countries have now improved their ability to protect themselves against some of the potentially adverse effects of capital inflows on domestic credit – through the adoption of more flexible exchange rate regimes, a more intensive use of sterilised intervention, and stronger financial regulation and supervision. As discussed in Chapter 3, this is important for assessing macroeconomic outcomes under IT.

What this evidence suggests is that the volatility associated with large capital inflows is often the consequence of the rapid increases in liquidity, aggregate demand pressures, real exchange rate appreciation, and growing external imbalances associated with these flows.²¹ During the surge episode of the early to mid-1990s for instance, that was particularly the case in the main recipient countries in Latin America (compared to those in Asia), as a result of various factors.²² The deterioration in competitiveness weakened the credibility of the fixed exchange rate in some of these countries and raised doubts about their sustainability. The domestic liquidity expansion that resulted from these inflows may have been a factor behind the credit boom and the subsequent deterioration in banks' balance sheets that some of these countries experienced. The surge in capital flows to MICs in the immediate aftermath of the GFC – caused in part, as noted earlier, by the increase in global liquidity associated with the expansionary monetary policies pursued by reserve currency countries – has also induced booms in credit and equity markets, real appreciation, and inflationary pressures in many recipients and raised concerns about asset price bubbles and financial fragility.²³ Between March 2009 and August 2011 for instance, Brazil, South Africa and Colombia recorded real appreciations of 39%, 29% and 24%, respectively. Figure 1.6 shows that real property prices in some major cities in IT-MICs have increased significantly since 2010.

The evidence also suggests that the more open and integrated a country is to global financial markets, the deeper are the channels through which reversals in capital flows will impact both the real economy and the financial system – and the more critical the policy response becomes to ensure macroeconomic and financial stability. In addition, cross-border bank-related capital flows can be a potential source of instability, not only because of their size but also because they may amplify cyclical movements in domestic financial conditions and exacerbate domestic imbalances. Increased exposure to adverse shocks magnifies the possibility of default and the risk of bankruptcy among borrowers and lenders alike. The former also tends to foster collateralised lending.

²¹ Episodes of large capital inflows, in Latin America and elsewhere, have not been systematically associated with upfront increases in inflation. A key reason is that in many cases the deflationary effect of the exchange rate appreciation associated with these inflows (especially when a large proportion of intermediate goods is imported) has been very pronounced.

²² See, for instance, Fernandez-Arias and Montiel (1996). Chief among these factors were the greater reliance on pegged exchange rates in Latin America (which provide no "cushion" when residual inflation is high); the different composition of inflows (FDI flows accounted for a larger share of inflows to Asian countries); the allocation of these flows (with a more pronounced tendency to allocate flows to investment in Asia, as opposed to consumption in Latin America); and the better ability of Asian countries to sterilise and control the money supply. As it turned out, however, these differences did not prevent a costly financial crisis in East Asia in the late 1990s.

²³ Box 1 also summarises some recent studies on the macroeconomic effects of capital flows on exchange rates, asset prices and credit growth.

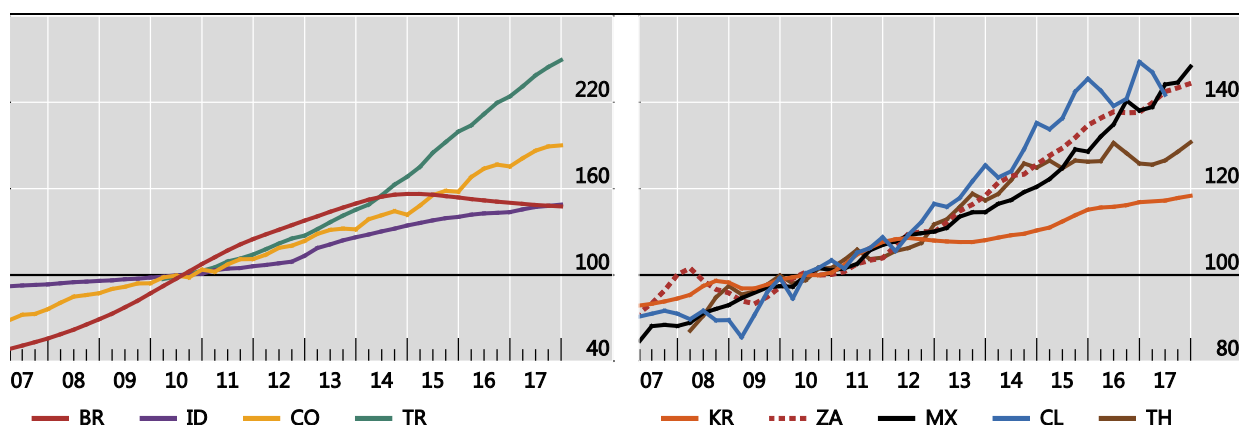
1.5 Credit booms and financial crises

MICs (and developing countries in general) have suffered many costly crises over the past three decades, with large drops in output, persistent credit crunches, and sharp increases in unemployment and poverty. Using panel data covering the period 1975–97, Hutchison and Noy (2006) for instance found that currency crises led to reductions in output of about 5–8% over a two- to four-year period, whereas banking crises led to output reductions of the order of 8–10% over the same period. In the same vein, Joyce and Nabar (2009) found that banking crises have a significant negative effect on domestic investment.²⁴

Real property prices, 2007–17

2010 = 100

Figure 1.6



BR = Brazil; CL = Chile; CO = Colombia; ID = Indonesia; KR = Korea; MX = Mexico; TH = Thailand; TR = Turkey; ZA = South Africa.

Source: National data.

Less extreme events of financial instability also tend to be costly in terms of activity and employment. As discussed by Bloom et al (2012), for instance, firms may become more cautious in investing and hiring when financial uncertainty increases. It may also hamper the economy's ability to reallocate resources following shocks. This, in turn, may have adverse effects on activity and employment. At a more empirical level, Cardarelli et al (2009), for instance, find that slowdowns or recessions are often substantially more severe when they are preceded by financial stress. In particular, slowdowns or recessions preceded by banking-related stress tend to involve two to three times greater cumulative output losses and tend to last two to four times as long. In the same vein, Claessens et al (2011b) find that recessions in MICs are longer and deeper when accompanied by financial disruptions – the average output decline in a recession rises from 5.0% if there is no concomitant credit crunch to 8.5% if there is a credit crunch. Likewise, recessions associated with equity price busts result in a 6.8% decline in output, on average, versus a milder 3.3% fall in the absence of equity price busts. Other studies have found that recessions whose origin is the collapse of credit-fuelled bubbles – periods during which banks make loans that appear to have abnormally low expected returns – also tend to be more severe and longer-lasting than those generated by “normal” monetary policy contractions aimed at curbing inflationary pressures.

More generally, rapid credit growth – often associated with episodes of large capital inflows in MICs, as documented earlier – is often a warning sign of financial instability. Even though not all episodes of credit booms end up in crises, crises are almost invariably preceded by episodes of credit booms. Indeed, there is robust evidence to that effect. For instance, in a study of 61 developed and developing countries over the period 1960–2010, Mendoza and Terrones (2012) find a systematic relationship between

²⁴ See Agénor and Montiel (2015, Chapters 14 and 15) for a review of the evidence on crises in MICs.

credit booms and a boom-bust cycle in production and absorption, asset prices, real exchange rates, capital inflows, and external deficits. Banking crises, currency crises or sudden stops often follow credit booms, and they do so at similar frequencies in developed and developing economies.²⁵ In the same vein, Dell'Ariccia et al (2012) find that credit booms – which are often triggered by financial reform, capital inflow surges associated with capital account liberalisations, and periods of strong economic growth, and tend to be more frequent in fixed exchange rate regimes, when banking supervision is weak, and when macroeconomic policies are loose – end up in a crisis half the time, when they last longer than six years. Fielding and Rewilak (2015) also find that credit booms increase the likelihood of a banking crisis in relatively fragile financial systems, that is, those characterised by a poor financial performance of banks. Other contributions highlight the fact that the *speed* of credit expansion may matter for the risk of financial distress.

Financial variables other than credit growth have also been associated with financial crises. In a study by IMF (2009), for instance, the nominal year-on-year rate of credit growth tends to be quite high in the periods leading up to a crisis. In addition, the change in the credit-to-GDP ratio also tends to be high before distress episodes. Both facts are consistent with other studies mentioned earlier. At the same time, even though credit growth and asset price fluctuations often move in parallel (as a result of collateral effects, as discussed earlier), the evidence that asset prices (in particular, equity prices) are good out-of-sample predictors is weaker (see also Anundsen et al (2014)). In addition, credit-to-deposit ratios (a measure of bank leverage) higher than 120% appear to be associated with financial crises within the next year. Foreign liabilities of the private sector typically accelerate rapidly as well before a crisis, whereas external borrowing by banks and the non-bank private sector grows from around 10% to 25% in the run-up to a crisis. Following a crisis episode, these liabilities fall dramatically during the next 12 months. Finally, the study finds that banks' foreign liabilities as a fraction of domestic deposits increase from about 32% to 38% two years before a crisis.

A more formal analysis of the impact of foreign liabilities on financial crises is provided by Ahrend et al (2012), who find that the structure of a country's external liabilities, more than the overall level, is a key determinant of its vulnerability to financial crises. Specifically, a bias in gross external liabilities towards debt (in particular short-term *bank* debt) raises the risk of a crisis. The same holds in the presence of a high degree of currency mismatch.²⁶

Another variable that has proved to be associated with financial crises is the real exchange rate. In an empirical study covering the period 1973–2010 for both high- and middle-income economies, Gourinchas and Obstfeld (2012) find that the two factors that emerge consistently as the most robust and significant predictors of financial crises are a rapid increase in leverage and a sharp real appreciation of the currency. Although a real appreciation may have a positive effect on the balance sheets of domestic borrowers indebted in foreign currency, it may lead to a loss of competitiveness and a large deterioration of the country's current account balance, which may be viewed at some point in time as unsustainable by foreign lenders – thereby triggering an abrupt change in risk perceptions.

Finally, it is worth noting that there is robust evidence on the role of credit booms as determinants of financial crises in AEs as well. Reinhart and Rogoff (2008), for instance, find that systemic banking crises are typically preceded by asset price bubbles, large capital inflows and credit booms, in rich and poor countries alike. Schularick and Taylor (2012) provide evidence for 14 developed countries for the period 1870–2008; they find that lagged credit growth turns out to be highly significant as a predictor of financial

²⁵ Mendoza and Terrones (2012) also find that credit booms often follow surges in capital inflows, gains in total factor productivity, and financial reforms, and are far more common with managed than flexible exchange rates.

²⁶ They also find no evidence that the share of overall short-term debt (maturity less than one year) in total external liabilities directly influences the risk of banking crises – a result that may reflect the fact that a substantial part of that debt takes the form of trade credit.

crises, but the addition of other variables adds very little explanatory power. Related studies documenting the link between (excessive) credit growth and financial crises, in both advanced and developing economies, include Aikman et al (2015) and Aldasoro et al (2018).²⁷ At the same time, however, it is also possible that the link between credit growth and financial crises is, or has become, weaker in countries with more developed financial markets.²⁸

The key point that can be drawn from the foregoing discussion is that although the exact trigger to financial crises in MICs can be almost any event (including political turmoil, a real estate crash, a sharp decline in the country's terms of trade, or contagion from other economies), making it hard to predict their exact timing, they are often preceded by sustained imbalances – especially high rates of credit growth, which in many instances are themselves related to surges in capital inflows. Thus, policy measures that can help to prevent these imbalances from emerging or developing, and to minimise the chances of a crisis occurring, may have large welfare benefits.

²⁷ Taylor (2015) provides a more comprehensive list of references.

²⁸ Gerdesmeier et al (2010) find that credit aggregates also play a significant role in predicting asset price busts in AEs. By contrast, Assenmacher-Wesche and Gerlach (2010) find that for these countries, deviations of credit and asset prices from trend (viewed as measures of financial imbalances) contain little useful information for forecasting future economic conditions. This is consistent with the view that the link between credit growth and financial instability is weaker in countries with deep financial markets.

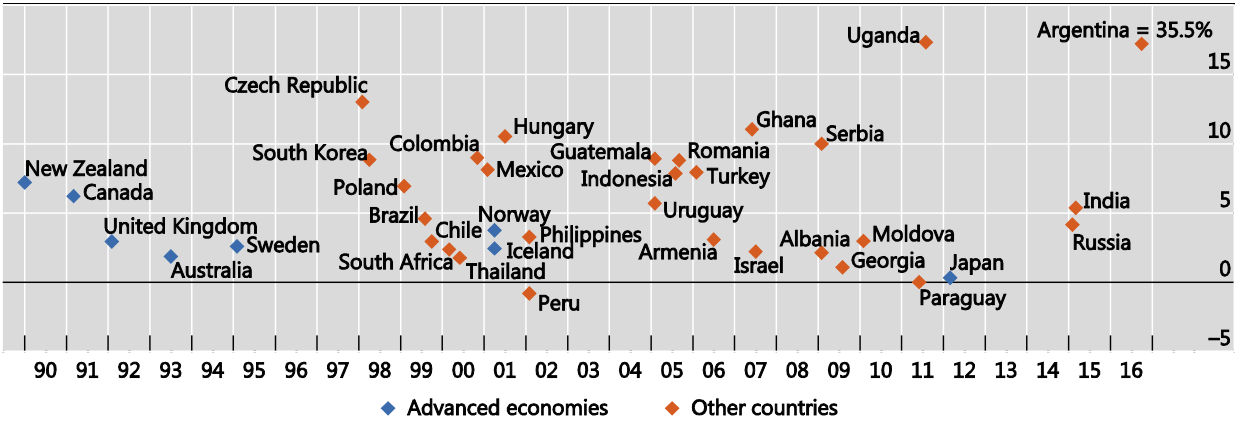
Chapter 2. Characteristics of inflation targeting

As illustrated in Figure 2.1, as of 2016 36 countries were operating a fully fledged IT regime, eight of them AEs – starting with New Zealand in 1990 and most recently Japan in 2012.²⁹ Among AEs, money demand instability, and a weakening in the relationship between monetary aggregates and inflation, played an important role in the decision to adopt IT. Among the other countries the transition was often abrupt, following the forced abandonment of a fixed or adjustable exchange rate regime (Brazil, for instance, in 1999), or in the context of a gradual shift towards a more flexible exchange rate regime (such as Ghana in 2007). The figure also shows clearly that, at the time of formal adoption of an IT regime, inflation was on average running at a significantly higher average level in MICs, compared to AEs, and that among MICs large differences in initial inflation prevailed at the time the regime was implemented.³⁰ Today, most countries practice flexible IT, which involves not only maintaining price stability but also mitigating output fluctuations.³¹

Countries operating a fully fledged IT regime, 1990–2016

Inflation rate at time of policy adoption

Figure 2.1



Sources: Central bank data; Datastream; national data.

This chapter provides a brief overview of the main features of IT regimes, as envisaged initially by its advocates. It then discusses prerequisites for implementing IT and the inherent credibility issues that IT regimes face. The nature of the trade-offs that central banks may face when confronted with demand and supply shocks are addressed next. Finally, a brief comparison between IT and two other monetary policy regimes that have been discussed in recent years, price level targeting and nominal income targeting, is conducted.

²⁹ As documented by Cobham (2018), the focus on inflation has been a key feature of monetary policy frameworks in general since the end of the Bretton Woods international monetary system in the early 1970s. However, as discussed next, IT implies a formal commitment to an inflation target, unlike other frameworks.

³⁰ As indicated in Figure 2.1, Argentina formally announced a switch to IT in 2016 at a time when annual inflation was running at about 35.5% – the highest among any country at the time of IT adoption. However, on 26 October 2018, it indicated its intention to switch temporarily (until June 2019) to a money growth target, with the objective of better anchoring inflation expectations.

³¹ Strict inflation targeting (which involves focusing solely on inflation) is generally sub-optimal, as demonstrated by Svensson (1997) and further discussed by Saborowski (2010).

2.1 Main features of inflation targeting regimes

A conventional IT regime is characterised by three main features. The first is a public announcement of a target for inflation (in the form of either single points or bands, symmetric or asymmetric) to be reached at a specified horizon or maintained permanently. The inflation target is in principle low enough to minimise the distortionary effects associated with high and variable inflation – high volatility in relative prices and distortions in investment decisions, forced redistributions of wealth between savers and borrowers, and so on. At the same time, a positive inflation target also helps to *grease the wheels*, because it makes it less likely that the economy will be constrained by downward nominal wage rigidity. Indeed, the higher the inflation target, the less likely it is that *nominal* wages will need to decline to facilitate adjustment in the labour market. Another argument for a positive inflation target is that official price statistics are subject to measurement bias, in effect, overstating true inflation. This is notably the case for the consumer price index (CPI), which in practice has been the preferred index in IT countries (Patel and Villar (2016)).³²

The second feature of an IT regime is an explicit policy decision framework to achieve the stated objectives, whereas the third is a high degree of transparency, and an effective communication strategy, concerning the course of action planned by the central bank. Transparency is an essential component of IT as it helps to anchor expectations and ensure stability, at least as long as the inflation target is not too high (Ascari et al (2017)). Communication is also critical because even when the inflation target is well publicised, uncertainty about the horizon at which the target is expected to be achieved can destabilise expectations and may translate into higher inflation volatility (Branch and Evans (2017)). Moreover, an effective communication strategy may improve the trade-offs that the authorities face; indeed, guaranteeing that market participants understand current policy and how future actions may be determined helps the central bank maintain inflation expectations focused around the target. In fact, since its inception IT has been thought of by many advocates as a policy framework whose main characteristic is to enhance the transparency and coherence of monetary policy.

2.2 Prerequisites for inflation targeting

The early literature highlighted four basic requirements for implementing an IT regime. The first is a high degree of central bank independence (not necessarily in setting the inflation target itself but rather in choosing and manipulating policy instruments), the second is the absence of a de facto targeting of the nominal exchange rate (or, equivalently, the predominance of the inflation target), the third is increased transparency and accountability, and the fourth is a healthy financial system.

2.2.1 Central bank independence

IT requires that the central bank be endowed with a clear mandate to pursue the objective of price stability and, most importantly, with a large degree of independence in the conduct of monetary policy – namely, in choosing the instruments necessary to achieve the target rate of inflation.³³ This implies, in particular, the ability to resist political pressures to stimulate the economy in the short term and the absence of *fiscal*

³² Yet another argument for a sufficiently high inflation target is related to the risks associated with the zero lower bound (ZLB) on interest rates. The lower the inflation target, the lower the average nominal policy interest rate will be. Therefore, the greater the likelihood that adverse shocks will push interest rates to the ZLB and hence limit the central bank's ability to respond with conventional policy. However, this issue has mainly been of concern in AEs.

³³ Several countries have followed a contractual approach to IT: the government sets an inflation target in a contract with the central bank and gives the central bank full *operational* independence so that it can manipulate its policy instruments to achieve the agreed target.

dominance, that is, a situation in which fiscal policy considerations play a prominent role in monetary policy decisions. These requirements are difficult to satisfy in countries where the inflation tax is a significant source of revenue for the government. In such conditions, fiscally induced inflationary pressures could undermine the effectiveness of monetary policy, for instance by forcing the central bank to maintain low interest rates in an attempt to prevent unsustainable public debt dynamics.³⁴

2.2.2 Absence of *de facto* exchange rate targeting

Adopting a low, stable inflation rate as the main objective of monetary policy requires, in principle, the absence of any commitment to a particular value of the exchange rate, as is the case under a freely floating exchange rate regime. In practice, however, in many of the developing countries that have opted for a *de jure* flexible exchange rate, monetary authorities have continued to pay considerable attention to the value of the domestic currency – often adopting a *de facto* target path or band. As discussed in more detail in the next chapter, there are various reasons for the central bank to be concerned with nominal exchange rate movements, even when it enjoys a high degree of independence and is thus able to commit itself to the pursuit of price stability only. In particular, the exchange rate has a direct impact on inflation and plays a key role in transmitting monetary policy shocks to prices. If the pass-through effect is high, the central bank may be tempted to intervene on the foreign exchange market to limit currency fluctuations. A high degree of nominal exchange rate instability may also be of concern to policymakers to the extent that it translates into a high degree of variability in the real exchange rate and distorted relative price signals to domestic producers, which in turn may lead to a misallocation of resources between tradables and non-tradables. Furthermore, in partially dollarised economies such as Peru or Turkey, large fluctuations in exchange rates can lead to banking and financial instability by inducing large portfolio shifts between domestic and foreign currency-denominated assets. Finally, in countries where the corporate and banking sectors hold large foreign currency liabilities, exchange rate depreciations can have significant adverse effects on their balance sheets. This concern has been heightened in recent years, during which the favourable global liquidity conditions that followed the GFC prompted corporations and banks in MICs to borrow and issue debt in foreign currency (mostly US dollars; see BIS (2018)). This has prompted policymakers to assess vulnerabilities and to intervene in foreign exchange markets, in case of abrupt movements of the exchange rate, to preserve domestic financial stability. As of 2017, most IT-MICs, including Brazil, Indonesia, South Africa and Turkey, belonged to the “floating” exchange rate category of the IMF’s *de facto* classification of exchange rate regimes.³⁵ However, while this implies that the exchange rate is largely market-determined, it does not imply that foreign exchange market intervention takes place only to “moderate the rate of change and prevent undue fluctuations in the exchange rate” as stated by the IMF. This issue is also discussed further in the next chapter.

2.2.3 Transparency and accountability

Openness and transparency in the conduct of monetary policy are important ways to improve credibility in an IT regime. Making the central bank publicly accountable for its decisions raises the incentive to achieve the inflation target and therefore enhances the public’s confidence in the ability of the monetary authorities to do so. This may also lead to improved decision-making on the part of the central bank by exposing to public scrutiny the process through which monetary policy decisions are taken. The fact, for instance, that monetary authorities must announce policy changes and explain the reason for these changes to the public may help to stabilise inflation expectations and increase the effectiveness of monetary policy under IT.

³⁴ See Ismailov et al (2016) for evidence on the impact of the size of public debt on the likelihood of choosing IT.

³⁵ See IMF (2018). In contrast, in “free-floating” regimes, intervention occurs only exceptionally (at most, three instances in the previous six months, each lasting no more than three business days) and aims to address disorderly market conditions.

A potential problem with accountability in an IT framework is related to the difficulty of assessing performance on the basis of inflation outcomes only. The lag between policy actions and their impact on the economy makes it possible (or tempting) for the central bank to blame unforeseen or totally unpredictable events for inadequate performance, instead of taking responsibility for policy mistakes. To mitigate this risk, the central bank in an IT country is usually required to justify its policy decisions and publicly explain differences between actual outcomes and inflation targets.³⁶ Openness and transparency have been promoted through the regular publication of an *Inflation Report*, which sets out the central bank's analysis of recent economic developments and a forecast for inflation (as well as of other key macroeconomic variables) over the coming year or years. Accountability has been promoted by providing public explanations (often in the form of a public letter from the governor of the central bank to the government) of why the rate of inflation has deviated from the target by more than a given percentage on either side, how long these deviations are expected to persist, and what policies the central bank intends to implement to bring inflation back to target.

2.2.4 Healthy financial system

The ability to conduct an independent monetary policy is hampered in countries suffering from severe weaknesses in the financial system, which may force the central bank to repeatedly inject large amounts of liquidity to support ailing banks. These weaknesses may also constrain the monetary authority's ability to manipulate interest rates. Indeed, a rise in these rates can lead to higher default levels among banks' borrowers and put pressure on their balance sheets. Furthermore, as noted earlier, in countries where the corporate and banking sectors hold large foreign currency liabilities, exchange rate depreciations can have significant adverse effects on their balance sheets. This may induce the central bank to be concerned with nominal exchange rate movements and adopt an implicit exchange rate target – which could, as also noted earlier, be in conflict with the inflation target. However, a weak financial system is not an argument for rejecting IT as a policy regime; rather, it calls for financial sector restructuring and a strengthening of bank regulation and supervision prior to, or at the same time as, adopting or implementing IT.

More generally, there has been a debate as to whether the prerequisites highlighted in the early literature are sine qua non conditions for adopting an IT regime (see Roger (2009) and Mishkin (2011)). In fact, in many (if not most) cases, at least some of the initial conditions identified earlier were not fulfilled at the time IT was adopted. This is the case for central bank (operational) independence, or the absence of fiscal dominance, which are issues that Brazil and Turkey were confronted with in 1999 and 2006, respectively. In addition, one condition considered later on also as a prerequisite was moderately low inflation; as illustrated in Figure 2.1, this was clearly not present in a number of countries at the time of IT adoption.

2.3 Credibility of inflation targeting regimes

In an IT regime, the reaction function of the central bank relates the policy interest rate to an inflation forecast, because of the typical lag (of up to two years in practice) that exists between the change in the policy instrument and its actual impact on inflation. Thus, the credibility of monetary policy depends not on achieving a publicly observable, intermediate target that is viewed as a leading indicator of future inflation (as is the case under monetary or exchange rate targeting), but rather on the credibility of a *promise* to reach the inflation target in the future. This, in turn, depends on whether the public believes that the central bank will stick firmly to the objective of price stability, as summarised by the inflation target. Credibility and, by extension, the reputation of the monetary authority, therefore play a crucial role

³⁶ The distinction between goal independence and instrument independence implies that the latter is essential for the accountability of monetary authorities.

in stabilising inflation expectations under IT and making them more forward-looking. In turn, if expectations are firmly anchored to the (low) rate targeted by the central bank, a one-off shock to the price level would have only a transitory effect on the inflation rate. Conversely, a non-credible IT regime would likely translate into higher inflation, without, in the end, achieving systematically higher output and employment.³⁷

At the same time, because performance can only be observed ex post, the need for transparency and accountability becomes more acute under this regime, in order to help the public assess the stance of monetary policy and determine whether deviations from target are due to unpredictable shocks rather than policy mistakes. Thus, in order for IT to be a credible commitment, the public must be informed of (and understand) the policy actions the central bank plans to take and must believe that these actions are consistent with the stated medium-term goals. Transparency may also improve the incentive of the central bank to pursue the publicly announced goal, making the stated commitment more credible (Faust and Svensson (2001)). As a result, transparency may reduce the volatility of inflation expectations and plays an essential role (as noted earlier) in an IT regime.

Although a sufficient degree of credibility – or more accurately, following Drazen and Masson (1994) and Cukierman (1992, 2015), an adequate anti-inflation reputation – is essential to achieve an inflation target, establishing credibility or improving reputation, defined for instance as an increase in the weight given by the public to preannounced targets in forming inflation expectations, is a difficult process.³⁸ This is particularly so in countries with a history of high inflation and macroeconomic instability. Analytically, it has been shown – most notably by Walsh (1995) and Svensson (1997) – that inflation targets can be used as a way of overcoming credibility problems because they can mimic optimal performance incentive contracts; and by increasing the accountability of monetary policy, IT may reduce the inflation bias inherent in discretionary policy regimes. Moreover, as argued by Walsh (1999), the public announcement of inflation targets may itself help to improve the credibility of the central bank when initially there is uncertainty about its policy preferences. More generally, improving credibility and reputation requires the central bank to deliver over time rates of inflation that are consistent with preannounced targets.³⁹ From that perspective, and partly because of the challenges associated with recent calls for central banks to focus more on financial stability, monetary policy credibility remains a work in progress in many countries. The next chapter will examine the extent to which the goals of improved credibility, as captured by lower and more stable inflation expectations or reduced inflation persistence, have been achieved under the IT regimes implemented by MICs in the past two decades.

2.4 Demand shocks, supply shocks, and policy trade-offs

Demand and supply shocks create different challenges for central banks under IT. Demand shocks tend to affect output and prices in the same direction and create no trade-off for monetary policy. A positive

³⁷ The classic reference on the inflationary bias of monetary policy is Barro and Gordon (1983). But even in the absence of an inflationary bias, there may be a gain from improved credibility (Clarida et al (1999)). The reason is that when agents are forward-looking the level of current variables depends not only on the current level of the policy instrument but also on its expected level at future dates.

³⁸ As shown by Cukierman (2015), imperfect credibility may also affect the choice of horizon for price stability because reputation (or lack thereof) can affect the speed of inflation stabilisation. Neuenkirch and Tillmann (2014) present a stylised model in which agents' inflation expectations are more directly sensitive to deviations from the inflation target. To (re-)establish credibility, monetary policy must set higher interest rates today if average inflation has exceeded the target in the past. This policy therefore affects the speed at which inflation can be stabilised following a transitory shock.

³⁹ By contrast, the perception that the goal of stabilising the exchange rate unduly influences the conduct of monetary policy (a phenomenon that has been referred to as *exchange rate dominance*) may also have an adverse effect on the credibility of the central bank.

demand shock, for instance, calls for higher interest rates to mitigate the increase in activity and dampen inflationary pressures. By contrast, a supply shock creates a fundamental trade-off between stabilising output and inflation.

Consider, for instance, a temporary increase in the price of imported intermediate goods, such as oil. This tends to reduce output, as the demand for oil falls, and to increase prices, as producers tend to raise the price of final goods to offset the increase in production costs.⁴⁰ Suppose also that the increase in prices is such that it causes inflation to rise above its target value. How quickly should the central bank aim to bring inflation back to target? There are two conflicting considerations. On the one hand, the quicker the disinflation (the higher the policy rate), the shorter the period during which inflation is above target; on the other, the quicker the disinflation, the larger the cyclical drop in output. The optimal length of the target horizon depends therefore in a fundamental way on policy preferences regarding price and output stability. The greater the relative importance attached to output stabilisation relative to inflation stabilisation, the longer the optimal length is. At the same time, however, a longer targeting horizon may damage the credibility of monetary policy, because agents may infer that the central bank's willingness to tolerate higher inflation has increased (or that its commitment to low inflation has weakened). This is especially important if private agents have only imperfect or noisy information about the central bank's preferences. Put differently, the trade-off between the cost of having inflation above target (which is lower if disinflation is faster) and the cost of output fluctuations (which is higher if disinflation is faster) translates into a trade-off between credibility and flexibility, which can be partially resolved by altering the speed at which the central bank responds to shocks. The reason this trade-off arises is because, in response to supply shocks, to reduce inflation the central bank must induce a (temporary) reduction in output.⁴¹

At the same time, the extent and duration of the reduction in output depend themselves on the credibility of the commitment to the inflation target. The more credible the commitment is, the faster inflation expectations will fall (despite actual inflation remaining above target for some time), and the lower will be the output cost of reducing inflation. This is an important consideration for an economy with a history of high inflation. As noted earlier, by providing a firm anchor for inflation expectations, a credible stance against inflation helps to mitigate the impact of inflationary shocks, preventing one-off shocks to the price level from transforming into sustained inflation. Thus, in responding to supply shocks, limiting flexibility may be important to reduce the severity of the credibility problem – especially in countries where, to begin with, the degree of confidence in the central bank's commitment to low inflation is not well established.

2.5 Price level targeting and nominal income targeting

As possible alternatives to IT, two regimes have often been considered in the literature: price level targeting (PLT) and nominal income targeting (NIT).⁴²

2.5.1 Price level targeting

Both IT and PLT can allow for a positive inflation rate in the long run. The crucial distinction between the two regimes is how the central bank reacts to unexpected changes in inflation. Under IT, the central bank acts to bring inflation back to its target value. It treats the effect of the inflation shock on the price level

⁴⁰ Recent evidence on the impact of global oil prices on domestic inflation is provided by Choi et al (2017) for a large sample of advanced and developing economies. At the economy-wide level, key determinants of this impact are the share of transport-related services in the CPI basket and energy subsidies.

⁴¹ See Agénor (2002) for a formal illustration. With a cost channel to monetary policy (for instance as a result of working capital needs, as noted in Chapter 1), the usual trade-off that the central bank faces in response to a supply shock is magnified. For instance, in response once again to a spike in oil prices (that is, a negative supply shock that leads to a rise in inflation and a drop in output), an increase in the policy rate would raise production costs further and magnify the fall in output.

⁴² Another regime, product price targeting, is discussed later on.

as a bygone. This means that a temporary shock to the inflation rate has a permanent effect on the price level. By contrast, under PLT, the central bank acts to return the price level to its original targeted growth path. Thus, the distinguishing feature of PLT is that, unlike under IT, bygones are *not* bygones. Past inflation misses must be corrected. For instance, following a period of below-target inflation, policy would seek a period of above-target inflation to ensure the desired rate of change in the price level over time. In addition to providing greater price level certainty over the long run, PLT could reduce the volatility of output and inflation through automatic, self-correcting changes in inflation expectations.

The academic literature is somewhat ambiguous regarding the costs and benefits of PLT compared to IT.⁴³ For PLT to perform well, private agents need to be forward-looking and the policy well understood and credible – just as is the case for IT. The simulation results reported by Acuña-Roa and Parra-Polania (2016), for instance, using a model with inflation persistence (as a result of partial indexation to lagged inflation), show that when the degree of indexation is high IT dominates PLT. However, this result does not hold when indexation is weak. Under normal circumstances, the expected benefits of PLT are likely to be too small to justify the risks of abandoning a well understood policy objective (inflation). This may explain why, in practice, no country (as of yet) has adopted PLT.

2.5.2 Nominal income targeting

Under NIT, the monetary policy target is a predetermined path for the nominal value of aggregate output or income. The focus on nominal values is often motivated by uncertainty regarding estimates of the output gap (a particularly important issue for MICs, as discussed later), but in the context of AEs the motivation has also been as a way to stimulate activity.⁴⁴

Similar to PLT, NIT implies a history-dependent conduct of monetary policy, as past deviations from the target have to be made up in the future. If nominal GDP moves away from the target path, the objective can be met by any combination of inflation and real GDP adjustment that sums to the targeted level. The policymaker is, in principle, indifferent as to whether the source of the adjustment lies in prices or quantities.

Because demand shocks move output and inflation in the same direction, the policy response to these shocks under NIT is qualitatively similar to that under IT. By contrast, in the response to supply shocks, there are some significant differences. As noted earlier, in response to, say, an increase in oil prices, under IT the central bank faces a trade-off with respect to its objectives: it must increase the policy rate to generate a contraction in aggregate demand and reduce inflationary pressures, but this may lead at the same time to a further reduction in output and employment. By contrast, under NIT, the supply shock is automatically split between inflation and output. In the long run, this may result in a situation where inflation is similar to that observed under an IT regime but with smaller fluctuations in output – which essentially results from the fact that (unlike under IT) there is no problem of excessive tightening in response to adverse supply shocks.

Nevertheless, there are several potential drawbacks associated with NIT. First, although some formal model-based experiments do suggest that NIT performs better than IT, overall the message is mixed (see Box 2). Second, as noted earlier, in responding to supply shocks, in order to meet the nominal income target policymakers must ensure that the real output effect is offset by an equal and opposite movement in inflation. However, this may increase uncertainty about the path of inflation, potentially causing allocative inefficiencies and limiting the effectiveness of the target as a nominal anchor. Increased uncertainty about the division of the target variable into its real and price components could also drive up interest rates. Moreover, speculation about how a specific target is allocated between inflation and real output could alter the central bank's ability to affect inflation expectations. In turn, the inability to firmly

⁴³ See Ambler (2009) for a review of that literature.

⁴⁴ See, for instance, Frankel (2012).

anchor expectations may ultimately reduce the effectiveness of monetary policy. Finally, in practice communicating to the public how a nominal income target is established or adjusted over time may be difficult, given the frequent and often large revisions in nominal GDP data. This could also make accountability a significant challenge. These difficulties may explain why NIT, just like PLT, has yet to be adopted as the official monetary policy framework of any country.

Box 2

Analytical studies of the benefits of nominal income targeting

A number of analytical contributions have focused on a comparison of NIT and flexible IT. An early study by Frisch and Staudinger (2003) provides three main lessons. First, for both targeting regimes, optimal monetary policy entails an interest rate response to both demand and supply shocks. Second, both strategies imply the same response to a demand shock – a complete offset through interest rates, which leaves inflation and the output gap unchanged. Third, if the shock is a supply disturbance, there is a significant difference between the performances of the two strategies. If the central bank follows IT, policymakers face a trade-off between inflation and output stabilisation (as discussed in the text). This trade-off depends on the preference parameter attached to output stability relative to inflation stability. A large value of that parameter implies an accommodative monetary policy; that is, strong output stabilisation at the expense of high inflation.

The role of supply shocks in assessing the performance of NIT and IT is also central in the contributions of Bhandari and Frankel (2017) and Garín et al (2016). Bhandari and Frankel (2017) estimate the relative importance of supply shocks for the Indian economy, as well as the slope of India's aggregate supply curve. They conclude that NIT dominates IT in its ability to minimise a central bank loss function that depends only on output and inflation volatility. They argue India may benefit from an NIT regime more than an IT regime due to the relative importance of supply shocks and the slope of India's supply curve. Garín et al (2016) also show that NIT performs better than IT in response to supply shocks. Moreover, as shown in the experiments reported by Smith (2016), in the presence of a cost channel of monetary policy, adding a nominal growth target to the policy interest rule in an IT regime can help to better anchor inflation expectations.

The implication of the foregoing analysis is that there are conditions under which NIT may perform better than IT – although not uniformly so. Using a closed-economy model with both sticky wages and prices, Kim and Henderson (2005) find that NIT dominates IT (from a welfare perspective), for a range of plausible parameter values. Numerical simulation results by Jensen (2002) also show that when shocks causing an inflation-output gap trade-off in monetary policy are important, NIT performs better, in the sense that it leads to more stable inflation than under IT – essentially by creating greater inertia in official interest rates.

Some contributions have focused on a comparison between IT and NIT in an open-economy context – arguably a more appropriate setting for MICs. Guender and Tam (2004), for instance, find that strict adherence to an NIT rule may cause excessive fluctuations in the exchange rate, and thus in the overall price level if households consume both domestic and imported final goods. The higher the degree of openness, or the stronger the sensitivity of aggregate supply to changes in the real exchange rate, the more pronounced these fluctuations are. IT appears preferable for a small open economy, particularly for those that are highly dependent on imported intermediate goods. However, although these results are based on a range of empirically plausible parameter values, their robustness can be questioned on several grounds. Further research therefore appears warranted.

Chapter 3. Performance of inflation targeting regimes

This chapter provides a thorough review of the performance of IT in MICs during the past two decades. It begins with a discussion of outcomes with respect to actual inflation, inflation targets and inflation expectations in a representative group of countries. While informative, this discussion is only preliminary; a formal analysis is essential to control for the various factors that may affect the relationship between these variables. The focus then turns to an overview of formal empirical studies on the performance of IT regimes. These studies have generally followed one of two approaches. The first measures the effects of IT on the level and volatility of inflation, as well as other macroeconomic variables (including output, the exchange rate, and fiscal discipline). The second focuses on characterising central bank operating procedures, attempting to distinguish between policy functions of IT and non-IT countries. Studies in the first strand of the empirical literature employ both individual country time series and multi-country panel methods, while those in the second strand are almost exclusively focused on individual country time series. The chapter concludes with an overall assessment of the performance of IT regimes in MICs.

3.1 A first look at the data

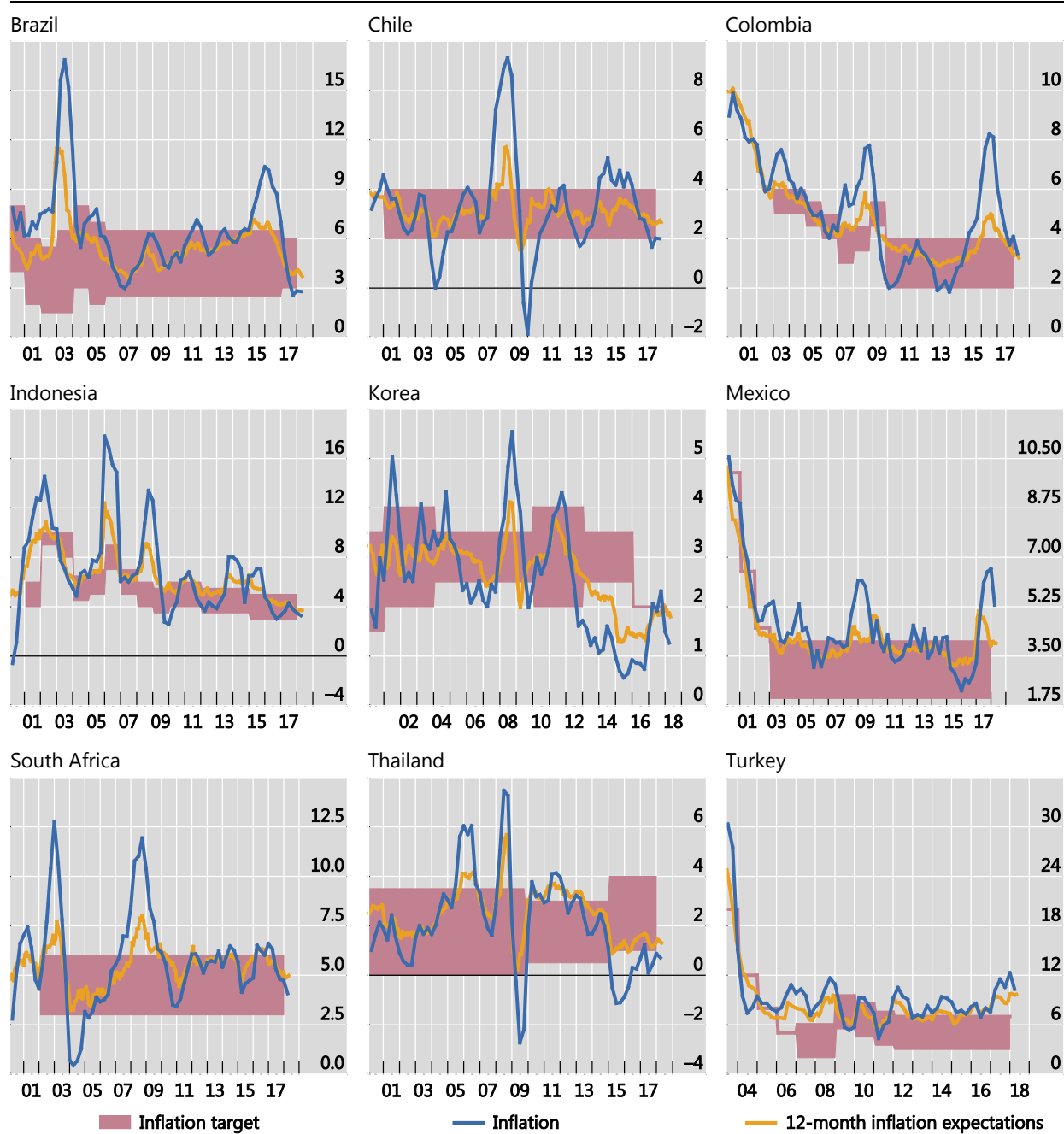
To assess the performance of IT regimes in MICs an informative preliminary step is to compare inflation outcomes, inflation targets and inflation expectations over the periods during which these regimes were in place. Figure 3.1 shows the evolution of actual inflation, expected inflation and the target band for nine of the selected group of IT-MICs referred to in the previous chapter (Brazil, Chile, Colombia, Ghana, Indonesia, Korea, Mexico, Nigeria, South Africa, Thailand and Turkey). Figures 3.2 and 3.3 complement that information by showing, respectively, deviations of inflation from target (defined as the midpoint of the band), and deviations of actual inflation from expected inflation. In addition, Figure 3.4 shows the volatility (or degree of dispersion) of inflation expectations.

The figures suggest that in all countries there have been periods where the gap between actual inflation and the target value has been fairly small (that is, inflation well within the band), but at other times there have been substantial deviations. Proximate causes for these outcomes have varied across countries and have included food price increases, domestic demand expansion and exchange rate depreciation in some cases, as well as falling energy prices and exchange rate appreciation in others. Episodes of globally correlated shocks have also played a role; in particular, in the immediate aftermath of the GFC, and during the commodity price shock of 2008–09, almost all countries in the group deviated substantially from their target levels of inflation. Moreover, for some countries deviations from target appear to be asymmetric: countries tend to overshoot their inflation target more often than they undershoot. This is the case for Brazil, Indonesia and Mexico, for instance. In several countries, including Colombia and Korea, the dispersion of inflation expectations also increased sharply in the aftermath of the GFC. In addition, even though inflation expectations have been less volatile than actual inflation, there are periods when large increases in headline inflation, for instance in the aftermath of the confidence crisis in Brazil in late 2002, or in Chile in 2008, were followed by significant jumps in expected inflation. This may be construed as evidence that, when positive shocks to inflation are large, they have an adverse effect on central bank credibility and tend to impart more inertia to inflation expectations. In contrast to deviations in actual inflation from target, the gap between actual and expected inflation does not appear to display much evidence of asymmetry, except perhaps for Turkey. This could perhaps reflect the fact that inflation expectations have been, in general, well anchored to the inflation target.

Selected IT-MICs: actual inflation, expected inflation, and target band

In per cent

Figure 3.1

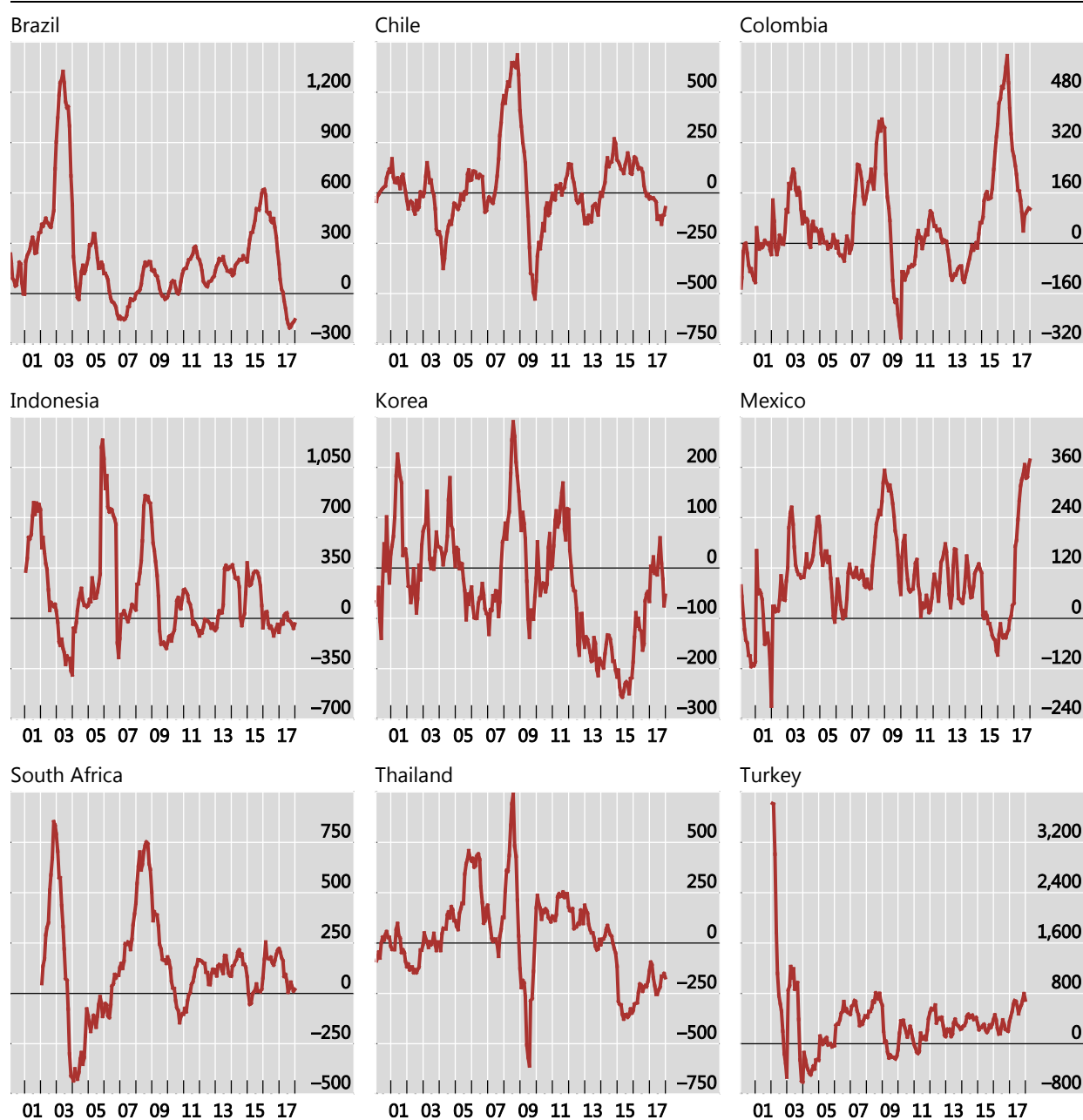


Sources: Consensus data; national data; authors' calculations.

Selected IT-MICs: deviations of inflation from target¹

In basis points

Figure 3.2



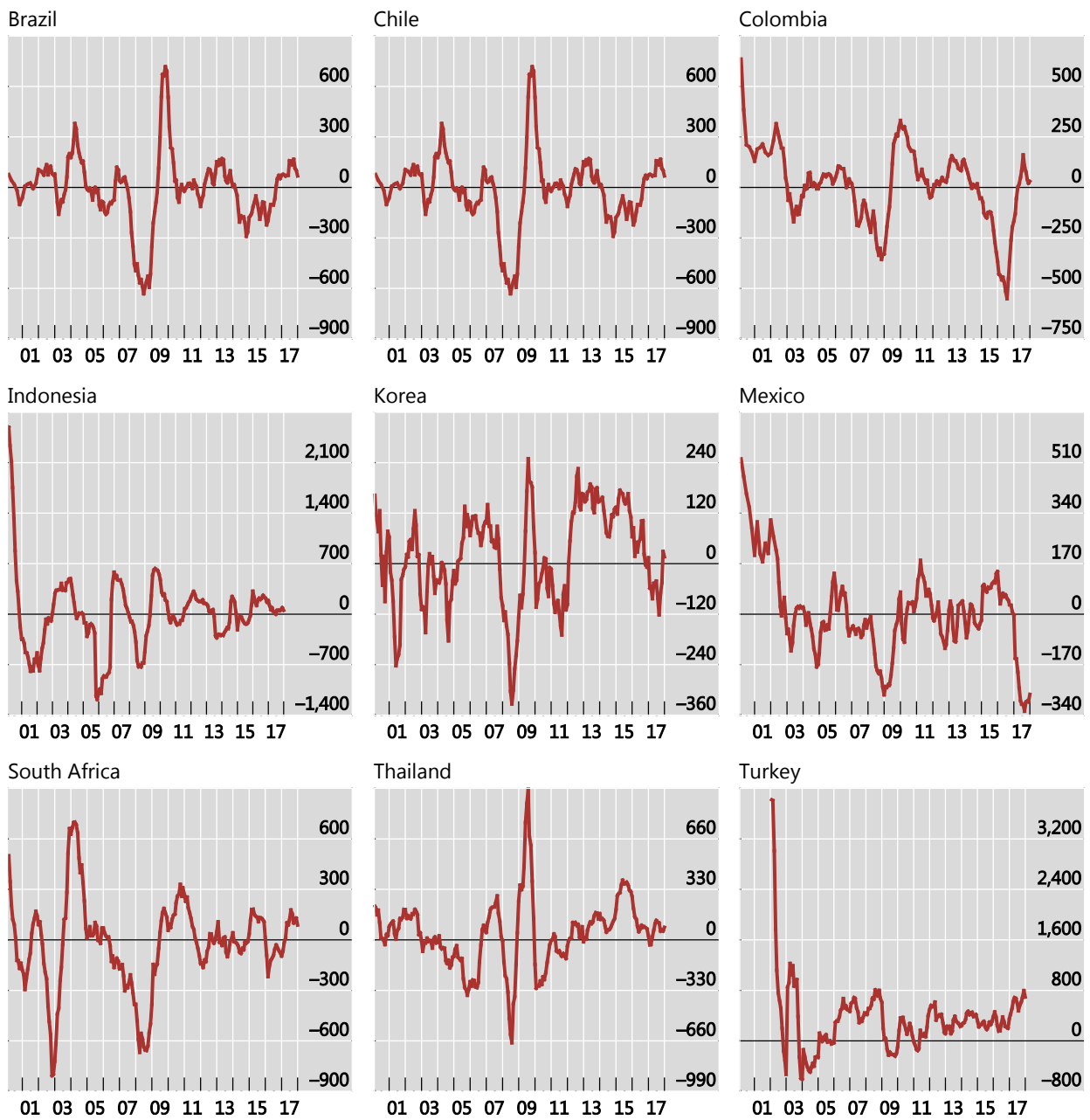
¹ Deviation from target centre.

Sources: Consensus data; national data; author's calculations.

Selected IT-MICs: deviations of actual inflation from expected inflation

In basis points

Figure 3.3

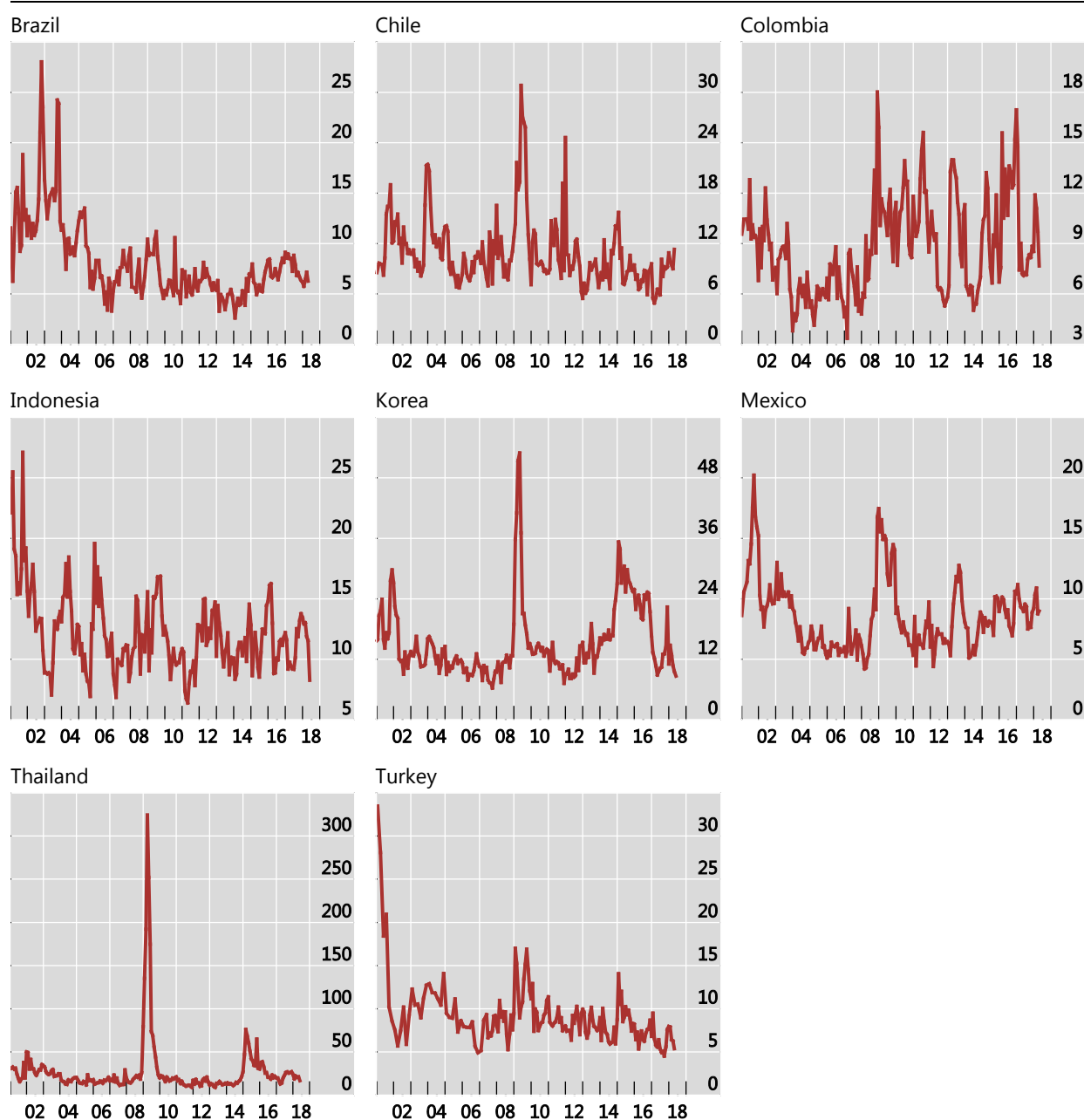


Sources: Consensus data; national data; authors' calculations.

Selected IT-MICs: dispersion of inflation expectations

Coefficient of variation¹

Figure 3.4



¹ Factor 100 applied on coefficient of variation.

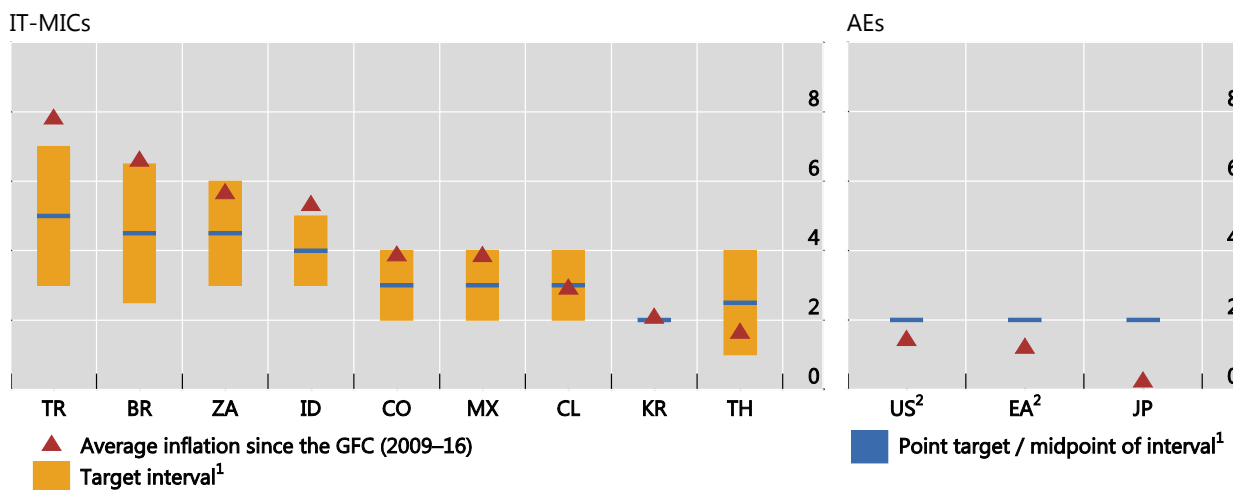
Sources: Consensus data; national data; authors' calculations.

Some further informal evidence on the performance of IT regimes can be gleaned by focusing more specifically on the experience of AEs and MICs in the immediate aftermath of the GFC; that is, the period 2009–16. During that time inflation was outside the central bank's target zone in many economies, both AEs and MICs (Figure 3.5), but with different signs. For AEs, the contraction in output associated with the GFC led to deflationary pressures and inflation hovering below target. For IT-MICs, it was the opposite: consistent with previous figures, inflation exceeded target values in many of them.

Advanced economies and middle-income countries: inflation and inflation target, 2009–16

In percentage points

Figure 3.5



BR = Brazil; CL = Chile; CO = Colombia; ID = Indonesia; KR = Korea; MX = Mexico; TH = Thailand; TR = Turkey; ZA = South Africa; US = United States; EA = euro area; JP = Japan.

¹ For countries following an IT policy. ² The United States and the euro area do not officially follow an IT policy. However, the Federal Reserve states a 2% inflation target as a denominator of its monetary policy and the European Central Bank publicly aims for inflation below but close to 2%.

Sources: Datastream; national data; authors' calculations.

An important factor for understanding the behaviour of inflation in both groups during that period relates, as noted earlier, to the sharp decline in commodity prices. Between mid-2014 and early 2016, for instance, these prices (in particular that of oil) fell sharply (Figure 3.6, left-hand panel), reflecting both weaker demand and supply factors. This fall helped to push down inflation all around the world. But in many MICs, a concomitant sharp currency depreciation more than offset this effect (Figure 3.6, right-hand panel), pushing inflation above target, as stated earlier. In several countries, this in turn added to domestic factors and contributed to driving inflation outside the central bank's target zone. That was not the case for AEs.

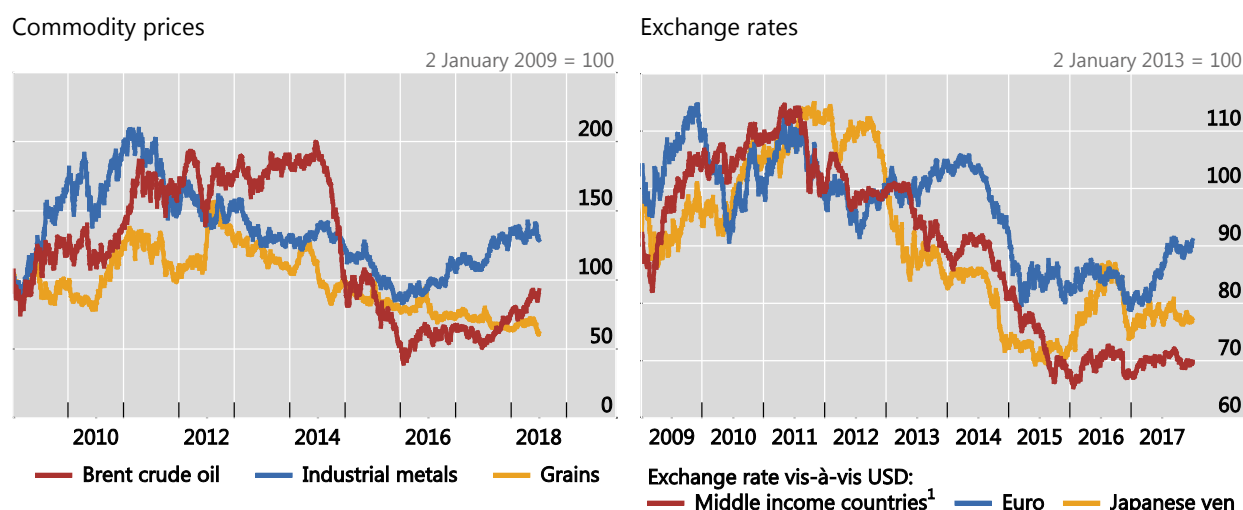
Another informal piece of evidence that helps us to understand how IT may have affected inflation performance in MICs relates to the possible effect of the exchange rate on inflation expectations. The evidence suggests that the exchange rate may affect inflation expectations in these countries through changes in risk premia. Indeed, the left-hand panel of Figure 3.7 shows that a 10% exchange rate movement against the US dollar is typically associated with a corresponding CDS move of up to 50 basis points in the subsequent quarter. At the same time, as shown in the right-hand panel of Figure 3.7, increases in the slope of the US yield curve are reflected in corresponding increases in CDS risk premia in MICs.⁴⁵ Indeed, easy financial conditions in the US and a weak dollar create incentives for overborrowing by MICs, which then reverses quickly when global financial conditions tighten. The risk of contractionary depreciations tends to be particularly high for countries where recent issuance of external debt instruments has been large or where a substantial share of contracts (especially in the non-tradable sector) is denominated in, or indexed to, foreign currency. Therefore, in order to minimise this channel of transmission of risk into the exchange rate and vice versa, foreign exchange market intervention might be

⁴⁵ The slope here is measured by the difference between the rates paid on 10-year Treasury notes and three-month bills. Barroso et al (2016) show for the case of Brazil that this variable is an appropriate gauge of US monetary policy, as it captures the effects of several rounds of quantitative easing.

important under an IT regime – especially when a central bank believes that exchange rate pressures are temporary – in addition to the other reasons, such as exchange rate smoothing, discussed in the next chapter.

Commodity prices and exchange rates after the GFC, 2009–18

Figure 3.6



¹ Aggregate for MICs, weighted average based on the GDP and PPP exchange rates of Brazil, Chile, Colombia, Indonesia, Korea, Mexico, South Africa, Thailand and Turkey.

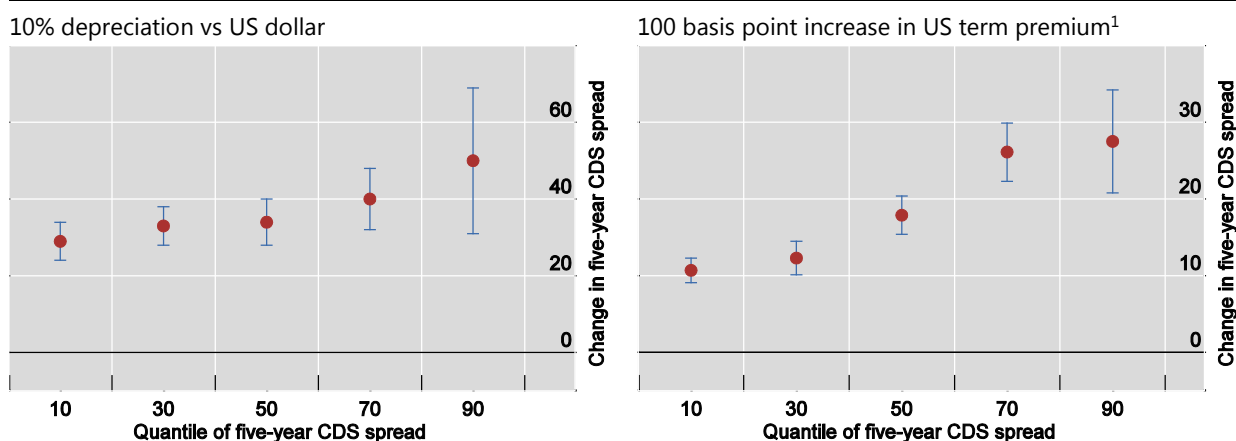
Sources: Bloomberg; authors' calculations.

The foregoing analysis is informative because it provides a preliminary assessment of the performance of IT regimes. However, simple comparisons of this sort are incomplete because they do not control for various factors that may matter. For instance, a reduction in the volatility of inflation expectations may reflect a more stable fiscal environment, which has led to reduced risk premia over time. Conversely, an increase in such volatility may result from a weakening of the fiscal outlook. More generally, high volatility of inflation expectations may reflect not only a lack of monetary policy credibility (for instance, because markets understand that at times the central bank also has a high preference for minimising fluctuations in the real exchange rate or output, as discussed later), but also concerns about the medium-term fiscal position, or simply intrinsic heterogeneity in the formation of expectations. In addition, what is important is to assess *relative* performance, and this is often best done in a multi-country context where larger sample sizes are available and a control group of non-IT countries can be more easily defined in order to study differences in inflation performance between inflation targeters and non-targeters. Addressing these issues requires the use of formal empirical methods.

Risk premium movements in MICs associated with currency depreciation and increases in US term premium

In basis points

Figure 3.7



¹ Ten-year minus three-month Treasury bill.

Sources: Markit; authors' calculations.

Therefore we turn next to a review of the formal statistical evidence on the performance of IT regimes in MICs, dwelling on the two methodological approaches mentioned earlier – first, with a focus on macroeconomic outcomes (including inflation expectations) and second on changes in central bank behaviour.

3.2 Macroeconomic outcomes

The first approach to a formal assessment of the performance of IT regimes consists of comparing macroeconomic outcomes following the adoption of these regimes, with those pertaining to a control group of non-IT countries. The focus of this literature has been mainly on whether the adoption of IT has contributed to substantial declines in average inflation, lower inflation volatility, and macroeconomic stability in general, compared to countries that have maintained a different monetary policy regime. A key issue in that context is the extent to which, as noted earlier, increased credibility of the monetary policy commitment to low and stable inflation translates into reduced volatility of inflation expectations. In addition to the level and volatility of (actual and expected) inflation, some studies have also discussed the implications of IT for the mean and volatility of output, the magnitude of the exchange rate pass-through, the volatility of nominal and real exchange rates, the size of fiscal imbalances and fiscal discipline more generally.⁴⁶

3.2.1 Level and volatility of inflation

Studies focusing on the effect of IT on the level and volatility of inflation include Gonçalves and Salles (2008), Lin and Ye (2009), Broto (2011), Abo-Zaid and Tuzemen (2012), Ferreira de Mendonça and de Guimarães e Souza (2012), Gerlach and Tillmann (2012), Yamada (2013), and Canarella and Miller (2017). The results are fairly consistent among them. Gonçalves and Salles (2008) use data for 36 developing countries (including 13 IT countries) over the period 1980–2005 and find that IT countries experienced greater drops in inflation on average. Lin and Ye (2009) and Ferreira de Mendonça and de Guimarães e

⁴⁶ There is also some evidence that the response of domestic macro-financial variables to global liquidity shocks are less volatile in IT countries than in non-IT countries (see Choi et al (2017)).

Souza (2012) find similar results. Abo-Zaid and Tuzemen (2012), using cross-country data for developed and developing countries over the period 1980–2007, find that IT developing countries were able to achieve lower and more stable inflation. In the same vein, Ferreira de Mendonça and de Guimarães e Souza (2012), using a broad sample of 180 countries for the period 1990–2007, find that the adoption of IT led to reduced inflation levels and volatility in developing countries, whereas the results are less robust for developed countries. Yamada (2013) finds that in most cases IT, combined with flexible exchange rates, delivered lower inflation in developing countries than alternative exchange rate regimes over the period 2000–07. In other cases, it does at least as well as a fixed exchange rate regime in terms of maintaining stable inflation rates. However, the results are partly dependent on the classification used for exchange rate arrangements, a common problem in this literature (see Levy Yeyati and Sturzenegger (2016)).

Focusing specifically on Latin America, Broto (2011) studies the inflation performance of five IT countries (Brazil, Chile, Colombia, Mexico and Peru) and three non-IT countries (Argentina, Ecuador and Uruguay) in her sample. She finds that the adoption of IT helped to reduce the level of inflation and inflation volatility in Chile, Colombia, Mexico and Peru, but the results are not as conclusive for Brazil. Nevertheless, she also identifies a reduction in the persistence of inflation volatility in Brazil after IT adoption. The persistence of inflation uncertainty also fell in all countries in the periods that followed IT adoption except in Colombia, where the evidence is not conclusive. In the same vein, Gerlach and Tillmann (2012) also find that inflation persistence fell significantly following IT adoption in several Asian MICs (Indonesia, Korea, the Philippines and Thailand). Finally, indirect evidence of the performance of IT is provided by Canarella and Miller (2017), who investigate inflation persistence in a sample that includes two IT-MICs (Chile and Mexico), and find that low global inflation (associated with the *Great Moderation*) does not appear to have played an important role in the decline of inflation in developing countries.

There are important differences between the various studies reported above in terms of the sample period used for estimation, the empirical methodology, the treatment of country-specific factors, and the control group (when there is one) used for comparative purposes.⁴⁷ This makes it difficult to draw firm conclusions regarding the systematic impact of IT on macroeconomic outcomes. A possible approach to this issue (which, it is worth noting, is not without its critics) is to use meta-regression analysis. Balima et al (2017) is one such study, based on a database consisting of 8,059 estimated coefficients from 113 empirical studies on the macroeconomic effects of IT. They find significant effects of IT on the level of inflation but no robust effect on inflation volatility.

3.2.2 Level and volatility of inflation expectations, and inflation forecasts

Partly due to data availability, studies focusing on the behaviour of the level and volatility of inflation expectations under IT have often been based on inflation forecasts published by professional forecasters. As suggested earlier, large deviations in expectations (or forecasts) from the inflation target can be an important measure of the credibility of an IT regime. The dispersion of these expectations or forecasts (or the degree of disagreement among agents) is also important; both measures help to assess the degree to which inflation expectations are anchored. The premise here is that although heterogeneous inflation expectations and forecasts may lead to long memory in actual inflation, successful implementation of IT should decrease this persistence by guiding the public's expectations and forecasts towards the announced target (see Yigit (2010)).⁴⁸

⁴⁷ Some studies are also not consistent with the results reported earlier. Ardakani et al (2018), for instance, in a contribution that uses a broader set of preconditions for IT and macroeconomic outcome variables than the existing literature, find no significant difference in the inflation level and inflation volatility between targeters and non-targeters after the adoption of IT.

⁴⁸ Formally, let π^* denote the inflation target, $\pi(t)$ actual inflation today, and $\pi^e(t+1)$ the expected inflation rate one period ahead; imperfect credibility can be captured by assuming that expected inflation is a weighted average of actual inflation and the inflation target, that is, $\pi^e(t+1) = \theta(t)\pi^* + [1 - \theta(t)]\pi(t)$, where the weight $\theta(t) \in (0,1)$ can be viewed as a credibility index, which

Studies focusing on the impact of IT on inflation expectations include, at the individual country level, Cerisola and Gelos (2009), Nahon and Meurer (2009), Ferreira de Mendonça and de Siqueira Galveas (2013) and Montes (2013) for Brazil and, at the cross-country level, Kose et al (2019). Cerisola and Gelos (2009) examine the macroeconomic determinants of survey inflation expectations in Brazil since the adoption of IT in 1999. They find that the IT framework has helped to anchor expectations, with the dispersion of inflation expectations declining considerably. They also find that apart from the inflation target, the stance of fiscal policy, as proxied by the ratio of the consolidated primary surplus to GDP, has had a strong impact on inflation expectations. The importance of past inflation in determining expectations appears to be relatively low – at least during the sample period – and the overall empirical evidence does not suggest the presence of substantial inertia in the inflation process. Nahon and Meurer (2009) identify the relationship between five credibility indexes of monetary policy in Brazil, changes in policy interest rates and the possibility that credibility reduces the costs of disinflation under IT. These credibility measures are calculated using survey data on expected inflation and the official inflation target. Using monthly data from January 2000 to December 2005, they find that the policy interest rate is a determining factor of the credibility indexes, and that higher credibility is associated with a reduction in the cost of disinflation. A related result is obtained by Montes (2013), who finds that improved credibility of the inflation target in Brazil was accompanied by a reduction in the variability of interest rates. Also related is the study by Ferreira de Mendonça and de Siqueira Galveas (2013), who find that transparency, presumably through a positive effect on the degree of credibility of monetary policy, has helped to reduce the volatility of inflation expectations in Brazil in the years that followed the adoption of the IT regime in 1999. Consistent with some of these country-specific studies, panel data regressions by Kose et al (2019) find that the presence of an IT regime is associated with stronger anchoring of inflation expectations.

Studies focusing on the behaviour of inflation forecasts include Capistrán and Ramos-Francia (2010) and Brito et al (2018).⁴⁹ Capistrán and Ramos-Francia (2010) find that the dispersion of long-run inflation expectations is smaller in IT countries, especially so for developing countries. Brito et al (2018) provide an empirical exploration of the determinants of disagreement about future inflation among professional forecasters in a group of 44 countries (half of which being developing economies) over the period 1986–2016. One of their key results is that disagreement about future inflation increases both the level and volatility of inflation. They also find that disagreement falls following IT adoption, as documented before them by Capistrán and Ramos-Francia (2010). This result is robust only for developing countries and can be attributed (although this is not explicitly tested) to increased transparency in the monetary policy process in these countries. Thus, greater transparency, and the resulting benefits in terms of improved credibility (as measured by lower level and volatility of inflation expectations), can explain why the gains from IT adoption (as documented earlier in terms of the level and volatility of observed inflation) appear to have been stronger in MICs than in AEs.

3.2.3 *Impact on other macroeconomic variables*

In addition to studying macroeconomic outcomes in terms of the level of inflation, actual and expected, and the volatility of inflation expectations and forecasts, studies focusing on the impact of IT on macroeconomic outcomes have also considered its effects on the level and volatility of output, exchange rate volatility and pass-through, and budget deficits and fiscal discipline.

depends negatively on the squared gap between the target and actual inflation, $[\pi^* - \pi(t)]^2$, implying that positive or negative deviations are equally costly. However, as discussed later, the effect of deviations can be asymmetric (positive gaps are less costly than negative gaps), and $\theta(t)$ may also depend on *how long* gaps are expected to persist.

⁴⁹ A related study is Obstfeld et al (2016), which focuses on the behaviour of inflation expectations in AEs. They find that these expectations are better anchored in IT countries (as measured by cumulative deviations from inflation objectives), compared to other countries in that group.

Level and volatility of output

Studies focusing on the impact of IT on the level and volatility of output (or output growth) include Gonçalves and Salles (2008), Mollick et al (2011), Abo-Zaid and Tuzemen (2012), Hartmann and Roestel (2013), and Balima et al (2017). Gonçalves and Salles (2008) find that IT countries experienced greater drops in volatility of GDP growth rates, relative to non-IT countries. In the same vein, Abo-Zaid and Tuzemen (2012) find that IT developing countries were able to achieve higher and more stable GDP growth, compared to non-IT countries. Mollick et al (2011) also find evidence of a positive effect of IT on output growth, but their results are weaker. Using a sample of 34 developed and developing economies over the period 1990–2010, Hartmann and Roestel (2013) find that both high inflation and inflation uncertainty significantly reduce output growth. Thus, to the extent that IT contributes to reducing inflation and its variability, it may have a sizeable impact on output growth and output stability. However, the extent to which the IT regime itself has contributed to these results is not clear; there is no “before-after” distinction in their sample and there is no breakdown between IT and non-IT countries. Finally, in their meta-regression analysis, alluded to earlier, Balima et al (2017) find a significant effect of IT on the volatility of economic growth. However, they do not find a robust effect of IT on the *level* of GDP growth. These results are partly consistent with the evidence that the correlation between inflation and growth tends to be weak at low levels of inflation (see Agénor and Montiel (2015, Chapter 17)). At the same time, if IT is associated with a reduction in the volatility of inflation (as documented earlier), it will lead to lower volatility in relative prices and improve the accuracy of price signals to entrepreneurs; in turn, this may lead to improved investment decisions and lower output volatility.

Exchange rate volatility and pass-through

Studies focusing on the impact of IT on nominal and real exchange rate volatility include Pontines (2011) and Ouyang et al (2016). Using a sample of 22 developed and 52 developing countries over the period 1985–2005, Pontines (2011) finds that developing countries that target inflation have lower nominal and real exchange rate volatility than non-IT developing countries, whereas the opposite holds for developed countries. Ouyang et al (2016) explore the impact of IT on real exchange rate volatility for a panel of 62 developing countries over the period 2006–12. They do so by decomposing changes in real exchange rates in terms of their two component parts; that is, changes in relative tradable prices across countries, and changes in sectoral prices of tradables and non-tradables within countries. Their results suggest that in developed countries IT regimes seem to have been associated with greater real exchange rate volatility, largely driven by external price shocks. For developing countries, by contrast, IT regimes show no difference in real exchange rate volatility. Within the group of MICs, the evidence is also ambiguous. This is consistent with the fact that, theoretically, the effect of IT on exchange rate volatility could go in either direction. On the one hand, because the exchange rate is in principle more flexible under an IT regime, it will naturally tend to fluctuate more in response to disturbances as a result of a stronger shock-absorbing role. On the other, if bouts of exchange rate instability prior to IT adoption are mainly related to abrupt shifts in market confidence in macroeconomic management, the implementation of an IT regime can reduce exchange rate volatility if it helps to improve policy credibility.

For many small open economies, the degree of exchange rate pass-through to domestic prices is a critical component of the monetary transmission mechanism and depends in general on the policy regime. Following Taylor’s (2000) conjecture, it is commonly admitted that improvements in monetary policy performance (reflected in stronger nominal anchors and low, stable inflation) may result in an endogenous reduction in the exchange rate pass-through to consumer prices, because the extent to which a firm decides to pass along an increase in its costs is lower when inflation expectations are well anchored. In turn, a lower pass-through effect implies that there is greater scope for fluctuations in the nominal exchange rate to absorb shocks, which should help to better insulate the domestic economy from external disturbances.

General studies on exchange rate pass-through include Carrière-Swallow et al (2016), who find in a group of 62 advanced and developing economies that price stability and greater monetary policy credibility have significantly reduced the degree of exchange rate pass-through to consumer prices.⁵⁰ Although this evidence is not, strictly speaking, an argument about IT performance, it is indirectly consistent with the evidence, discussed earlier, that under IT inflation volatility has fallen. They also find that the exchange rate pass-through to consumer prices has fallen over the past two to three decades in all country groups, consistent again with a greater degree of credibility of monetary policy and independently of its effect on the level and volatility of inflation.⁵¹

Studies that have focused more specifically on the impact of IT on the degree of exchange rate pass-through include Edwards (2007), Civcir and Akçağlayan (2010), Siregar and Goo (2010), Aleem and Lahiani (2010), Prasertnukul et al (2010) and Maertens et al (2012).⁵² Siregar and Goo (2010) find that in Indonesia and Thailand the adoption of IT was associated with a subsequent weakening of the pass-through effect. Similar regression results were established by Edwards (2007) for several MICs and Aleem and Lahiani (2010) for a group of six East Asian and Latin American MICs. In particular, Aleem and Lahiani (2010, Table 3) estimate that in Brazil the pass-through coefficient fell from 0.24 prior to the adoption of IT to 0.14 in its aftermath, whereas for Korea and Thailand it fell from 0.14–0.16 to almost zero. The drop is even more dramatic for Mexico, from 0.38 to 0.04. According to Maertens et al (2012), the adoption of IT also reduced the pass-through effect in Peru. Related results are obtained for Korea and Thailand by Prasertnukul et al (2010) and for Turkey by Civcir and Akçağlayan (2010). In these countries, as well as in Indonesia and the Philippines, exchange rate volatility also declined after the adoption of IT. These results are all consistent with the view that the adoption of an IT regime, by improving monetary policy credibility and anchoring inflation expectations more firmly, has helped to dampen exchange rate pass-through into inflation. However, even though the pass-through effect may have declined over time, it often remains higher in MICs than in AEs. As a result, it continues to play a key role in the monetary transmission mechanism.⁵³

Budget deficits and fiscal discipline

The effect of IT on budget deficits and fiscal discipline has been assessed by Abo-Zaid and Tuzemen (2012), Minea and Tapsoba (2014), Alpanda and Honig (2014), and Ardakani et al (2018). Alpanda and Honig (2014) find that IT is associated with reduced fiscal imbalances and lower inflation, even in countries with low central bank independence. One explanation for these results is that the implementation of IT brings about lower inflation expectations (consistent with the evidence reviewed earlier), which tends to reduce interest rates and weakens the adverse effects of debt service on the budget. Abo-Zaid and Tuzemen (2012), Minea and Tapsoba (2014), and Ardakani et al (2018) all find that IT enhances fiscal discipline, proxied by the ratio of fiscal deficits to GDP in the first case, the cyclically adjusted primary fiscal balance in the second, and the public debt-to-GDP ratio in the third. The results of Ardakani et al (2018) hold on average for the broad sample that they consider (98 countries over the period 1990–2013), and for developed and developing countries alike. Individual country results may of course differ, as suggested by our previous discussion of the experience of Brazil and Chile.⁵⁴

⁵⁰ As a proxy for monetary policy credibility, they use the degree of disagreement among professional forecasters of inflation. The robustness of this measure is debatable.

⁵¹ Another important variable that may affect the degree of exchange rate pass-through is the state of the business cycle; see Agénor (2002) for a discussion and empirical evidence for MICs. In a study on Latin America, Ghosh (2013) documents the effect of (lagged) inflation itself and trade openness on the magnitude of the decline in the pass-through effect.

⁵² It should be kept in mind that while these contributions generally assume a linear structure, the underlying pass-through process may be non-linear (see Bussière et al (2014)).

⁵³ See, for instance, Minella and Souza-Sobrinho (2013) for evidence on the importance of the exchange rate channel for inflation dynamics in Brazil.

⁵⁴ The joint impact of IT and fiscal rules on inflation and fiscal discipline is discussed in Chapter 6.

3.3 Central bank policy response

The second empirical approach to evaluating performance under IT has focused on central bank policy response under IT and non-IT regimes. The key issue in that context has been the extent to which the adoption of IT has changed central bank operating behaviour, not only with respect to traditional objectives (inflation deviations from target and output gaps), but also with respect to exchange rate changes, fluctuations in asset prices, or indicators of monetary conditions. In most cases, the methodology has involved estimating simple and augmented Taylor-type rules and testing for statistical significance of the coefficients of the additional variables in the regressions. Studies following this approach include Mohanty and Klau (2004), Civcir and Akçağlayan (2010), Teles and Zaidan (2010), Aizenman et al (2011), de Mello and Moccero (2011), Fendel et al (2011), Bleich et al (2012), Neuenkirch and Tillmann (2014) and Bolaños and Cadavid-Sánchez (2018).

Mohanty and Klau (2004) estimate augmented Taylor rules for 13 countries (of which six current IT-MICs), which include, in addition to inflation and the output gap, lagged interest rates and current and lagged real exchange rate changes. With data ranging from the mid-1990s to 2002, they find that the coefficients on real exchange rate changes are statistically significant in 10 countries, with the contemporaneous effect ranging from 0.1 for Thailand to 0.3 for Brazil and Chile and 0.6 for Mexico and the long-run effect ranging from 0.7 for Thailand to 1.6 for Mexico and 2.7 for Peru. The long-run coefficients are very large; indeed, the policy response to exchange rate changes frequently appears to be larger than the response to inflation or the output gap. Mohanty and Klau conclude that this supports the “fear of floating” hypothesis discussed in the next chapter. They do not directly address the issue of performance of IT regimes. However, their results for the MICs in their sample suggest that these countries, whether or not they profess to follow an IT regime, do try to stabilise the exchange rate through monetary policy, in addition to inflation and output. By contrast, de Mello and Moccero (2011) obtain mixed results. They estimate interest rate policy rules for Brazil, Chile, Colombia and Mexico – all characterised by IT and flexible exchange rates during most of their sample period. Consistent with the results reported earlier with respect to outcomes, they find that IT was associated with stronger and more persistent responses to expected inflation in Brazil and Chile. However, Mexico is the only country where changes in (nominal) exchange rates are statistically significant in the central bank’s reaction function during the IT period.

Other studies aimed at testing for an exchange rate effect on policy interest rates include Moura and de Carvalho (2010), Sánchez (2010), Best (2013), Barajas et al (2014) and Ghosh et al (2016). Best (2013) finds that the Bank of Mexico, through its Taylor rule, has responded consistently to movements in the nominal exchange rate during the floating exchange rate regime. This result is corroborated by Moura and de Carvalho (2010). In a broader study, Ghosh et al (2016) find that IT central banks in developing countries respond to real exchange rate movements above and beyond any impact on expected inflation when setting interest rates.⁵⁵ By contrast, estimates by Sánchez (2010) for Korea over the IT period 1999–2006 do not detect a significant concern for exchange rate variability, and neither do those of Moura and de Carvalho (2010) for the other Latin American MICs in their sample. In the same vein, Barajas et al (2014) estimate standard and augmented Taylor rules for four IT countries in Latin America (Brazil, Chile, Colombia and Peru) and find no significant effect of exchange rate misalignments on policy rates.

The role of the exchange rate in the policy rule is also the focus of Aizenman et al (2011). In addition, in their empirical analysis they consider how this role is affected by the share of commodities in a country’s production structure – and, hence, its potential vulnerability to terms-of-trade shocks. They argue that the distinction between heavily concentrated commodity-exporting countries and non-concentrated countries is potentially important in how IT works in practice. Using panel data, they find

⁵⁵ It is also worth noting that Caputo and Herrera (2017) find that IT central banks in developing economies tend to respond through their Taylor rule to movements in the federal funds rate, besides reacting to expected CPI inflation and to the domestic output gap. Changes in the federal funds rate are an important determinant of capital flows and subsequent exchange rate movements in recipient countries.

that (in line with their theoretical model) IT-MICs tend to systematically respond to the real exchange rate in their policy rule. Moreover, within that group of countries, in those with particularly high concentration in commodity exports central banks change interest rates much more proactively in response to real exchange rate changes than do their counterparts in the non-commodity-intensive group. However, other studies provide mixed results; Bolaños and Cadavid-Sánchez (2018) in particular find that although the introduction of IT had a significant effect on lowering inflation and its volatility in Brazil, Chile, Colombia, Mexico and Peru (all, except Mexico, large commodity exporters), as supported by more responsive interest rate reaction functions, it was also accompanied by *less* sensitivity of policy rates to output deviations and exchange rate fluctuations.

Indirect evidence on the anchoring effect of IT is provided by Teles and Zaidan (2010), Bleich et al (2012), and Neuenkirch and Tillmann (2014). The first study evaluates the validity of the *Taylor principle* for stabilising inflation in several MICs that use IT regimes (Brazil, Chile, Colombia, Mexico, Peru, the Philippines, South Africa, Thailand and Turkey, all of which (except the Philippines) are included in the sample considered in this book).⁵⁶ The results showed that compliance with the Taylor principle results in the deviation of expected inflation from target to be stationary in all cases; that is, there is no systematic gap between the two variables over time. This is again consistent with the results reported earlier regarding the effect of IT on anchoring inflation expectations. For their part, Bleich et al (2012), using data for 20 IT countries (seven of which are MICs) over the period 1990–2007, provide evidence which suggests that once a country formally introduces IT, the inflation coefficient in its monetary policy reaction function increases significantly to values above unity for the majority of IT countries (11 of 20), and five of the MICs (Brazil, Colombia, Mexico, South Africa and Turkey), but not for Chile and Peru. This feature again reflects the Taylor principle. However, neither study provides a comparative analysis with respect to non-IT countries, which begs the question of whether there may have been a common factor (such as the *Great Moderation*) at play. Finally, indirect evidence on the credibility effect of IT is provided by Neuenkirch and Tillmann (2014). Using a sample of five IT-AEs, they find that past deviations from IT feed back into the central bank's reaction function and that this effect is economically significant. Although similar results are not available for IT-MICs, they suggest that, in general, credibility losses may well induce central banks to undertake larger interest rate steps. However, it is important to note that such a strategy may backfire if the output cost of this policy is perceived to be excessive.

3.4 Assessing the evidence

By and large, empirical studies based on macroeconomic outcomes (especially in terms of actual and expected inflation) suggest that IT regimes in MICs have been fairly successful – even more so, in many regards, than in AEs. One reason for this could simply be that, to begin with, AEs did not suffer to the same extent from severe or highly volatile inflation and benefited from higher central bank transparency. Another is the possibility that the adoption of IT was more effective in countries that initially lacked credibility in the management of monetary policy.⁵⁷ Indeed, except for periods of severe external shocks, IT countries were relatively more successful in meeting their targets, and the output sacrifice ratio (the percentage fall in output resulting from a 1 percentage point reduction in inflation) was lower after the adoption of IT in these countries compared with other groups. In addition, the level of expected inflation fell in many IT-MICs (relative to the control group), and both the variability of expected inflation and the average absolute forecast error (controlling for the level and variability of past inflation) fell significantly. Inflation persistence declined as well in IT countries – a result that is consistent with the view that IT has

⁵⁶ The Taylor principle requires that the nominal policy rate be increased sufficiently to ensure that the real interest rate (which affects aggregate demand) rises as well following a positive shock to inflation; in simple New Keynesian models, it is a necessary condition to ensure macroeconomic stability. See, for instance, Clarida et al (1999).

⁵⁷ These two reasons could of course be related, given the links (discussed earlier) between lack of credibility and the degree of persistence in inflation expectations, and the link between transparency and improved credibility.

played a role in strengthening the effect of forward-looking expectations on inflation, hence weakening the degree of inflation inertia. Overall, the reduction in volatility and in the degree of persistence of inflation expectations suggests that the implementation of IT has been associated with improved credibility of monetary policy, without significant reductions in output growth rates. However, empirical studies provide mixed evidence on whether IT has contributed to a reduction in output volatility. In a sense, this is understandable; monetary policy is only one element of the macroeconomic policy framework; lack of fiscal discipline could mitigate its benefits in terms of output stability.

The evidence based on estimated policy reaction functions largely corroborates the results based on macroeconomic outcomes. It suggests that IT central banks in many MICs have become more responsive to deviations in actual (or expected) inflation from target – improving, in so doing, prospects for macroeconomic stability. From that perspective, the fact that some (although not all) studies find a positive effect of exchange rates in Taylor rules does not necessarily reflect a deliberate attempt to target the exchange rate, but rather an indirect response to the impact that it has on aggregate demand. It may also be evidence in favour of the fear of floating argument, which may itself (as discussed in the next chapter) result from various considerations. It is also important to note that the fact that some studies are unable to detect a *systematic* effect of exchange rate changes on policy rates does not preclude the possibility that central banks react *episodically* to these changes; indeed, these studies (which are usually based on linear regression techniques) do not capture the fact that policy response may be *non-linear*, in the sense that it occurs only when, for instance, the (cumulative) change in the exchange rate is relatively large compared to a norm set by the central bank, or when that change is in one direction only (appreciation).

In sum, the foregoing discussion suggests that, regardless of the methodology used, most recent studies reach similar conclusions: the adoption of an IT regime in MICs has led to lower average inflation rates and reduced inflation volatility compared to a control group of non-IT countries, and possibly a lower (although still high in some cases) exchange rate pass-through. Operating procedures of IT central banks have also become more responsive to inflation gaps. Although in achieving these outcomes most MICs benefited from the period of *Great Moderation* in world inflation, as well as from deep structural reforms, the IT regime may have led to important, and possibly irreversible, institutional changes in the conduct of macroeconomic policy. At the same time, however, even though the volatility and persistence of inflation expectations have fallen (substantially in some cases) over time, credibility has remained a “work in progress” in many countries. A possible reason for that, as discussed in more detail later, is the fact that central banks continue to confuse markets at times by signalling a strong preference for output or exchange rate stability. As a result of this perceived shift in preferences, credibility is lost quickly, and restoring it takes time.

Two issues have not been fully addressed in the existing literature. First, the econometric studies discussed earlier do not capture the fact that not only the *magnitude* but also the *direction* or *duration* of deviations from inflation targets may matter in terms of their impact on inflation expectations – possibly in a non-linear fashion. Particularly large (or positive) and persistent deviations from targets may have a more significant cost in terms of central bank credibility, imparting as a result greater inertia to inflation expectations than smaller (or negative) deviations. The stronger the central bank’s perceived preference for output – a key parameter affecting the target horizon; that is, the speed at which actual inflation should be brought back to its target value following a temporary shock – the longer the gap will be expected to persist, and the lower will be the credibility of the inflation target. In addition, these effects may be *asymmetric*. Indeed, as discussed earlier in reference to Figures 3.2 and 3.5, deviations of actual inflation from the inflation target have been common in MICs (as well as in high-income economies), including during episodes of global shocks. But undershooting of the inflation target (even when it is large) does not necessarily translate into gains in credibility, whereas instances of overshooting (even when small) could create severe credibility issues if they persist, unless they are corrected by more aggressive policy responses – as documented in some of the empirical evidence discussed earlier (see Neuenkirch and Tillmann (2014)).

Second, as also noted earlier, since the onset of the GFC there have been renewed concerns about systemic financial risks and the possibility that a monetary policy regime geared solely to achieving low inflation may exacerbate these risks. Yet, to this day there has been no comparative empirical study of the consequences of IT policies for financial stability (or proxies for it, such as credit growth or changes in the credit-to-GDP ratio). These and other challenges to IT are discussed next.

Chapter 4. Challenges to inflation targeting

As noted in Chapter 2, in most countries IT was initially implemented to address the challenges associated with the difficulty of sustaining exchange rate pegs and achieving monetary targets in the presence of money demand instability. But, despite performing well during the past two decades (especially in MICs, as documented in the previous chapter), and even though there is little disagreement that the main medium- to long-run goal of monetary policy remains the pursuit of price stability, IT faces challenges of its own. This chapter discusses the nature of these challenges in a MIC context: the difficulty of building and maintaining credibility; the risks posed by liabilities and fiscal dominance; the implications of terms-of-trade shocks for monetary policy; the role of exchange rate volatility and fear of floating; and the potential trade-offs between price stability and financial stability, in a context where the emphasis is on prevention, rather than ex post resolution, of financial crises.

4.1 Building and maintaining credibility

As discussed in Chapter 2, the credibility of an IT regime depends on the credibility of a *promise* to reach the inflation target in the future. Establishing credibility has therefore proved elusive, often occurring over an extended period of time, keeping inflation expectations and actual inflation high in the process. In countries where the preference for output stability is perceived by the public to be high to begin with, or to increase significantly once the unemployment rate rises above a threshold level, the credibility of an announced inflation target may be significantly undermined. In turn, as also noted earlier, lack of confidence in policymakers' commitment (or ability) to maintain low inflation may be one of the reasons why empirical studies find that inflation displays a strong degree of persistence in MICs (see Agénor and Bayraktar (2010)); regardless of the monetary policy regime, low credibility tends to impart a strong backward-looking component to inflation expectations.

Indeed, two important lessons from the experience of MICs during the past two decades, as noted in the previous chapter, are that uncertainty about the central bank's preferences over output and inflation may adversely affect credibility, and that price shocks may have large asymmetric effects on credibility. Overshooting the inflation target (possibly out of concern for limiting short-run output losses) may be highly costly in terms of lost credibility, in contrast to undershooting; that is, actual inflation below target. In addition, credibility depends not only on the *level* of deviations from target, but also on *how long* these deviations last. Adopting a target band does not, by itself, solve the problem.⁵⁸ The fact that credibility remains a work in progress in some MICs is an important consideration when discussing the possibility of extending the mandate of the central bank to explicitly account for an additional target, such as financial stability, as discussed later.

4.2 Fiscal liabilities, risk premia, and fiscal dominance

In the immediate aftermath of the GFC, large fiscal deficits fuelled a substantial increase in the size of public debt in all major advanced economies. For IT-AEs, for instance, the size of the public sector debt as a share of GDP jumped from an average of 39.7% in 2007 to 66.9% in 2017 (Figure 4.1, left-hand panel). By contrast, over the same period in IT-MICs the average debt-to-GDP ratio has increased only from 35.4% to 44%. There are also large differences within these groups; among AEs, for instance, the GIPS countries (Greece, Ireland, Portugal, Spain) saw their debt ratio more than double, whereas IT-MICs recorded both

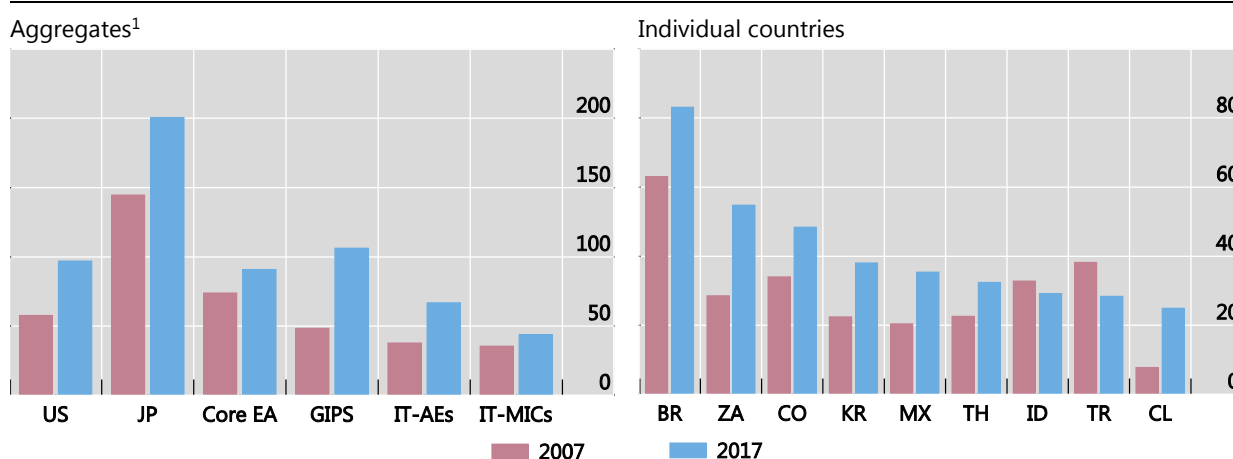
⁵⁸ As noted in Chapter 2, a trade-off exists between credibility and flexibility in the choice of the optimal target band: the wider the bands are, the more likely it is that the point target (or the midpoint of the band) will be achieved, but the less credible the target becomes. Horváth and Matějů (2011) provide evidence suggesting that countries where the macroeconomic environment is less stable (often the consequence of inadequate anchoring of expectations due to low credibility) tend to establish a wider range for their inflation target.

increases (most notably in Brazil, Chile, Colombia, Mexico and South Africa) and reductions (in Indonesia and Turkey; Figure 4.1, right-hand panel). In some countries, these ratios rose significantly because they relied on countercyclical fiscal policy to mitigate the spillover effects of the GFC on economic activity.

General government nominal debt

As a percentage of GDP

Figure 4.1



Core EA = Core euro area: Germany, France and Italy; GIPS = Greece, Ireland, Portugal, Spain; IT-AEs = Advanced economies which are inflation targeters: Australia, Canada, New Zealand, Norway, Sweden, United Kingdom; IT-MiCs = Middle-income countries which are inflation targeters: Brazil, Chile, Colombia, Indonesia, Korea, Mexico, South Africa, Thailand, Turkey. BR = Brazil; CL = Chile; CO = Colombia; ID = Indonesia; JP = Japan; KR = Korea; MX = Mexico; TH = Thailand; TR = Turkey; US = United States; ZA = South Africa.

¹ Weighted averages based on rolling GDP and PPP exchange rates.

Sources: National data; authors' calculations.

The increase in public debt-to-GDP ratios in some MICs occurred despite the existence of fiscal rules, whose goal was to contribute to anchoring medium-term expectations about fiscal policy.⁵⁹ Brazil, for instance, introduced a Fiscal Responsibility Law in May 2000 that prohibits financial support operations among different levels of government (namely, a ban on federal government financing of state and local governments), sets caps on personnel expenditure, and requires that limits on the indebtedness of each level of government be set by the senate (see Araújo et al (2012)). Chile introduced a structural balance rule in 2001, which became law in August 2006; the indicator used nets out the cyclical impact of three variables that affect central government revenue (the level of economic activity and the prices of copper and of molybdenum; see Claro and Soto (2012)). However, these rules did not prevent a build-up in debt in these countries, as noted earlier. More generally, in countries where fiscal imbalances persist, the spectre of *fiscal dominance* (discussed in Chapter 2) may re-emerge.

In addition to overt fiscal imbalances, IT-MiCs are exposed to significant contingent fiscal liabilities. Population in many of these countries is ageing fast; the old-age dependency ratio in some of

⁵⁹ In general, there are four kinds of fiscal rules (see García (2012) and Agénor (2015)): those that mandate balanced budgets or impose limits on fiscal deficits, irrespective of the cyclical position of the economy; those that fix limits on the level of public expenditure, often in specific areas (for instance, discretionary as opposed to non-discretionary spending) or particular programmes; those that impose revenue collection goals; and those based on the structural fiscal balance or adjusted by the business cycle, which allow the operation of automatic stabilisers and provide some room for discretionary policy within the cycle.

them may well triple between 2011 and 2040 (see Montoro et al (2012)). A large part of these populations, currently outside any social security system, ultimately has to be covered by a formal pension arrangement.⁶⁰ This may put considerable pressure on fiscal accounts in the future. While the impact of this rise will vary across regions and countries, depending on the nature and scope of pension arrangements, the experience of AEs suggests that the share of health and pension expenditure in GDP is likely to rise substantially in many IT-MICs in the next decade.⁶¹

Public policy reform can greatly reduce the fiscal burden associated with an ageing population; some countries have actually engaged in that path (see Clements et al (2012)). However, future fiscal liabilities associated with health care spending and pensions may have immediate implications for monetary policy, especially in those countries engaged in a rapid demographic transition: the expectation that these liabilities may lead to *future* fiscal deficits, and that these deficits may be monetised, could affect inflation expectations *today*. Indeed, as demonstrated by Leeper (2011), the possibility of a fiscal limit (in terms of the size of the public debt) is such that an IT regime may fail to anchor inflation expectations in the periods before the fiscal limit is hit.⁶² The fundamental reason for this *fiscal arithmetic* of course is that current beliefs about post-limit policy behaviour affect current economic decisions. If expectations of higher inflation push market interest rates higher today, this could immediately worsen the fiscal situation and consequently hamper the ability of monetary policy to lower policy rates in downturns or to raise them to choke off inflationary pressures.⁶³ The policy implication is that anchoring beliefs about (future) fiscal policy may be crucial for the conduct and performance of (current) monetary policy. If governments can reduce uncertainty about their plans for meeting their fiscal obligations and controlling public debt in the medium run, the central bank's ability today to set interest rates to achieve its inflation target would be enhanced. At the same time, as discussed further in Chapter 6, maintaining some degree of flexibility in fiscal policy is essential to address some types of shocks (especially terms-of-trade shocks) and ensure the credibility of the overall macroeconomic policy regime.

In an open economy, a related channel through which fiscal discipline and public debt dynamics may affect the performance of IT regimes is through the *risk premium channel* analysed by Favero and Giavazzi (2004) and Blanchard (2005). In an environment where the domestic public debt is high and the average maturity of that debt is short, concerns about debt sustainability may lead to a significant increase in the risk premium demanded by investors, both domestic and foreign. In turn, this can create a dilemma for monetary policy: a tighter policy associated with higher real interest rates would increase the debt service burden and could actually lead to capital outflows and eventually to a depreciation of the domestic currency, by increasing the risk of default on public debt. If the degree of exchange rate pass-through is high, the depreciation of the national currency will raise domestic prices. As a result, a *price puzzle* (higher inflation associated with a contractionary monetary policy) may emerge.

This argument relies on the uncovered interest rate parity condition operating in a rather unconventional way: as long as there are concerns about debt sustainability, increases in interest rates as part of a tight monetary policy further increase the probability of default, thereby inducing investors to demand a higher risk premium. As a result, capital outflows and currency depreciation are observed, which also worsen price dynamics, especially when there is a high degree of pass-through (as noted in the

⁶⁰ Among MICs Brazil is unique in having only 10% of the population over the age of 65, but spending on pensions is already high, at about 14% of GDP.

⁶¹ Another source of potential liabilities is associated with implicit government guarantees to the financial system. However, strengthening the financial system and improving financial stability should reduce the magnitude of these liabilities or the likelihood that they will materialise.

⁶² The impact of uncertainty about future fiscal policy on today's macroeconomic outcomes was highlighted in an important early contribution by Drazen and Helpman (1990).

⁶³ As noted by Sims (2005), even if economic agents know how policies will adjust once the economy hits the fiscal limit, it may no longer be possible for monetary policy to achieve its inflation target. In effect, monetary policy's loss of control of inflation begins well before the fiscal limit is hit.

previous chapter) from exchange rate to prices. Yet, there is some evidence to support this risk premium channel, as presented by Zoli (2005) for the period surrounding the 2002 macroeconomic turmoil in Brazil, and by Aktas et al (2010) and Akyurek et al (2011) for Turkey after its 2001 financial crisis. The lesson from these episodes is that when markets are worried about public sector debt rollover or the sustainability of public debt, changes in policy rates can have a powerful unconventional impact on expectations. If interest rate hikes or cuts are delayed, markets may become concerned over debt dynamics and expect future monetisation of the public debt, as discussed earlier. Thus, tighter monetary policy could lead immediately to higher inflation. Put differently, with a weak fiscal position and policy uncertainty, monetary policy alone cannot determine expected inflation. The question that arises in these conditions, as discussed later, is what measures can be taken to ensure the consistency and credibility of the overall macroeconomic framework under an IT regime.

4.3 Managing commodity price shocks

World commodity prices have remained highly volatile in the past two decades, while displaying at times a high degree of persistence (Figure 4.2).⁶⁴ From the perspective of monetary policy, the consensus view is that commodity price shocks that are (or are perceived to be) temporary should not require a policy response, just like any other supply shock. But when inertial mechanisms are widespread, even temporary shocks may feed into domestic prices through wage indexation and sustained increases in inflation expectations. The consensus view has therefore proved to be a difficult option to follow in practice. How to deal with commodity price shocks (or more generally terms-of-trade shocks) remains therefore a critical issue for IT-MICs.

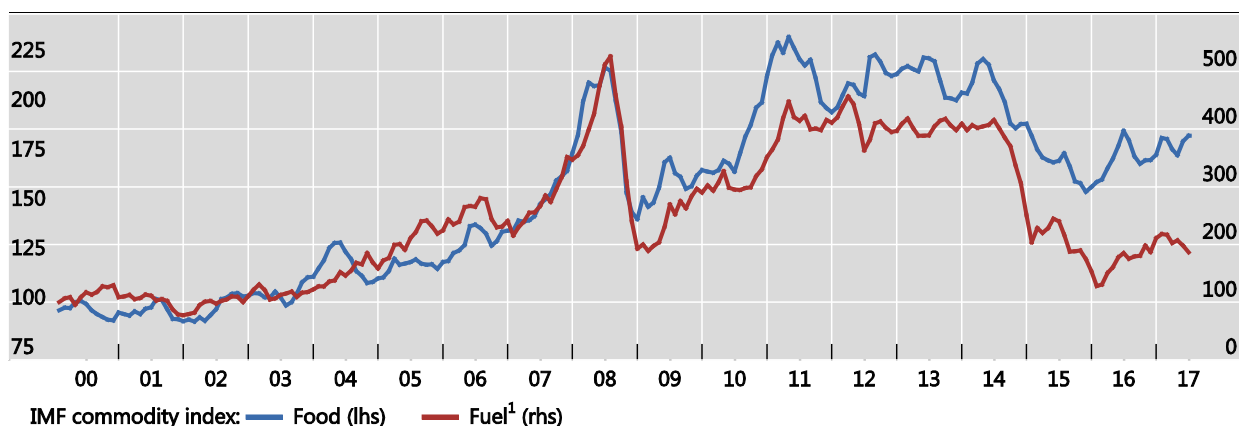
To some extent, the current debate on how to respond to terms-of-trade shocks parallels the initial discussion (in a closed-economy context) on IT adoption in many countries – whether they should choose headline CPI inflation or a *core* CPI inflation measure, which excludes or down-weights volatile food and energy prices, as their inflation target. The original argument in favour of targeting core inflation is that it is less sensitive to transitory shocks and easy to explain: it excludes highly volatile products and is subject to shocks that have a very short duration. In principle, if headline and core inflation have the same long-run mean, and non-core inflation has no long-run effects on core inflation, then the issue is trivial – countries should opt for core inflation (see IMF (2011c), and Walsh (2009, 2011)). Doing so would deliver more stable headline inflation over the medium term and lower output volatility than the alternative of stabilising headline inflation in the short term – a policy that would entail countering the first-round effects of commodity price shocks, or terms-of-trade shocks, on domestic prices.

⁶⁴ Caballero and Cowan (2007) document the very high volatility in the terms of trade in MICs over the period 1985–2004.

World commodity prices, 2000–17

2000 = 100

Figure 4.2



¹ Fuel (Energy) Index: includes crude oil (petroleum), natural gas, and coal price indices.

Source: IMF commodity price database.

However, in practice, non-core inflation often affects core inflation over time. A key reason for this is that food and energy tend to represent a large fraction of the consumption basket in MICs (see Agénor (2002), IMF (2011c), Anand et al (2015) and Ha et al (2019)). If shocks to domestic food and oil prices (whether induced by external developments or not) display persistence, they may have significant second-round effects, directly through their impact on production costs and indirectly through wages, which may feed into core inflation – thereby generating persistent movements in overall prices. There is evidence to suggest that this channel can be quite significant in MICs. Using a sample of 46 countries, Pedersen (2011), for instance, finds that, consistent with the foregoing discussion, propagation from food prices to core inflation is higher in developing economies than in AEs.⁶⁵ In fact, the optimal price index to target in the former group of countries may well include a positive weight on food prices (see Anand et al (2015)).

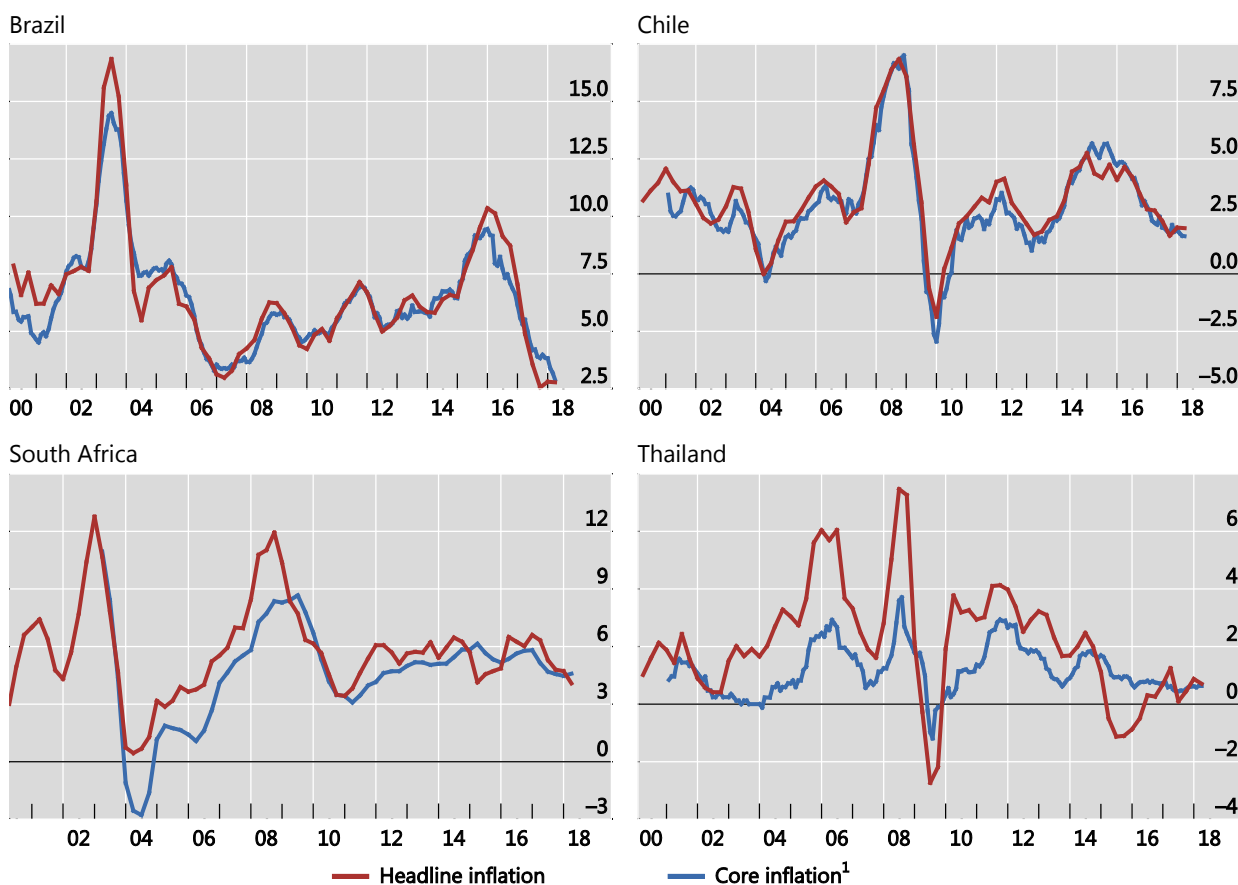
Operationally, despite targeting headline inflation, most central banks in IT-AEs and IT-MICs pay close attention to the behaviour of various measures of core inflation, which involve either excluding certain components from headline CPI (as noted earlier) or re-weighting all components of that index based on the volatility of its components (see Silver (2006)). However, the previous analysis suggests that in an environment where commodity price shocks are persistent, core inflation measures that exclude all food and energy prices may not perform well as predictors of future headline inflation. As shown in Figure 4.3, this appears to have been the case for Thailand (which continues to officially target a measure of core inflation that excludes fresh food and energy prices) and South Africa. Moreover, some central banks have avoided using core inflation as an official target for fear of being perceived as *opportunistic manipulators* and undermining the credibility of the IT regime. As a result, few countries set their inflation targets in terms of core inflation.

⁶⁵ He also finds that the propagation of food price shocks to core inflation is much larger than that of energy price shocks.

Headline and core inflation measures

In per cent

Figure 4.3



¹ For Brazil, measured using the exclusion method which excludes fuel and 10 items of the food and beverages group from the IPCA; for Chile, measured by excluding fruits, fresh vegetables and fuels from the IPCX; for South Africa, measured excluding food, non-alcoholic beverages, petroleum and energy; for Thailand, measured by excluding raw food and energy.

Sources: DataStream; national data; authors' calculations.

Some observers, most prominently Frankel (2011), have argued that an alternative to core inflation, or more generally CPI-based targeting, is *product price targeting* (PPT), a regime under which the price target is based on a broad index of all domestically produced goods, whether they are exportable or not. Specifically, under PPT the central bank's inflation target is set on the basis of a price index that reflects a basket of goods that the country under consideration produces (thereby including those that it exports), rather than an index that reflects the basket of goods that it consumes (which would include those that it imports). Frankel proposed to use a broad output-based price index (that is, a producer price index, PPI), which would reflect the prices of all goods produced domestically, as the anchor for monetary policy.⁶⁶

The rationale for PPT is that in an IT regime based on headline inflation, commodity price or terms-of-trade shocks may lead to perverse policy responses. In principle, such shocks should be accommodated by offsetting movements in real exchange rates; that is, a *deterioration* (improvement) in the terms of trade should be associated with an exchange rate *depreciation* (appreciation). These movements are essential to maintain domestic and external equilibrium (see for instance Agénor and Montiel (2015, Chapter 1)). But in a CPI-based IT regime, if the price of, say, imported oil rises in world

⁶⁶ Frankel also considers some other measures in which prices of export commodities are given a more substantial weight.

markets, creating a current account deficit, a CPI-based target would induce the central bank to raise interest rates – which, by attracting capital flows, would lead to a currency *appreciation* and a further worsening of the current account. The policy response therefore operates in the opposite direction to what is needed to restore external balance. Conversely, with a terms-of-trade improvement, induced by, say, a fall in the price of imported final goods, a CPI-based inflation target would call for a reduction in domestic interest rates (given that inflation is now lower), which may induce an outflow of capital and a currency *depreciation*, which would further improve the current account. Conventional IT therefore prevents the contraction in monetary policy (higher interest rates) that would be called for to generate the required appreciation of the exchange rate and mitigate the external surplus. Thus, for countries that are price takers on world markets, terms-of-trade volatility poses a significant challenge to IT based on headline CPI.

By contrast, under PPT, terms-of-trade shocks are fully accommodated. Under a target based on a PPI, an increase for instance in the world price of imported oil would not trigger a hike in interest rates (and thus an appreciation), whereas an increase in world prices of the country's commodity exports – which raises the PPI, with no direct effect on the CPI – would lead to higher interest rates and an appreciation, as called for to maintain external balance.

However, there is a range of circumstances under which PPT may not perform much better, or very differently, from standard IT. Suppose that the imported good whose price increases (oil) is not only consumed as a final good but also used as an intermediate input in production. In such conditions, the increase in the price of oil will feed not only into the CPI but also into the PPI. Which effect is larger will depend in general on the composition of household spending and the structure of production costs; the point, however, is that in such conditions a PPI-based inflation target would also lead to higher interest rates and an appreciation – a perverse policy response from the perspective of maintaining external balance, as would be the case with a CPI-based IT regime. Similarly, suppose that the price of a domestically produced good increases on world markets, and that the good is also consumed domestically. In response to the increase in the world price, domestic producers may switch supply to foreign markets – implying, all else equal, a drop in domestic sales and thus higher consumer prices at home if demand is inelastic in the short run. As before, with a CPI-based inflation target interest rates would increase and the exchange rate would appreciate. The same would occur with a PPI-based inflation target; the difference between the two regimes would depend once again on the structure of household spending and the composition of production costs.

Implementing PPT faces a host of practical difficulties as well. Although the GDP deflator is one possible output-based price index that could be used in such a regime, it has the disadvantage of being available only quarterly in many countries. It is also subject to lags in collection, measurement errors, and significant subsequent revisions. Implementing such a regime (given that decisions are taken in real time) could therefore require a substantial investment in data collection and analysis – without necessarily alleviating the problem completely.

In addition, there is potential for conflict or uncertainty resulting from differences in price movements between CPI- and PPI-based inflation: because the PPI is not easy for the public to understand and follow, these differences can create communication and credibility problems, particularly in countries with a history of failed attempts at stabilising inflation or vulnerable to large domestic and external shocks. In such conditions, a headline inflation target, being more familiar to the public, would make monetary policy more transparent – even if it is subject to some defects in measuring underlying price pressures.

4.4 Exchange rate volatility, fear of floating, and policy responses

The exchange rate plays an essential role in the monetary transmission mechanism. It affects the main target variables of monetary policy (inflation and the output gap) through both direct and indirect channels. A direct channel (the pass-through effect alluded to earlier) operates via the impact of prices of

imported final goods on domestic consumer prices with, generally, a relatively short lag. Indirect channels operate through both aggregate demand and aggregate supply. By altering the real exchange rate, the nominal exchange rate affects relative prices and thus (through an intratemporal substitution effect) aggregate demand, output and inflation. In economies where agents (including banks) are highly indebted in foreign currency, exchange rate changes may also affect aggregate demand through wealth and balance sheet effects.⁶⁷ The supply side effects of the exchange rate operate through its effect on the cost of imported intermediate inputs and because nominal wages may depend on (actual or expected) changes in consumer prices caused by exchange rate changes. These demand and supply side effects can explain why exchange rate variability exacerbates the variability of economic activity, as established by Kandil (2015), for instance, in a cross-country study for Latin America and the Caribbean. In turn, the exchange rate is affected by interest rate differentials, foreign disturbances, and expectations of future exchange rates and risk premia that depend on domestic factors, such as the size of the domestic public debt (as noted previously) or the degree of credibility of the inflation target. The exchange rate is thus important under IT, in transmitting the effects of both changes in policy interest rates and domestic or foreign disturbances.

As discussed in Chapter 2, in principle the adoption of an IT regime requires the absence of any commitment to a particular value of the exchange rate. Apart from smoothing interventions, the currency should float freely. The common argument is that when limiting exchange rate fluctuations is a stated or an implicit policy target, it will usually be difficult for the central bank to convey to the public its intention to give priority to price stability over other objectives of monetary policy in a credible and transparent manner. Private agents are likely to discount and/or get confused by public pronouncements; in turn, lack of credibility will translate into higher, and more persistent, inflation expectations. Thus, the absence of (implicit or explicit) commitment to a particular level for the exchange rate – or, equivalently, giving the inflation target unambiguous priority over other policy objectives – is viewed as essential for the functioning of an IT regime.

In practice, as documented by Ebeke and Fouejieu (2015), IT countries do indeed have a relatively more flexible exchange rate regime (on average) than non-IT countries at similar levels of development. However, even for those IT-MICs which have opted for a *de jure* flexible exchange rate, monetary authorities have continued to pay considerable attention to the value of the national currency – often intervening heavily in foreign exchange markets, adopting a *de facto* target path or band, and providing hedger of last resort support to highly indebted corporations. In what follows, key reasons for what has been characterised as a *fear of floating* are discussed. Policies aimed at stabilising the exchange rate (the use of policy interest rates and sterilised intervention) are then examined.

4.4.1 *Fear of floating*

Almost from the moment they adopted IT, many MICs started to develop a so-called *fear of floating*, which has led policymakers to take deliberate policy actions to stabilise the exchange rate (Calvo and Reinhart (2002)).⁶⁸ There are various reasons for the central bank to be concerned with nominal exchange rate movements, even when its degree of independence (and thus its ability to commit itself only to the pursuit of price stability) is high. As noted earlier, the exchange rate has a direct impact on inflation and plays a key role in transmitting monetary policy and exogenous shocks to prices. If the pass-through effect is high, the central bank may be tempted to intervene on the foreign exchange market to limit currency fluctuations. A high degree of nominal exchange rate instability may also be of concern to the extent that it translates into a high degree of variability in the real exchange rate, which may distort relative price signals to domestic producers and translate into a misallocation of resources. Another important

⁶⁷ Balance sheet effects can be powerful enough to dominate other effects of the exchange rate through more standard channels (see, for instance, Catão and Pagan (2011)).

⁶⁸ Put differently, a country exhibits fear of floating when it claims to be pursuing a policy goal that is independent from the exchange rate, but keeps intervening in the foreign exchange market without any clear link with that policy goal.

consideration is that in dollarised IT-MICs (like Peru or Turkey, for instance), large fluctuations in exchange rates can lead to banking and financial instability by inducing large portfolio shifts between domestic and foreign currency-denominated assets. This is a particularly important consideration in the context of the *integrated inflation targeting* framework discussed in the next chapters. Underdeveloped markets for foreign exchange (which limit the availability of hedging instruments), a short history of stable inflation, and the fact that excessive currency appreciation may exacerbate risk-taking behaviour by financial intermediaries are also reasons for a country to fear floating exchange rates and potential bouts of currency volatility.

There is mixed formal evidence to support the fear of floating argument. Ball and Reyes (2004), for instance, have argued that in the early years of the IT regime in Brazil, although the central bank seemed to react strongly to changes in inflation, it also engaged in exchange rate smoothing, which can be construed as a symptom (albeit weak) of fear of floating. At the same time, Nogueira and León-Ledesma (2009) find that the adoption of IT meant a strong movement towards greater exchange rate flexibility in Brazil. In a more comprehensive study, Ball and Reyes (2008) compared IT regimes to the fear of floating regime in MICs. They conclude that these are distinctly different regimes and that the IT regimes are more similar (in terms of the behaviour of interest rates, exchange rates, and other variables) to floating regimes than to the fear of floating ones.

In practice, identifying fear of floating behaviour is difficult. In particular, even though exchange rate pass-through may have decreased substantially after the adoption of IT in several MICs (as discussed in the previous chapter), it remains high in many of them; a central bank may still choose to smooth short-run exchange rate movements to attain its inflation target. This does not mean that the monetary authority does not allow the currency to adjust to a new long-run equilibrium following a permanent shock to fundamentals, but rather that it will not let this movement interfere with the attainment of their inflation objective (Nogueira and León-Ledesma (2009)).⁶⁹ Indeed, as discussed earlier, exchange rate movements affect domestic inflation through a variety of direct and indirect channels that may be separate from domestic demand or supply shocks.

A more general problem with the fear of floating argument is that it implicitly assumes that the optimal policy is always a free-floating regime, and consequently that any intervention in the foreign exchange market would lead to a sub-optimal outcome. However, this is not necessarily the case for MICs. In particular, as noted by Reyes (2007) and as discussed next, in countries where the exchange rate pass-through remains high, and vulnerability to external shocks is significant, intervention aimed at stabilising the exchange rate may be essential to ensure that macroeconomic and financial stability is achieved.

4.4.2 *Stabilising the exchange rate: policy interest rates*

Underdeveloped financial systems or a high share of commodities in production can make it difficult to stabilise domestic output in the face of large external shocks. In such conditions, and independently of fear of floating considerations, monetary policy may well need to react to the exchange rate. Both Aghion et al (2009) and Aizenman et al (2011), for instance, have argued that it is optimal for the central bank to pursue an interest rate rule that accounts for movements in the real exchange rate. Céspedes et al (2004), Morón and Winkelried (2005) and Cavoli and Rajan (2006) also suggest that there may be some benefit from including the exchange rate in the reaction function of an IT central bank in financially vulnerable economies. Importantly, some of these studies show that, using numerical simulations, the optimal weight on the exchange rate does not need to be very high. In the same vein, Roger et al (2009) and Garcia et al (2011) find that for financially robust economies, putting a small weight on exchange rate smoothing is beneficial in handling risk premium shocks, with no significant adverse consequences for inflation or

⁶⁹ In fact, Agénor (2002) has argued that the *absence* of such interventions can be destabilising.

output performance. For financially vulnerable economies, some exchange rate smoothing is found to be even more beneficial, largely reflecting perverse effects of demand shocks on exchange rate movements.⁷⁰

The empirical literature on Taylor rules reviewed in the previous chapter provides mixed evidence as to whether central banks in MICs respond explicitly, and systematically, to exchange rate movements. The reason, as noted earlier, could be that a reaction of the policy interest rate to the exchange rate may simply reflect the fact that the central bank reacts to anything that may affect inflation; in a standard IT framework, exchange rate movements are already factored in indirectly. This is one interpretation of Brazil's experience (Nogueira and León-Ledesma (2009)). In addition, as noted in our assessment, the fact that some of the existing studies are unable to detect a significant, systematic effect of exchange rate movements on policy rates may be because central banks react non-linearly, or in state-contingent fashion, to these movements.

More fundamentally, there are limitations and risks to making the central bank interest rate rule sensitive to exchange rate changes; that is, to using one instrument to achieve two targets. Roger et al (2009) provide a review of the literature on the conditions under which it makes sense for the central bank to include the exchange rate in its policy reaction function. By and large, the literature finds only limited support for doing so and points at significant risks. In particular, Roger et al (2009) conclude that although having an exchange rate term in the interest rate rule may help to reduce volatility of the exchange rate, interest rate and trade balance, this may come at a cost in terms of inflation and output volatility, especially if the economy is exposed to demand and cost-push shocks. They also note that any benefits tend to disappear with high degrees of exchange rate targeting. Moreover, as discussed next, central banks concerned with exchange rate stability do not need to rely on interest rates only; they may also intervene on the foreign exchange market.

4.4.3 *Stabilising the exchange rate: sterilised intervention*

In many IT-MICs, and MICs in general, the scale of foreign exchange market intervention, in either the spot or the forward market, has increased massively since the GFC (see Adler and Tovar (2014) and Gadanecz et al (2014)). As a result, ratios of foreign exchange reserves to GDP, in line with ratios of private external asset positions, increased significantly in almost all IT-MICs between 2006 and 2017 (Figure 4.4). In Chile, for instance, following two major episodes of intervention in 2008 and 2011, the central bank ended up accumulating around 5.5% of GDP in foreign reserves.

In line with the foregoing analysis, and as discussed in more detail in Box 3, a number of reasons and motivations have been offered by central banks to justify foreign exchange market intervention: (i) to reduce nominal exchange rate volatility, given its potentially adverse effects on aggregate demand and inflation; (ii) to prevent a deterioration in competitiveness; (iii) to build up foreign exchange reserves as self-insurance against external shocks; (iv) to attenuate domestic asset price pressures; and (v) to mitigate adverse effects of currency fluctuations on balance sheets and their impact on domestic financial markets, especially in dollarised countries. From that perspective, foreign exchange market intervention can be viewed as complementing macroprudential regulation or as a bona fide macroprudential policy instrument in its own right. Adler and Tovar (2014) survey intervention motives in 15 economies in Latin America between 2004 and 2010. They document that *reducing excess volatility* is typically the main stated motive for foreign exchange market interventions, while the most frequently argued reasons for intervening are building reserves (buffers) for self-insurance purposes and containing exchange rate volatility. The objective of price stability has been the focus only in episodes of large exchange rate depreciations – even in countries with low pass-through of exchange rates to domestic prices, given the sheer size of the fall in the exchange rate. At the same time, not a single country in the sample surveyed by Adler and Tovar (2014)

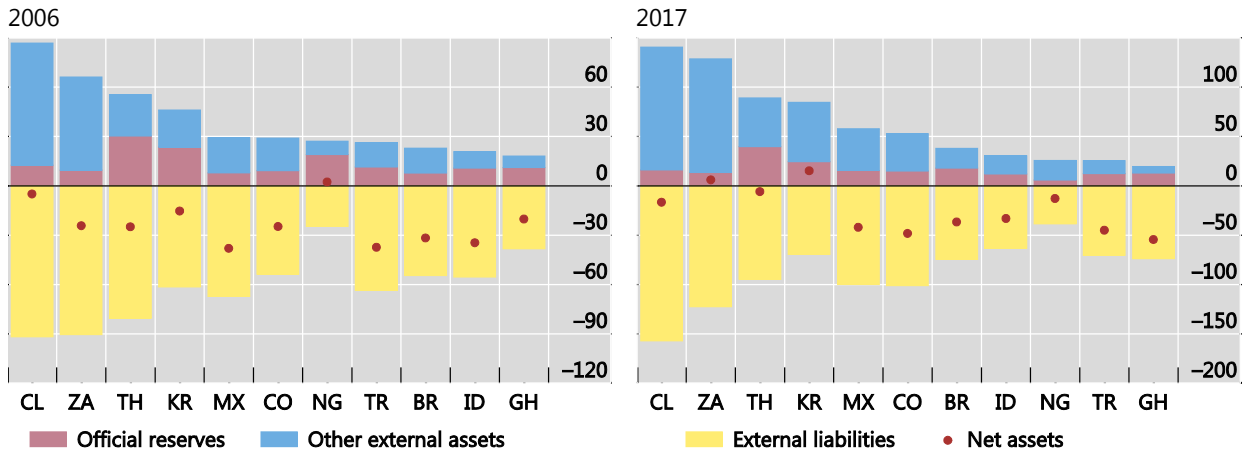
⁷⁰ Pavasuthipaisit (2010) developed a dynamic stochastic general equilibrium model that also concludes that IT regimes should respond to exchange rate shocks under certain conditions.

mentioned the *level* of the exchange rate as an objective of foreign exchange market intervention. This suggests that the competitiveness motive may be weaker in the current environment.

Foreign reserves and private external asset positions, 2006 and 2017

As a percentage of GDP

Figure 4.4



BR = Brazil; CL = Chile; CO = Colombia; GH = Ghana; ID = Indonesia; KR = Korea; MX = Mexico; NG = Nigeria; TH = Thailand; TR = Turkey; ZA = South Africa.

Sources: IMF, *International Financial Statistics* and *World Economic Outlook*; authors' calculations.

Foreign exchange market intervention has taken a variety of forms, including, for instance, outright foreign exchange transactions in the spot or futures foreign exchange markets using non-deliverable forward contracts (NDFCs), where the central bank pays counterparties the equivalent in domestic currency (see Garcia and Volpon (2014), Domanski et al (2016) and Gonzalez et al (2018)). Brazil's central bank has used these foreign exchange swap auctions and US dollar sale auctions with a repurchase agreement, with the aim of providing hedges to economic agents and liquidity to the foreign exchange market.⁷¹ This intervention strategy has provided efficient hedging instruments for economic agents during periods of reduced capital inflows and exchange rate volatility. It is worth noting that this strategy works insofar as private agents believe that they can transfer NDFCs to spot US dollars; that is, that convertibility risk is negligible and that is ensured by the transparent availability of the stock of international reserves at the central bank. The strategy is also possible only because of the depth of Brazil's futures markets for foreign exchange and its legislation.⁷² Nevertheless, similar contracts have been used recently in several other IT countries in Latin America, including Mexico and Peru.

Regardless of its form, foreign exchange market intervention in MICs has usually been highly sterilised, as documented by Aizenman and Glick (2009), for instance. It has also been fairly effective in terms of mitigating exchange rate volatility and reducing risks to financial stability (see Box 3). This could also reflect pervasive financial frictions or the fact that intervention has taken place mostly during stress

⁷¹ Despite the name, these foreign exchange swaps are forwards that settle in domestic currency; that is, they are tools to change foreign exchange exposures, not to provide funding. Nordstrom et al (2009) survey intervention practices in 14 IT-MICs.

⁷² The advantage of NDFCs is that they do not use up reserves because there is no foreign currency payment. However, their use requires liquid markets and a significant degree of central bank credibility. Nedeljkovic and Saborowski (2017) compare the relative effectiveness of spot and non-deliverable futures in Brazil. They find both instruments to be effective in affecting the level and volatility of the exchange rate, with a significant link between both instruments. They also document that Brazil's central bank tends to rely more on spot foreign exchange interventions to contain capital flow pressures, while using futures to impact the trend of the exchange rate, rather than its current value.

episodes (Gabaix and Maggiori (2015)). However, as could be expected, interventions tend to be less effective when changing global conditions impart a clear trend to the exchange rate (Fratzscher et al (2018)). And when intervention reduces exchange rate volatility, it may also encourage speculation, by mitigating currency risks (Chutasripanich and Yetman (2015)).

Box 3

Reserve accumulation and sterilised intervention

Many central banks in MICs have accumulated sizeable stocks of foreign assets in recent years. This process has occurred in response to several factors. The first and more traditional one is that reserves may be used to cushion the effects of terms-of-trade shocks on a country's real exchange rate and its exports, thereby smoothing the adjustment of the current account. The second is an attempt to mitigate the downside risk of greater financial integration, and provide self-insurance against sudden reversals in capital flows. The third and related factor is that it reflects a greater emphasis on mitigating exchange rate volatility associated with capital flows and more intense sterilisation operations. The fourth factor is more "political" in nature – the reserves allow countries to avoid calling on international financial institutions for support. Lastly, in some countries reserve accumulation has occurred as a by-product of managing exchange rates to promote exports by (deliberately) undervaluing the domestic currency.⁷³

Whether it is driven by precautionary behaviour or not, reserve accumulation may have important monetary implications. When a central bank buys foreign reserve assets, it must decide whether to fund the purchase by increasing the monetary base, which may lead to increased inflationary pressures, or by reducing its net domestic assets, which sterilises the impact of its operation on the monetary base. Central banks may offset the effects of reserve accumulation on the monetary base in a number of ways, including selling market instruments, such as government bonds or central bank bills, or using swaps or repurchase operations.⁷⁴

There is some evidence to suggest that reserve accumulation has helped to mitigate exchange rate movements. Aizenman and Riera-Crichton (2006), for instance, study the link between reserve accumulation and the real exchange rate in a panel of 80 developed and developing countries over the period 1971–2004, and find that, for the latter group especially, reserve accumulation helped to mitigate real appreciation. This occurred equally in response to terms-of-trade shocks or capital inflows, especially short-term inflows.

To a significant extent, in recent years reserve accumulation in MICs has been the by-product of sterilised foreign exchange market intervention, in an attempt to guide the nominal exchange rate towards values deemed consistent with fundamentals and mitigate its volatility. However, sterilised intervention raises several feasibility issues. First, by keeping domestic interest rates higher than they would otherwise be, sterilisation tends to magnify the cumulative inflow of capital, especially if there is simultaneously appreciation pressure coming from fundamentals, improved terms-of-trade and/or an ongoing tightening cycle of monetary policy. Second, sterilised intervention entails quasi-fiscal costs, because the central bank exchanges high-yielding domestic assets for low-yielding reserves. The magnitude of these costs will be greater the higher the degree of capital mobility and the larger the gap between domestic and foreign rates of return. Third, even if sterilisation succeeds in limiting domestic monetary expansion, it may not completely insulate the economy from the effects of capital inflows. For instance, if domestic interest-bearing assets are imperfect substitutes, then a capital inflow may be associated with a shift in the composition of demand for domestic interest-bearing assets, as well as with an increase in the total demand for such assets. In this case, unless the composition of domestic assets issued in sterilisation operations matched that demanded by creditors, the structure of domestic asset returns would be altered. In turn, this would trigger a portfolio reallocation which, in the presence of wealth effects, could affect aggregate demand and prices.

⁷³ See Aizenman (2008) for a review of the factors underlying foreign reserve accumulation, and potential externalities.

⁷⁴ With foreign exchange swaps, the central bank typically agrees to buy foreign exchange forward, while with repurchase operations, the central bank sells securities with an agreement to buy them back at a certain date in the future. When markets are thin, central banks often rely on non-market instruments, such as transferring the deposits of government and public financial institutions from commercial banks to the central bank or selling foreign exchange reserves to the government, which it uses to reduce its external debt. Central banks may also seek to sterilise the effects of reserve inflows, not just on the monetary base, but also on the broader money supply – by, for instance, increasing reserve requirements on bank deposits.

Along these lines, Garcia (2011) finds that sterilised foreign exchange purchases under IT and a credit channel, by inducing a fall in loan rates, may lead to an increase in bank credit and an expansion of aggregate demand. A related argument is made by Vargas et al (2013): if sterilisation is conducted through the use of government bonds held by commercial banks, and if these bonds and bank loans are imperfect substitutes, foreign exchange intervention will not only affect the exchange rate through a modified (uncovered) interest parity but also through the provision of credit to the economy. The reason is that when the central bank actively intervenes in the foreign exchange market, and expands, for instance, its stock of international reserves, it also increases the holdings of government bonds by commercial banks, affecting the composition of their portfolio. This shift in commercial banks' balance sheets towards bonds tends to reduce the interest rate on loans. The implication of this analysis is that IT countries may have another reason to be concerned when conducting foreign exchange sterilised interventions, besides their high cost and effectiveness (or lack thereof) in preventing nominal appreciation: even if sterilised purchases of foreign exchange are effective in terms of preventing a *nominal* appreciation, they may stimulate activity and raise inflation, thereby contributing to a *real* exchange rate appreciation.

Notable studies on the effectiveness of foreign exchange market intervention, both before and after the GFC, include Berganza and Broto (2012), Vargas et al (2013), Barroso (2014), Claro and Soto (2013), Tashu (2014), Blanchard et al (2015), Chamon (2015), IMF (2015), Adler et al (2016), Daude et al (2016), Tobal and Yslas (2016), Chamon et al (2017), Nedeljkovic and Saborowski (2017), Fratzscher et al (2018) and Kuersteiner et al (2018). Some of these studies assess the impact on exchange rate *levels*, implicitly or explicitly testing for the portfolio balance approach. For instance, Adler et al (2016) examine cross-country evidence and find that sterilised intervention reduced the pace of appreciation when the intervention responded to capital inflows. A similar result is obtained by Blanchard et al (2015), Daude et al (2016), and Fratzscher et al (2018). Barroso (2014), Chamon et al (2017), and Nedeljkovic and Saborowski (2017) all find that foreign exchange market intervention helped to limit appreciation pressures in Brazil. These results are interesting because, as noted in the text, in responding to a survey by Adler and Tovar (2014) no country in Latin America mentioned the *level* of the exchange rate as an objective of foreign exchange market intervention.

Other studies have focused on the impact of intervention on the *volatility* of exchange rates. In an early contribution focusing on 37 countries over the period 1995–2010, Berganza and Broto (2012) find that foreign exchange market intervention has been fairly effective at lowering exchange rate volatility in IT countries. In the same vein, Barroso (2014), IMF (2015) and Nedeljkovic and Saborowski (2017) find that foreign exchange market intervention reduced volatility in Brazil. Likewise, Tashu (2014) finds that foreign exchange market intervention was effective in reducing exchange rate volatility in Peru. Similar evidence is provided by Chamon (2015) and Tobal and Yslas (2016) for Mexico and Kuersteiner et al (2018) for Colombia. Claro and Soto (2014) study the effectiveness of reserve purchases in Chile in 2008 and 2011. They find that, although successful in terms of mitigating exchange rate volatility, these interventions entailed some costs. Before these intervention episodes, the balance sheet position of the central bank was already weak. With the amount of reserves accumulated following intervention (of the order of 5.5% of GDP, as noted in the text), the balance sheet mismatch has increased, and the cost of carrying reserves has further reduced the profits of the central bank. Finally, Fratzscher et al (2018) find that foreign exchange market intervention has been very effective not only in terms of smoothing the path of exchange rates (as noted earlier), but also in stabilising the exchange rate in countries with narrow band regimes.

A general limitation of most of these studies is that they are based on econometric specifications that do not allow for the dynamic effects of intervention. They essentially use various controls and compare the behaviour of the exchange rate in periods with intervention to its behaviour in periods without intervention. In addition, the possibility of non-linear effects is not explicitly accounted for.

More generally, it appears that the coexistence of an inflation target and active exchange rate management is a common phenomenon in many countries, at least informally. This appears to contradict one of the requirements for IT, as discussed in Chapter 2. However, as noted earlier, intervention to stabilise the exchange rate should not be seen as fear of floating, but potentially as necessary for attaining inflation targets. This view is consistent with the evidence, discussed in Box 3, which suggests that foreign exchange market intervention has been fairly effective at lowering exchange rate volatility in IT countries. Indeed, even though the feasibility and effectiveness of sterilisation remain in general a matter of debate, a greater weight on mitigating exchange rate volatility has been (as noted earlier) one of the key reasons why central banks have sterilised capital flows more aggressively in recent years. Brazil is a case in point. At the end of

2010 and in early 2011, the central bank intervened at high frequency through spot and futures markets to mitigate exchange rate volatility associated with capital inflows. In doing so, it helped to smooth exchange rate movements and maintain price stability.⁷⁵ In that sense, there is no conflict between the goal of price stability, the focus of monetary policy, and maintaining exchange rate stability through (sterilised) intervention. This policy assignment also appears to be consistent with the results obtained by Barajas et al (2014) for IT countries in Latin America.

More generally, the combination of two instruments (interest rates and sterilised intervention) to achieve two objectives (price stability and exchange rate stability) is consistent with Tinbergen's principle: the interest rate is adjusted to achieve the inflation target level, whereas foreign exchange market intervention aims to mitigate large, temporary deviations in the exchange rate from its medium-term equilibrium value, assuming that the central bank knows that value with some degree of certainty. This two-target, two-instrument regime should not give confusing signals to the public, as emphasised by Ostry et al (2015) and Ghosh et al (2016). In the analytical experiments reported by Buffie et al (2018), this policy combination – which they refer to as *exchange rate-anchored IT* – does indeed help to enhance the viability of forward-looking IT and could enhance credibility.⁷⁶

In practice, of course, clarity about the goals associated with each instrument, the reasons for intervention, and the mechanics of intervention, are all important to avoid creating policy uncertainty, confusing markets, and weakening credibility. In fact, a better communicated, transparent, and thus more credible foreign exchange market intervention policy could reduce the need to actually intervene, as market participants would anticipate the central bank's action in response to movements in the exchange rate, while at the same time they might continue to believe that monetary policy does not have an explicit exchange rate stabilisation goal. In turn, this would strengthen the effectiveness of IT. What should be avoided is a situation where a single instrument (the interest rate) is used to achieve both price and exchange rate stability, especially when shocks are external in nature and are associated with large capital movements. With two targets, but one instrument, credibility is bound to be adversely affected.

At the same time, it is important to keep in mind that sterilisation can be costly. The most common cost occurs when the central bank must offer interest rates on its sterilisation instruments that are higher than the rates that it earns on the foreign reserve assets that it accumulates (see Box 3). For instance, as estimated by Adler and Mano (2016) for a group of 73 countries over the period 2002–13, the total cost of sustaining foreign exchange positions (through an expansion of central bank balance sheets) is in the range of 0.2–0.7% of GDP per year for countries that intervene sporadically and 0.3–1.2% of GDP per year for countries that intervene heavily. Thus, the quasi-fiscal costs of foreign exchange market intervention are not negligible.

Another possible cost operates through changes in the foreign liabilities of domestic banks. From an analytical perspective, Garcia (2012) and Vargas et al (2013) have drawn attention to the expansionary effect of sterilised intervention on credit and, through credit, on aggregate demand (see Box 3). If credit is already growing at a significant pace, this may create financial stability risks. In that sense, the macroeconomic effects of intervention depend on monetary and macroprudential policy responses. From an empirical perspective, Gonzalez et al (2018) find that the massive intervention programme with daily auctions implemented in August 2013 in Brazil (which involved supplying foreign exchange derivatives, with therefore no direct impact on the country's international reserves) helped to mitigate the adverse

⁷⁵ To the extent that they helped to stabilise capital flows, the macroprudential measures that were implemented during that time (increases in bank reserve and capital requirements, higher financial transaction tax) also contributed to stabilising the exchange rate (see Pereira da Silva and Harris (2012)).

⁷⁶ In the model developed by Buffie et al (2018), IT with a fully flexible exchange rate incurs a high risk of indeterminacy (that is, multiple equilibria), which can induce fluctuations in the economy that are driven by self-fulfilling expectations, rather than fundamentals; as a result, shifts in expectations can be associated with a large degree of volatility. Moreover, small inflation shocks may result ex post in much larger increases in inflation. When the central bank leans heavily against exchange rate fluctuations in a managed float regime, both problems disappear.

effects of the GFC on domestic credit supply – proving, in effect, to be expansionary. In the same vein, Gadanecz et al (2014) have argued, based on reduced-form regressions for a group that includes several IT-MICs, that even if the immediate change in commercial bank reserves due to foreign exchange market intervention is offset by the sale of short-term government securities, bank lending may still be stimulated. However, the quantitative importance of the expansionary effect of intervention, as estimated by Gonzalez et al (2018) for Brazil, is very small, whereas the broader study by Gadanecz et al (2014) suffers from identification problems. One cannot therefore conclude with any degree of confidence that foreign exchange market intervention by the central bank may systematically, and significantly, weaken its ability to control domestic credit conditions. Finally, another possible cost of foreign exchange market intervention is that it could increase systemic risk instead of mitigating it, by exacerbating moral hazard problems. Indeed, if intervention succeeds in mitigating exchange rate volatility, it may induce more risk-taking and magnify balance sheet mismatches, thereby amplifying financial fragilities.

But although the direct (quasi-fiscal) and indirect costs, or side effects, of sterilised intervention may not be negligible, they should not be viewed in abstracto. Instead, they should be compared with the potential costs associated with excessive exchange rate volatility, measured not only in terms of more volatile inflation and sustained deviations from the inflation target but also, as discussed later on, in terms of risks to financial stability – especially in dollarised economies or in countries where domestic agents (corporations and banks) are heavily indebted in foreign currency and hedging opportunities are limited.

4.5 Financial integration and policy trade-offs

As discussed in detail by Agénor and Pereira da Silva (2018), increasing interconnectedness of financial institutions and markets, and more highly correlated financial risks, have intensified cross-border spillovers in recent years. Although financially integrated markets have benefits, they carry substantial risks as well (as noted in Chapter 1), with potentially large economic costs. Increased financial integration has therefore raised new challenges to monetary policy in an IT regime. Two aspects of these challenges are considered next: the monetary trilemma and the financial trilemma.

4.5.1 *The monetary trilemma*

As countries have continued to liberalise their capital account, they have found that achieving simultaneously the goals of greater financial integration (or free capital mobility), exchange rate stability, and monetary policy independence have proved unattainable, in line with the so-called impossible trinity dilemma or *monetary trilemma* (see Mundell (1963) and Obstfeld and Taylor (1998)). If a country chooses exchange rate stability and free capital mobility, it must give up monetary policy autonomy; conversely, an independent monetary policy in the presence of free capital mobility is possible only through exchange rate flexibility. Empirical evidence in favour of the open-economy trilemma is provided by Bleaney et al (2013), who show, using data for 126 countries, that countries on credible pegs without capital controls follow foreign interest rates closely, and that the hypothesis of complete lack of monetary independence cannot be rejected.

Some early responses to the monetary trilemma involved greater financial integration and increased (but still managed) exchange rate flexibility, trading off exchange rate stability with capital mobility while maintaining some degree of monetary independence. Indications are that this configuration has served these countries well. Edwards (2004), for instance, finds that countries with more flexible exchange rate regimes were better able to accommodate shocks stemming from a reversal than countries with more rigid exchange rate regimes. In addition, the evidence suggests that one reason why several IT-MICs weathered the GFC well is partly because exchange rate flexibility limited overvaluation of their currencies – although the resulting real appreciation may have been large in the immediate aftermath of the crisis (between March 2009 and August 2011), as noted in Chapter 1 for Brazil, South Africa and Colombia. Other countries, especially in recent years, have more actively intervened in foreign exchange

markets, as documented earlier. Steiner (2017) finds that foreign exchange market intervention indeed provides an effective instrument to relax the trilemma; an active reserve policy allows central banks to pursue independent monetary and exchange rate policies when the capital account is liberalised.

A more comprehensive study by Obstfeld et al (2017) offers a broader perspective. They begin by noting that because most studies (including the study by Bleaney et al (2013), alluded to earlier) test the empirical validity of the trilemma by focusing on the behaviour of policy interest rates, they do not pay sufficient attention to whether the monetary autonomy afforded by flexible exchange rates actually helps to insulate the domestic economy from global financial shocks. Accordingly, Obstfeld et al focus on the role of the exchange rate regime in influencing the transmission of global financial conditions to domestic financial and macroeconomic outcomes. Using a large sample of countries, they find that fixed exchange rate countries are more prone to experiencing financial vulnerabilities, such as rapid domestic credit and house price growth, and increases in bank leverage following global financial shocks. In particular, while domestic financial developments respond to global financial conditions regardless of the exchange rate regime, the response is stronger under fixed exchange rate regimes (especially rigid regimes, such as hard pegs and single currency pegs) as compared to more flexible regimes. In some ways, this greater sensitivity may reflect the greater constraints imposed on monetary policy by fixed exchange rate regimes. By contrast, other, more flexible, intermediate regimes (bands, crawls and managed floats) are generally statistically not much different from free floats, in terms of their insulation properties. They therefore offer a viable option to achieve some degree of monetary policy autonomy with limited exchange rate volatility. Put differently, reaping the benefits of exchange rate flexibility does not require adopting a pure float. This is particularly important for countries where (as discussed earlier) mitigating exchange rate volatility through foreign exchange market intervention is a key policy objective.

However, independently of the issue of the cost and efficacy of sterilised intervention, doubts have been raised about the ability of countries with flexible exchange rates to insulate their financial conditions from global capital markets and ensure monetary policy autonomy. Indeed, some studies argue that the capacity of central banks to set policy rates under flexible exchange rate regimes does not ensure their ability to influence domestic monetary and financial conditions. In particular, even if short-term rates can be set independently, long-term rates may be strongly influenced by global forces (Obstfeld (2015)), and these may exert a more powerful influence on domestic real variables than short-term rates. Another channel could be the flexible exchange rate itself, which, instead of acting as a shock absorber, could amplify the boom-bust cycle through balance sheet effects and leverage dynamics.⁷⁷ More generally, Rey (2015) contends that there exists a *global financial cycle* in which gross capital flows, banking sector leverage, domestic credit, and prices of risky assets co-move positively across countries regardless of the exchange rate regime. Further, these variables are strongly negatively related to measures of global market volatility and risk aversion (such as the VIX index), which in turn are strongly influenced by US monetary policy – implying therefore that it is the financing conditions in major AEs, not national policy rates, that effectively determine domestic financial conditions.⁷⁸ However, the magnitude of the effect of US monetary policy as a key global driver in asset prices, risk premia and other financial variables elsewhere has been questioned in other studies (see Cerutti et al (2017b) and Arregui et al (2018)).

⁷⁷ For instance, domestic currency appreciation in the face of lax financial conditions abroad can raise asset and collateral values, creating a procyclical effect on credit and asset markets. Gertler and Karadi (2011) and Bruno and Shin (2015) outline different mechanisms through which this leverage process could be self-reinforcing.

⁷⁸ The idea that there exists a global financial cycle, where global factors (especially US monetary policy and investor risk appetite) influence cross-border capital flows, is not new. Rey, however, argues that cross-border financial spillovers are *similar* for fixed and flexible exchange rate countries – implying irrelevance of the exchange rate regime, and a two-way trade-off between capital mobility and monetary autonomy (a policy *dilemma*, rather than a trilemma).

4.5.2 The financial trilemma

Another source of policy trade-offs in financially integrated economies relates to what Schoenmaker (2011), and subsequently Claessens et al (2010, Chapter 2) and Obstfeld (2015) refer to as the *financial trilemma* – the fact that financial integration with global markets (with no intervention in cross-border financial flows), national control over financial supervision and regulation, and financial stability, are not all mutually compatible. That is, under a financial trilemma, a country can attain any pair of these goals: financial stability and international integration, financial stability and independently pursued financial policymaking, or international integration and autonomous financial regulatory policies.⁷⁹ However, all three objectives cannot be achieved simultaneously. The financial trilemma implies that, should countries choose to focus on domestic financial stability and to pursue independent financial regulation – assuming that macroprudential policies are effective in dealing with financial stability issues – a goal of internationally linked financial markets cannot be achieved.⁸⁰

A common policy response in recent years has been to rely more on macroprudential policies, especially those of a time-varying nature. As documented by Ghosh et al (2017), these policies appear to have been effective in helping recipient countries insulate themselves from global financial shocks and mitigate the systemic financial risks that international capital flows may create. Beirne and Friedrich (2017) also find that macroprudential policies have proved effective in mitigating cross-border bank capital inflows. However, to the extent that (as mentioned earlier) the transmission processes of monetary and macroprudential policies are closely linked (especially through changes in asset prices and credit), addressing the financial trilemma raises significant challenges for the design of an IT regime. This issue is also discussed in the next chapter.

4.6 Price stability and financial stability

As noted in the introduction, the role of monetary and macroprudential policies in achieving macroeconomic and financial stability has been the subject of an extensive debate since the GFC. Two issues have dominated this debate. The first relates to the extent to which central banks, in addition to pursuing a price stability objective, should also respond directly to financial imbalances – in the form of an unsustainable expansion of credit or a significant and sustained deviation of asset prices from their longer-term values. The risk, as noted in the previous chapter, is that an IT central bank focusing exclusively on its standard macroeconomic objectives may neglect information about the build-up of financial imbalances that do not translate immediately into headline inflation. As a result, policy interest rates may not rise sufficiently, or rapidly enough, to prevent the build-up of financial imbalances.

The second issue relates to how best to combine monetary policy and macroprudential regulation, given that both policies influence each other's transmission process to the economy. Indeed, the credit and business cycle effects of macroprudential policy may influence price developments and monetary policy decisions, whereas changes in monetary policy, even when they are motivated solely by price stability considerations, may affect systemic financial risks through their impact on the cost and availability of credit. As discussed in Chapter 1, this credit channel is particularly important for most MICs, including IT-MICs. These linkages create potential trade-offs in the use of these policies with respect to achieving simultaneously macroeconomic and financial stability. These issues are addressed in detail in the next two chapters.

⁷⁹ Under a fixed exchange rate regime or a managed float, with limited scope for conducting an independent monetary policy, macroprudential instruments may be directed not only towards mitigating financial risks but also towards achieving macroeconomic objectives – although, in the latter case, benefits to financial stability may also result. This has often been the case in Latin America; see the discussion in the next chapter.

⁸⁰ Thus, national banking authorities may face significant pressures to insulate their financial systems from international competition. By contrast, international macroprudential policy coordination among national supervisory authorities may help address the trilemma and avoid these risks. See Agénor and Pereira da Silva (2018) for a discussion.

Chapter 5. Accounting for financial stability in an inflation targeting regime

One of the key lessons to emerge from the debate that followed the GFC is that prudential regulation and supervision must adopt a systemic (macroprudential) perspective to identify, and prevent the build-up of, weaknesses in the financial system. To that effect, and among other measures, the Basel III Accord unveiled a new capital framework which not only strengthens the definition of capital but also recommends the implementation of both a capital conservation buffer and a countercyclical capital buffer, as well as additional instruments which will be gradually phased in (see BCBS (2011, 2013)).⁸¹ According to the proposed rule, countercyclical capital buffers should be adjusted in response to excess growth in credit to the private sector, which is viewed as a reliable indicator of systemic risk.

At the same time, the design of a coherent, post-GFC macroeconomic management framework, involving both monetary and macroprudential policies and aimed at jointly achieving price and financial stability, remains the subject of an extensive debate. As noted in the previous chapter, two issues that have dominated this debate relate to the extent to which central banks, in addition to pursuing a price stability objective, should also respond to systemic financial risks, and how best to combine monetary policy and macroprudential regulation, given that both policies influence each other's transmission process to the economy.

This chapter addresses this issue from the perspective of IT-MICs. To set the stage for this analysis, Section 5.1 provides a brief discussion of systemic risk, financial stability, and macroprudential regulation, whereas Section 5.2 discusses the linkages between the regulatory regime and the monetary transmission mechanism. Section 5.3 addresses the main issue of interest from the perspective of an IT country: are monetary and macroprudential policies complements or substitutes? Specifically, instead of adding a countercyclical component to macroprudential regulation, should policymakers use monetary policy instead to achieve financial stability – in effect, use a single instrument to achieve two objectives? The growing consensus appears to be that macroprudential policy may not be sufficient to address financial stability concerns, and that monetary policy may need to play a more active role in that regard. This section examines the various arguments for and against that role, starting from a discussion of Tinbergen's principle regarding the number of instruments and targets (as mentioned earlier with respect to the debate on price and exchange rate stability), the relationship between monetary policy and bank risk-taking, the difference between sectoral and across-the-board policy instruments, the scope for monetary policy to respond to external shocks, the link between financial stability and monetary policy credibility, and finally the fact that macroprudential policy is more prone to a collective action problem, lobbying and political pressure. An overall assessment of the state of the debate is then provided.

5.1 Systemic risk and macroprudential regulation

5.1.1 Systemic risk and the rationale for macroprudential regulation

As noted at the outset, one of the key lessons to emerge from the GFC is that prudential regulation and financial supervision must adopt a macroprudential perspective to identify and prevent the build-up of systemic risk, which can be defined as *the risk of threats to financial stability that impair the functioning of a large part of the financial system with significant adverse effects on the broader economy* (Freixas et al (2015,

⁸¹ In fact, several countries have chosen to go beyond the Basel III recommendations, and are considering either substantially higher capital requirements or deeper structural measures with respect to the scope of operations by banking institutions, such as retail ring-fencing.

p 13)).⁸² From that perspective, the goal of macroprudential policy can be described as promoting financial stability by mitigating systemic risk to the financial system (see CGFS (2010), Giese et al (2013) and FSB-IMF-BIS (2016)). This contrasts with microprudential supervision, which focuses on the financial health of individual financial institutions.

As discussed, for instance, in Bank of England (2011), there are two distinct aspects of systemic financial risks: *time-varying risks*, which depend on the amount of risk that the financial system takes at a point in time relative to its capital and liquidity resources; and *structural risks*, which depend on the connections between entities within the system and the distribution of risk across these entities. The multifaceted nature of systemic risk implies that regulators must by necessity rely on a combination of different tools in order to strengthen the resilience of the system as a whole. From the perspective of this book, however, only time-varying systemic risk and instruments are discussed. These risks fall into four broad categories: excessive credit growth (often associated with procyclical risk-taking by financial institutions) and associated asset price inflation; excessive leveraging or deleveraging; systemic liquidity risks; and large and volatile capital flows. In turn, these categories often occur in combination with each other, and to varying degrees. In particular, as discussed in Chapter 1, MICs have time and again been confronted with episodes of sudden floods in capital flows, which have fuelled rapid credit growth, asset price pressures and excessive leveraging – followed by sudden stops in capital movements which throw the previous process into reverse.

5.1.2 Countercyclical macroprudential regulation

As noted earlier, systemic risk involves both a time-varying dimension and a structural dimension. With respect to the first dimension, a range of countercyclical tools have been used to increase resilience to shocks and contain the procyclical build-up of vulnerabilities. These include: (i) capital-based tools (both broad-based and sectoral); (ii) asset-side tools/loan restrictions; and (iii) liquidity-related tools.⁸³ Among these tools are countercyclical capital buffers, introduced (as mentioned previously) in the context of Basel III (see BCBS (2011)). Capital buffers, according to the Basel Committee's proposal, should be adjusted in response to excess growth in credit to the private sector (defined as deviations in actual credit growth from a trend value), which is viewed as a dependable proxy for systemic risk. Another instrument used by an increasing number of IT-MICs in Latin America is dynamic provisions – or, more accurately perhaps, cyclically adjusted provisions, as noted by Agénor and Pereira da Silva (2016, 2017) – an accounting regime under which both past due payments and expected losses over the whole business cycle are accounted for, and provisions are smoothed over the cycle. This contrasts with the commonly used incurred loss (or specific provisioning) system, in which provisions are triggered only by past due or delinquent payments. Colombia (between July 2007 and July 2008) and Peru (in November 2008) both introduced dynamic loan loss provisioning systems in the aftermath of the GFC.⁸⁴

Since the GFC, increasing use has been made of many of these instruments in both IT and non-IT countries, AEs and MICs, primarily targeting various types of bank credit. Table 5.1 provides data on recent macroprudential measures by regions, whereas Table 5.2 focuses on a selected group of countries,

⁸² See Galati and Moessner (2013) and Tucker (2016) for related definitions. Because financial instability is easier to identify than financial stability, financial stability has sometimes been defined as the absence of a systemic crisis. But this definition is not helpful from an operational standpoint because, before a financial crisis occurs, the financial system may still be in a highly vulnerable state.

⁸³ See Claessens (2015) for an overview of macroprudential policy instruments. In practice, it is difficult to classify instruments as micro or macro in nature. For some, the Basel III capital conservation buffer is meant to provide a buffer of capital that banks can use to absorb losses before they hit microprudential constraints. At the same time, doing so can reduce procyclicality of the capital framework and mitigate systemic risk. Similarly, the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR) can limit systemic liquidity risks arising from unstable funding structures. However, some experts view these measures as fundamentally microprudential in nature.

⁸⁴ Brazil also implements a risk-based forward-looking provisioning framework which in many ways mimics a countercyclical capital regime.

including the sample of IT-MICs on which this book focuses. As documented in more detail by Montoro and Moreno (2011), Tovar et al (2012), Pereira da Silva and Harris (2012), Armas et al (2014), Cordella et al (2014) and Agénor and Pereira da Silva (2016), reserve requirements and dynamic provisions have been used repeatedly in several Latin American MICs in an attempt to smooth the financial and business cycles, and to tighten monetary conditions without attracting capital inflows. In fact, the use of tools that are fundamentally prudential in nature as a substitute for monetary policy in response to external shocks has been a recurrent feature of policymaking in Latin America.

How successful has the use of these tools been? An informal look at the data suggests that it is not obvious that macroprudential policy was all that successful *prior to* the GFC – at least in Latin America. Indeed, in countries like Brazil, Colombia and Peru, macroprudential measures apparently did not prevent rapid credit growth in the lead-up to the crisis. A good question is whether, beyond the structural transformations that explain part of their credit growth (in the form of greater demand for financial services associated with an expanding middle class in Brazil, for instance), these countries would have experienced severe bouts of financial instability, even without turmoil in AEs.

At the same time, the policy response to the GFC appears to have been fairly successful. In Latin American MICs, reserve requirements were lowered during the GFC, in order to inject liquidity rapidly and restore market activity affected by sudden reversals in capital inflows.⁸⁵ In Asian MICs, intensive use was made of liquidity requirements and limits on foreign exchange positions.⁸⁶ In addition to reducing balance sheet vulnerabilities, these instruments helped to reduce risk-taking and strengthen the financial sector, explaining in part (as noted earlier) why many MICs were able to weather the GFC with limited strain.⁸⁷

⁸⁵ Some countries in the region (namely, Brazil and Colombia) also resorted to capital controls.

⁸⁶ Beginning in June 2010, Korea also introduced a series of macroprudential measures (including a leverage cap on the notional value of foreign exchange derivatives contracts, and a levy on banks' foreign exchange-denominated liabilities) aimed at building resilience against external financial shocks, especially reversals in cross-border banking sector liabilities, and the associated disruptions to domestic financial conditions. See Bruno and Shin (2014) for a discussion of these measures and their effectiveness.

⁸⁷ In addition, strict regulations and relatively high returns to domestic banking operations may explain low direct exposure of financial institutions to complex derivatives and subprime-related structured credit products in some countries.

Use of macroprudential measures by targeted credit and region

Number of policy actions, January 1995–March 2018

Table 5.1

Targeted credit Instrument type	Region ¹						
	Asia- Pacific	Central and eastern Europe	Latin America	Middle East and Africa	North America	Western Europe	All economies
	[11]	[14]	[6]	[4]	[2]	[18]	[55]
<i>General credit</i>	31	156	68	5	–	56	316
Countercyclical capital buffers	3	4	–	–	–	6	13
Limits on FX mismatch, position or liquidity	8	32	15	1	–	7	63
Capital inflow- or FX liability-based RR ²	5	44	17	4	–	–	70
Credit growth- or asset-based marginal RR ²	–	24	25	–	–	6	55
Others ³	5	1	–	–	–	5	11
<i>Housing/consumer/household credit</i>	168	125	24	13	13	114	457
LTV ⁴ limits and loan prohibitions	76	37	9	4	7	35	168
DSTI, DTI ⁵ limits and other lending criteria	49	34	4	3	6	23	119
Risk weights	17	40	8	4	0	42	111
Loan loss provisioning rules	15	3	3	2	0	10	33
Others ⁶	11	9	–	–	–	1	21
<i>Corporate credit (including CRE loans)⁷</i>	18	19	2	–	–	24	63
<i>Credit to financial institutions⁸</i>	2	2	2	–	–	3	9
<i>Total⁹</i>	219 (1.00)	302 (1.02)	96 (0.88)	18 (0.29)	13 (0.31)	197 (0.49)	845 (0.75)
<i>Memo items: Total</i>	158 (0.72)	219 (0.74)	52 (0.48)	18 (0.29)	–	66 (0.17)	513 (0.46)
General liability-based average RR ²	115	159	50	17	–	34	375
Liquidity requirements ¹⁰	43	60	2	1	–	32	138

¹ Numbers in square brackets indicate the number of economies in each region. ² RR = reserve requirements. ³ Including structural capital surcharges, other capital surcharges and loan loss provisioning rules on general credit. ⁴ LTV = loan-to-value. ⁵ DSTI = debt service-to-income; DTI = debt-to-income. ⁶ Including exposure limits on the housing sector, limits on FX loans to households, etc. ⁷ Including LTV limits, DSTI limits, risk weights, loan loss provisioning rules and exposure limits. CRE = commercial real estate. ⁸ Including limits on interbank exposure, exposure limits on non-bank financial institutions and risk weights on exposure to financial institutions. ⁹ The figures in brackets indicate the average number of actions per country per year for each region. ¹⁰ Including Liquidity Coverage Ratio (LCR), Net Stable Funding Ratio (NSFR), liquid asset ratio, etc.

Source: BIS (2018, p 67).

Selected IT and non-IT countries: use of macroprudential tools, 2003–17¹

Table 5.2

Policy tool	Country and date of implementation	Motivation-objective
Capital requirements	Argentina (2003, 2012, 2016, 2017), Brazil (2010, 2013, 2018) , Chile (2007) , China (2002), Hong Kong SAR (2003, 2017), Indonesia (2017) , Korea (2017) , Malaysia (2005, 2011), Mongolia (2009), Philippines (2005, 2014), Singapore (2015, 2017), Thailand (2011) , Turkey (2012, 2016) , Vietnam (2014)	To slow down credit growth.
Dynamic provisioning	Argentina (2016), Bolivia (2008), Brazil (2013) , China (2013), Colombia (2007) , Hong Kong SAR (2015), India (2015), Indonesia (2016) , Korea (2016) , Mexico (2016) , Peru (2008, 2014), Singapore (2016), South Africa (2016) , Turkey (2014) , Uruguay (2001)	To build up a cushion against expected losses in good times so that reserves can be released in bad times.
Liquidity requirements	Argentina (2018), Brazil (2018) , Colombia (2008) , Hong Kong SAR (2018), India (2008, 2015), Indonesia (2017) , Korea (2018) , Nigeria (2007), Singapore (2018), South Africa (2018) , Peru (1997), Turkey (2012)	To manage liquidity risk.
Reserve requirements on bank deposits	Peru (2011), Brazil (2010) , Turkey (2014) , Uruguay (2009, 2010, 2011)	To limit credit growth, manage liquidity, and complement monetary policy to achieve macroprudential goals.
Reserve requirements on short-term external liabilities of banking institutions	Peru (2010, 2011)	To increase the cost of bank financing with the aim of shifting the funding structure towards the longer term.
Tools to manage foreign exchange credit risk	Argentina (2002), Brazil (2007) , Korea (2009) , Mexico (1997) , Peru (2010), Philippines (2008), Turkey (2007) , Uruguay (2010)	To help financial institutions internalise foreign exchange credit risks associated with lending to unhedged borrowers.
Limits on foreign exchange positions	Brazil (2007, 2011) , Colombia (2007) , Korea (2010, 2013) , Peru (2010, 2011), South Africa (2008) , Thailand (2002)	To manage foreign exchange risk in on- and off balance sheet foreign exchange-denominated assets and liabilities.
Other	Argentina (disclosure, 2014), Peru (limits to foreign investment by domestic pension funds, 2010)	To facilitate capital outflows and ease pressure on the currency, domestic demand, and consumer prices.

¹ Countries in bold are those included in the sample of IT-MICs considered in this book.

Sources: Reinhardt and Sowerbutts (2016); Tovar et al (2012); Basel Committee monitoring reports on the adoption of Basel standards; BCBS.

A more rigorous assessment of the performance of macroprudential tools requires, of course, formal quantitative studies with appropriate control variables. For Latin America, these studies include Levin et al (2016) for Mexico, Gómez et al (2017) for Colombia, and Minaya et al (2017) for Peru. Colombia has used both countercyclical reserve requirements (in 2007, to control excessive credit growth) and a dynamic provisioning scheme for commercial loans, which was designed to establish a countercyclical buffer through loan loss provisioning requirements. Gómez et al (2017) find that both policies were effective in mitigating credit growth and that macroprudential policies have worked as a complement to monetary policy, as both exerted a moderating effect on credit growth when tightened. In Mexico, over the period 2009–13 loan loss provisioning was given a macroprudential scope by the introduction of rules intended to accurately calculate expected losses; Levin et al (2016) find that this policy had a negative and statistically significant impact on credit growth. Minaya et al (2017) study the effectiveness of two macroprudential measures implemented by regulators in Peru: dynamic provisioning, to reduce the procyclicality of credit, and reserve requirements on foreign currency liabilities of commercial banks, to lower the degree of dollarisation of the economy. Using credit register data that cover the period 2004–14, they find evidence that dynamic provisioning led to a deceleration in the growth rate of commercial bank lending. Moreover, mortgage dollarisation declined significantly after the implementation of the conditional reserve requirement scheme.

A cross-country analysis of the performance of macroprudential policy in Latin America is provided by Tovar et al (2012).⁸⁸ They conclude that, when appropriately calibrated and used in combination over the financial cycle, existing tools may prove effective for macroprudential purposes and could contribute significantly to addressing systemic risk. Tovar et al also find that over the period 2003–11 reserve requirements had only a moderate and transitory impact in slowing the pace of credit growth in Latin America.⁸⁹ However, they also note that even if macroprudential measures were to have a muted effect on credit growth, systemic risk and procyclicality could still be mitigated by these policies if they were to translate into changes in the *composition* of credit and/or improvements in the *quality* of bank funding. These effects are nevertheless difficult to assess, partly because of well known fungibility problems in banking.

Broader empirical studies of the performance of macroprudential tools, in both AEs and MICs, include Apergis (2017), Bruno et al (2017), Cerutti et al (2017a) and Akinci and Olmstead-Rumsey (2018). Even though these studies suggest that sector-specific macroprudential tools have proved effective in terms of mitigating financial risks (especially in terms of dampening pressure on house prices), the evidence in these studies appears to be somewhat less compelling, if not quasi-inexistent, when it comes to some of the countercyclical tools introduced under the new Basel arrangement (such as countercyclical capital buffers or the NSFR) and other tools such as dynamic provisions. Nevertheless, in a summary of the evidence, BIS (2018) suggests that, by and large, macroprudential measures have succeeded in strengthening the financial system's resilience, but as deployed so far their restraining impact on financial booms has not always prevented the emergence of familiar signs of financial imbalances, such as rapid credit growth. The evidence for Latin America discussed earlier differs from that assessment, so further research may be warranted.

⁸⁸ The tools examined include capital requirements, dynamic provisions, and leverage ratios; liquidity requirements; debt-to-income and loan-to-value ratios; reserve requirements on bank liabilities (deposits and non-deposits); instruments to manage and limit systemic foreign exchange risk; and reserve requirements or taxes on capital inflows.

⁸⁹ A model-based study by Glocker and Towbin (2012) for instance is more supportive. They find that reserve requirements can support the price stability objective if financial frictions are important and lead to substantial improvements if there is a financial stability objective. This issue is further discussed later on.

5.2 Regulatory regimes and the monetary transmission mechanism

Despite significant progress in recent years, no consensus has yet emerged on the transmission mechanism and effectiveness of macroprudential policies, the extent to which the regulatory regime may alter the monetary transmission mechanism, and (based on the preceding discussion) how changes in macroprudential instruments can affect activity and inflation, particularly through their effect on asset prices and bank credit. As noted earlier, the business cycle effects of macroprudential policy may influence price developments and monetary policy decisions, and in turn changes in monetary policy motivated solely by price stability may affect systemic financial risks. Put differently, the monetary transmission mechanism depends on the regulatory regime, and the effectiveness of macroprudential policy depends on how monetary policy is conducted.⁹⁰ This is important to account for in an IT regime because it may generate trade-offs between price stability and financial stability.

To illustrate, consider, for instance, the case where the economy is hit by a negative demand shock. In a standard (flexible) IT regime, as discussed in Chapter 2, the appropriate policy response is to lower the policy rate; there is no trade-off between the inflation target and the output objective. However, suppose that the shock has a high degree of persistence, that the central bank is concerned with systemic risk and that it believes that lowering interest rates for too long will increase incentives to individuals and financial institutions to take on more risk (as discussed later on); there may then be a trade-off between macroeconomic stability and financial stability.⁹¹

Another, more elaborate, example of a trade-off between monetary policy and macroprudential policy in a flexible IT context can be derived from the analysis in Agénor et al (2012), in a model where the impact of the *bank capital channel* on loan rates takes two forms: a cost effect (associated with the fact that issuing equity or debt for regulatory purposes is costly) and a monitoring incentive effect (due to the fact that more capital improves banks' monitoring incentives as a result of a *skin in the game* effect and leads to an increase in borrowers' repayment probability). Consider, for instance, a negative supply shock which lowers output (thereby increasing the risk of default) and raises prices. If the central bank raises the policy rate (to fend off inflationary pressures) and at the same time increases the minimum capital adequacy ratio (to promote financial stability), the net effect on the loan rate may be ambiguous. Indeed, the direct effect of a higher policy rate (the marginal cost of liquidity for lenders) is to *raise* the loan rate – and so does the increase in the cost of accumulating bank capital, which must rise to induce households to hold the additional equity or bank debt. However, at the same time higher bank capital leads to a higher repayment probability (through the monitoring incentive effect), which tends to *reduce* the loan rate. The net effect is thus in general ambiguous. Thus, depending on the nature of the shock and the channels through which the regulatory regime affects the credit market, the trade-off exists even in the presence of two instruments. In a study focusing on IT-MICs in the Asia-Pacific region, Kim and Mehrotra (2018) find that there are periods when macroprudential policy measures contributed to raising inflation above its target and periods when monetary policy decisions contributed to rapid credit growth, suggesting that there have indeed been short-term trade-offs between price and financial stability objectives.

Some observers have argued that the tension between price stability and financial stability also reflects in part the different policy horizons over which central banks aim to achieve stability goals. Price stability typically focuses on inflation developments over a short horizon, usually two years or so. By contrast, financial stability risks often develop over a longer horizon, because financial booms and busts tend to last longer than traditional business cycles. However, as noted in Chapter 1, the degree of

⁹⁰ Moreover, in major AEs the tension between price stability and financial stability has been exacerbated in recent years by exceptionally accommodative monetary policy. Indeed, in these countries interest rates have been kept at very low levels in order to stimulate aggregate demand and avoid deflation. This has occurred even as sustained credit growth and asset price pressures have raised concerns about the build-up of financial vulnerabilities.

⁹¹ Cesa-Bianchi and Rebucci (2015) provide another example of a trade-off (related to contractionary shocks) that the central bank may face between macroeconomic and financial stability when the interest rate is the only available policy instrument.

synchronicity between the business cycle and the financial cycle is fairly high in MICs in comparison to AEs; and as discussed later on, different policy horizons for different objectives can exacerbate credibility problems.

5.3 Macroprudential policy and monetary policy: complements or substitutes?

There is now a large amount of evidence to suggest that monetary policy may affect not only price stability but also financial stability, through various channels – including a risk-taking channel, as discussed by Borio and Zhu (2012). Indeed, changes in interest rates affect not only aggregate demand and supply but also financial conditions through intermediation costs, asset prices, borrowing and collateral constraints, banks' balance sheets and risk-taking behaviour, and default risks, as well as capital flows and exchange rates. Conversely, it is also well established that macroprudential policy regimes can affect the monetary transmission mechanism – possibly in substantial ways (Agénor and Pereira da Silva (2014)). These interactions have led to an ongoing debate on whether, at the level of the domestic economy, monetary and macroprudential policies are complements in achieving macroeconomic and financial stability.⁹²

To determine whether macroprudential policy and monetary policy are complements or substitutes in achieving financial stability, several issues need to be addressed: the extent to which Tinbergen's principle applies in this context; the impact of monetary policy on risk-taking; the effectiveness of macro versus sectoral instruments in preventing the development of financial imbalances; the extent to which monetary policy can react to some types of external shocks; the implications for monetary policy credibility of adding a financial stability objective to the central bank; and the fact that macroprudential policy is more prone to a collective action problem, lobbying and political pressure. These issues are addressed in turn.

5.3.1 Tinbergen's principle

As a general rule, Tinbergen's principle states that to attain a given number of independent policy objectives, there must be at least an equal number of instruments.⁹³ For the issue at hand, with macroeconomic (or price) stability and financial stability being the two objectives, it means that two separate tools are needed – the policy interest rate and a countercyclical macroprudential instrument. With an additional instrument, and in a deterministic environment, policymakers can internalise potential trade-offs between policy objectives and achieve their targets exactly and continuously (through dynamic rules); the two instruments are necessarily complements. From that perspective, the issue of whether monetary policy should respond to financial stability concerns is simply irrelevant; it *must* be combined with macroprudential policy, regardless. This is essentially the argument put forward by Svensson (2017), or what Stein (2013) has referred to as the *decoupling philosophy*.

By and large, the analytical literature on whether monetary policy should be used to achieve a financial stability objective, in the context of either separate or joint mandates with macroprudential regulation, remains largely unsettled (see Box 4). Moreover, in practice central banks operate in a stochastic world and aim to minimise deviations from their targets, rather than achieving them exactly and continuously. And because each instrument, manipulated independently, may affect both targets in the

⁹² For a more detailed discussion of the issue of complementarity or substitutability between macroprudential and monetary policies, see Adrian and Liang (2018), Agénor and Flamini (2016), Carrillo et al (2017) and the references therein.

⁹³ Strictly speaking, Tinbergen's principle is concerned with the existence and location of a solution to the dynamic system of equations driving the economy; it does not assert that any given set of policy responses will, in effect, lead to that solution. To make that assertion, it is necessary to investigate the stability properties of that system.

same direction, depending on the underlying shocks (thereby reducing volatility in both cases), they may be (partial) substitutes.⁹⁴ This issue is further discussed later on.

Box 4

Institutional mandates for macroeconomic and financial stability

Whether central banks should respond to financial imbalances in setting policy rates, and how best to combine monetary policy and macroprudential regulation, have been addressed in a number of analytical contributions. These contributions have often relied on formal dynamic stochastic general equilibrium (DSGE) models with financial frictions and an explicit account of financial regulation. Some of them have focused on the trade-offs that may arise when monetary policy rules are augmented to lean directly against the build-up of financial imbalances (as captured by credit growth or changes in the credit-to-GDP ratio, for instance, or interest rate spreads), whereas others have focused on the case where standard Taylor-type monetary policy rules (in which policy rates respond solely to inflation deviations from target and changes in either the output gap or cyclical output) are complemented by countercyclical macroprudential rules designed to achieve financial stability. These contributions are reviewed in Agénor (2019, Chapter 6). Collard et al (2017) and De Paoli and Paustian (2017), for instance, study policy coordination and optimal interactions between monetary and macroprudential instruments in a setting that involves separate prudential and monetary authorities with potentially different objectives. Christensen et al (2011), Agénor et al (2013), Angelini et al (2014) and Rubio and Carrasco-Gallego (2016) focus more specifically on the interaction between monetary policy and countercyclical capital buffers – along the lines proposed by the Basel III Accord – whereas Rubio and Carrasco-Gallego (2014) examine the interplay between monetary policy and loan-to-value ratios. In an open-economy framework, Glocker and Towbin (2012) find that a separation of tasks, whereby the policy interest rate responds to fluctuations in output and inflation and reserve requirements to fluctuations in loans, appears optimal, as stabilisation losses are small in comparison to a setting where both instruments respond to all variables. A common finding of the literature is that, in the presence of financial shocks, countercyclical macroprudential policy may yield significant gains in terms of macroeconomic stabilisation, regardless of the way monetary and capital requirements policies interact. In addition, some also find that when monetary policy leans against the wind, significant gains can be achieved, in terms of either reduced macroeconomic and financial volatility or higher social welfare. In response to real shocks, gains are generally negligible. This is consistent with the view that the benefits of macroprudential regulation are significant only to the extent that shocks affect the financial system directly, especially through the cost and availability of credit.

Other contributions have argued that monetary policy should remain squarely focused on macroeconomic stability whereas macroprudential policy should focus solely on financial stability. For Svensson (2017), for instance, monetary policy should (almost) never be used to contain threats to financial stability and so should not have a financial stability goal; moreover, monetary policy and macroprudential policies should be conducted by separate entities and need not be coordinated.⁹⁵ A higher policy rate, in particular, may have benefits in terms of lower real debt growth and a lower probability of financial crisis, but it may have costs in terms of higher unemployment and lower inflation, which may increase the cost of a crisis when the economy is weaker. A separation of mandates is therefore optimal, in terms of both instruments and objectives, with no need for coordination. However, this policy assignment may be sub-optimal if the ability of macroprudential regulation to mitigate credit growth is not well established or if the regulatory structure is fragmented – thereby impeding the effective operation of macroprudential tools. In addition, observers have argued that some of the assumptions underlying this line of analysis – that the policy response does not affect the cost of financial crises, that crises occur with a given frequency and that they do not result in permanent output losses – tend to underestimate the costs of crises and limit the potential benefits of a *leaning against the wind* policy (Filardo and Rungcharoenkitku (2016) and Gourio et al (2018)). The empirical evidence suggests that, indeed, recessions that coincide with financial crises often result in permanent output losses and persistently lower growth rates thereafter (see Claessens et al (2011b) and Claessens and Kose (2014)). Put differently, the costs and benefits of leaning against the wind need to be assessed over the course of full financial cycles – rather than focusing only on the occurrence of

⁹⁴ Cecchetti and Kohler (2012), using a simple macro model, found that interest rates and capital requirements are substitutes for achieving conventional monetary policy objectives; both can also be used to meet financial stability objectives.

⁹⁵ A similar view is taken by IMF (2015) and Ajello et al (2016).

full-blown financial crises – and the impacts of past policy decisions on today's and tomorrow's financial outcomes need to be accounted for. In addition, incorporating the role of asset prices, credit, and bank risk-taking may significantly alter the cost-benefit analysis of the use of monetary policy (Adrian and Liang (2018) and Filardo and Rungcharoenkitku (2016)).

The fact that financial crises are costly is also at the heart of the contribution by Gourio et al (2018). In a study focusing on the response to financial shocks, they find that the optimal policy trades off *leaning against the wind* to reduce crisis risk against the costs of larger fluctuations in output and inflation. This result arises even though in their model monetary policy is not a particularly powerful tool for managing the risk of financial crisis. Nonetheless, by lowering the probability of a financial crisis, the central bank generates welfare gains because of the large cost of these crises. Thus, the larger that cost, the stronger the case for leaning against the wind.

In Agénor and Flamini (2016), the focus is on reserve requirements as a macroprudential tool – an instrument, as noted in the text, that has been used extensively in MICs in recent years, not only as a substitute for monetary policy (often during episodes of large capital flows) but also as a tool to mitigate credit growth and manage financial risks. To investigate how best the combination of monetary and macroprudential policies can contribute to macroeconomic and financial stability, they analyse three alternative institutional arrangements featuring different levels of coordination between the monetary authority and the financial regulator. The first arrangement is the *goal-integrated mandate*, whereby the monetary authority and the financial regulator aim to jointly achieve macroeconomic and financial stability by minimising a common policy loss function. They have access to the same information set but they differ in that each entity can manipulate only one instrument – the refinance rate for the monetary authority and the required reserve ratio for the financial regulator. Thus, they are operationally independent, but fully coordinated. The second arrangement, the *goal-distinct mandate*, is such that the macroeconomic stability goal is delegated solely to the monetary authority, which sets the refinance rate accordingly, and the financial stability goal solely to the financial regulator, who sets the reserve requirement ratio on the basis of a simple implementable rule based on the behaviour of the credit-to-output ratio. This mandate features no coordination and captures the fact that, in practice, separate institutions are often made responsible for achieving narrower goals on the grounds of accountability; it therefore implies that spillover effects between authorities are not internalised by either one of them. The third arrangement, the *common-goal mandate*, is such that the financial stability goal is given to both the monetary authority and an independent and separate financial regulator. Yet, the central bank is allowed to set the policy rate only (by minimising its loss function) to achieve both macroeconomic and financial stability – thereby internalising spillover effects – whereas the financial authority sets the required reserve ratio as it does under the second mandate; that is, using a simple credit-based implementable rule. This last mandate features partial coordination in the sense that the monetary authority and the financial regulator share one of the two goals. Under all these mandates, macroeconomic stability is defined in terms of the volatility of output and inflation, whereas financial stability is defined in terms of the volatility of the credit-to-output ratio. To compare how the economy performs in terms of macroeconomic and financial stability under the three mandates, Agénor and Flamini define a policy loss function in terms of the unconditional variances of the macroeconomic, financial and instrument variables.

A comparison of the alternative mandates reveals that the benefit of using the macroprudential instrument is substantial under the goal-integrated mandate while it is negligible under the other mandates. These findings suggest that the macroprudential instrument should be used along with the policy interest rate only under coordination, when institutions share common goals and information sets, and follow rules that optimally account for the behaviour of the economy as a whole, as in the goal-integrated mandate defined earlier. Coordination at some levels does matter. Yet, coordination does not mean that one institution can (or should) interfere with the other: both are independent at the operational level. In fact, under this regime, each entity is assigned an optimal rule for its own instrument that reacts to the state of the economy. Thus, neither institution can affect how the other institution sets its instrument. Put differently, macroprudential policy should be relied upon as an instrument to promote economic stability if and only if its use is coordinated with the policy rate.

The fundamental reason for these results is the extent to which spillover effects can be internalised under the alternative mandates. When macroprudential policy is implemented through a credit-based reserve requirement rule (as is the case under the goal-distinct and common-goal mandates), the policy has some efficacy at stabilising credit and investment in response to a financial shock. It therefore contributes to promoting financial stability, as measured by the volatility of the credit-to-output ratio. However, because changes in the required reserve ratio operate through changes in bank pricing decisions, this stability gain occurs at the cost of increased volatility of market interest rates, which translates (through intertemporal effects) into more volatility in aggregate demand. In turn, this mitigates the

benefits of lower volatility in investment for the volatility of output and prices. These conflicting effects cannot be internalised by a financial regulator following a narrow rule – even when, as is the case under the common-goal mandate, monetary policy does not generate spillovers and accounts for the rule followed by the financial regulator. By contrast, under a goal-integrated mandate, the required reserve ratio reacts not only to fluctuations in the credit-to-output ratio but also to output and price volatility. Thus, under a broader mandate, involving coordination via common goals yet maintaining operational independence, macroprudential regulation can be more effective in promoting both macroeconomic and financial stability.

5.3.2 Monetary policy and risk-taking

As noted in the introduction, monetary policy – precisely when it is successful at maintaining low and stable prices – may itself induce boom-bust cycles in asset prices. Low interest rates may encourage increased risk-taking and excessive leverage, and promote a *search for yield* when banks' return target is sticky. Indeed, when expansionary monetary policy causes a drop in the yield of safe assets, banks may be forced to hold a larger amount of risky assets in order to meet the fixed or targeted level of returns that was guaranteed on their liabilities. At the same time, bank managers' compensation may also be linked with the return in excess of banks' minimal target. When low interest rates increase the probability of reduced compensation, managers' incentives to take more risk tends to increase as well (Rajan (2005) and Borio and Zhu (2012)). When the incentive to take on more risk increases sufficiently, there may be a trade-off between macroeconomic and financial stability.⁹⁶

This argument has been used to highlight a contributing factor to the GFC: the low interest rates and low inflation that were associated with the *Great Moderation* created in AEs an environment that encouraged risk-taking – with a switch from a lower yield on safe assets into higher-yielding risky assets, driving their prices up in the process – and more leveraging, which subsequently led to the development of asset price bubbles.

The possibility that loose monetary policy might have played a role in the lead-up to the GFC can be assessed by comparing actual policy rates with the ex ante predictions of a benchmark Taylor rule. As documented by Bean et al (2010), the federal funds rate was very low relative to the value predicted by the Taylor rule from 2001 to 2005 in the aftermath of the collapse of the dotcom bubble; although less significant, this was also the case in the euro area.⁹⁷ In both cases, the accommodative policy stance may indeed have had a strong impact on asset prices and credit growth. Eickmeier and Hofmann (2013) also find that in the United States monetary policy contributed to the unsustainable pre-crisis developments in housing and credit markets. In a broader study of OECD countries, Ahrend (2010) finds that, during periods when short-term interest rates have been persistently and significantly below what Taylor rules would predict, monetary policy has had a significant effect on increases in asset prices, especially housing prices. In terms of the direct implications of interest rates for asset prices, Frappa and Mésonnier (2010) also find evidence for AEs that low interest rates contributed to the growth in real house prices prior to the GFC. In a broader study using panel data for 18 OECD countries, Sá et al (2011) find that interest rate shocks had a significant and positive effect – the magnitude of which being a function of the degree of mortgage market development – on real house prices in AEs during the period 1984–2007. However, these results have been questioned by a number of observers. Both Bernanke (2010) and Svensson (2010b) reject the

⁹⁶ Bean et al (2010) provide a brief review of the alternative channels through which loose monetary policy may encourage increased risk-taking.

⁹⁷ The relatively low interest rates in the euro area may themselves have been the consequence of the low interest rates in the United States, as the European Central Bank tried to avoid a large real appreciation of the euro induced by high interest rate differentials.

view that the GFC was caused by an excessively accommodative monetary policy stance. In a more formal empirical analysis, Jean Louis and Balli (2013) find that, rather than an accommodative monetary policy, lax mortgage rules and financial deregulation were the main causes of the recent financial crisis in AEs.

More relevant from the perspective of this book, what is the evidence on the risk-taking channel for MICs prior to the GFC? It is rather mixed. Calani et al (2011) estimate Taylor rules for seven IT-MICs and find that the reduction in interest rates was more aggressive than the path implied by the estimated Taylor rules up to late 2008. In Colombia and Peru, gaps between actual and simulated Taylor rules in that study were particularly large.⁹⁸ Hofmann and Bogdanova (2012), using a broad sample of countries, find that policy rates were on aggregate below the levels implied by the Taylor rule for most of the period since the early 2000s. However, detailed country results are not reported, so their relevance for MICs, or specifically IT-MICs, cannot be assessed. Using bank-level data for more than 1,000 banks in 33 countries (including several MICs) during the period 2000–12, Chen et al (2017) find that, consistent with the proposition of the bank risk-taking channel of monetary policy transmission, banks' riskiness tends to increase when monetary policy is eased.⁹⁹ However, the extent to which changes in the financial system and prudential regulation have increased the importance of the risk-taking channel in MICs remains open to debate.

A broader discussion of the link between monetary policy and the perception and pricing of risk by economic agents has led to a more recent literature on the so-called *bank risk-taking* channel (Borio and Zhu (2012)). This literature has focused on how monetary policy affects the quality of loans. Risk-taking can occur on both the asset side of the banks' balance sheet, as they reach for yield, and through funding choices that entail extra reliance on short-term financing. The key argument is that a policy-induced interest rate change can affect bank risk, on both asset and liability sides, through mechanisms such as banks' risk perception, incentives to *search for yield* (as noted earlier), demand for leverage due to modified valuations of incomes and cash flows, and an adverse selection problem (Dell'Ariccia and Marquez (2006), Adrian and Shin (2010), and Borio and Zhu (2012)).

Overall, there does not appear to be strong evidence to suggest that (loose) monetary policy has been a *systematic* cause of boom-bust cycles in credit and asset prices in MICs in general, and IT-MICs in particular. A possible reason for this is that banks in these countries have for years maintained capital ratios well above those required by international standards, as documented by Agénor and Pereira da Silva (2010) and Fonseca et al (2010). In a sense, having more *skin in the game* reduced incentives to gamble, increased monitoring incentives, and may have prevented a weakening of balance sheets through imprudent lending practices. A second reason is the fact that in many of these countries a variety of microprudential tools were actively used to mitigate excessive risk-taking. In addition, with non-competitive credit markets (a common characteristic of banking in MICs, as documented in Chapter 1), low policy rates may mean higher bank spreads, higher profits, and possibly less, rather than more, risk. By implication, if there is no evidence that monetary policy has potentially perverse side effects on financial stability, there should be less concern in attributing a financial stability target to it.

Moreover, even if one believes that low interest rates were a key culprit of the GFC, this does not mean that monetary policy should respond directly to credit growth and asset prices: if increases in these variables are expected to lead to an expansion in aggregate demand (through wealth and direct effects on private spending), a policy that reacts in standard fashion to the output gap and (expected) inflation would naturally internalise the effect of these variables. There would be no need to respond directly to them. Put differently, in an IT regime excessive growth in credit and asset prices (just as is the case with

⁹⁸ The study also suggests that one reason why several IT-MICs weathered the GFC well may have been because monetary policy was used aggressively to mitigate output drops. Consistent with these results, de Carvalho Filho (2011) provides evidence showing that IT countries lowered nominal and real interest rates more sharply (controlling for a range of factors) than other countries.

⁹⁹ The primary measurement for levels of individual banks' risk-taking in their study is the time-varying Z-score, defined as the sum of the return on total assets plus the ratio of equity over total assets, divided by the standard deviation of return on assets. A lower value of the Z-score indicates that the bank is more exposed to insolvency risk.

the exchange rate, as discussed in the previous chapter) matter only to the extent that they affect the future (expected) path of inflation and output. By implication, as argued by some, if indeed there are trade-offs between (future) financial stability and (present) macroeconomic stability, they should not be addressed through tighter monetary policy, but rather by more targeted macroprudential measures.

The counterargument is that excessive risk-taking may also be related to procyclicality, which is itself driven by optimistic expectations and the inherent tendency of lenders to relax lending standards and underprice risks in good times. It is indeed well documented that bank intermediation is highly procyclical in MICs (see Claessens et al (2011b) and Calderón and Fuentes (2014)). During upturns, credit standards tend to be more lenient in terms of both screening of borrowers and collateral requirements. As a result, a greater number of riskier borrowers are able to secure loans, whereas the share of collateralised loans – or the degree of collateralisation itself – tends to decrease. The adverse selection problems created by informational asymmetries between lenders and borrowers are therefore magnified during boom times. In turn, as noted in Chapter 1, the weakening of lending standards may increase vulnerability to financial distress when the economy experiences a downturn. In such conditions, monetary policy – possibly in combination with some specific macroprudential tools – could help to mitigate procyclicality and thereby address the time dimension of systemic risk, through its effect on the economy-wide cost of borrowing.

5.3.3 Sectoral versus across-the-board instruments

A consensus view among policymakers and academic economists is that while monetary policy should not be used to “prick” stock market bubbles, it could be quite effective at deflating debt-financed bubbles, especially if they are credit-financed – a common occurrence in MICs.¹⁰⁰ By inducing a direct and across-the-board increase in the cost of borrowing, monetary policy may be more powerful than macroprudential policy in these circumstances.

More generally, as noted in Chapter 1, both macroeconomic instability and financial instability tend to increase in the lead-up to financial crises. This creates a case for monetary policy to react promptly, in normal times, to indications of growing financial vulnerability – especially as captured through excessive credit growth. By leaning against the financial cycle, a more active monetary policy may help to stabilise conventional targets (output and inflation). In such conditions there may be a *stabilisation dividend*. Indeed, a stable and sound financial system can contribute to macroeconomic stability by facilitating the transmission of monetary policy actions and cushioning the impact of macroeconomic shocks through the financial sector. In addition, a stable and sound financial system may decrease the incidence of financial stress and lead to less disruption to economic activity, which in turn may contribute to price stability.

However, to the extent that it affects all lending activities (regardless of whether they represent a risk to stability or not), the policy interest rate may be too blunt an instrument to be useful to address financial stability concerns, which often have a sectoral dimension – such as, for instance, overheating of the housing market, fuelled by mortgage loans, or specific segments of consumer loans. From that perspective, imposing a cost on the entire economy is not warranted – even though there is evidence to suggest the existence of a high correlation between credit growth, which depends on the cost of borrowing and thus the policy rate, and house price inflation (see Claessens et al (2011b)). Because the effect of higher policy rates on bank risk-taking may depend on each institution’s initial capital position, the net aggregate effect may be limited. Banks with a low capital base (or with less to lose), for instance, may try to “gamble”, expanding the asset side of their balance sheets by lending to increasingly riskier borrowers, whereas highly capitalised banks may choose to diversify their portfolios towards less risky assets. In addition, trying to “prick” a developing housing price bubble through a (possibly large) economy-

¹⁰⁰ Blinder (2010) and Mishkin (2011) have both emphasised the distinction between credit-fuelled bubbles (such as house price bubbles) and equity-type bubbles (in which credit plays only a minor role) in their analysis of post-GFC monetary policy. However, they appear to be fairly agnostic as to whether the central bank should respond to credit-based bubbles through regulatory instruments or interest rates.

wide increase in the cost of borrowing could have an immediate adverse effect on the supply side, given the importance (as noted in Chapter 1) of bank credit in financing working capital needs. In turn, this may increase macroeconomic volatility. In such conditions, sectoral macroprudential tools (such as changes in loan-to-value ratios, debt-to-income ratios, countercyclical capital requirements on real estate lenders, and so on) may be more appropriate to prevent risk concentration.¹⁰¹ This, of course, assumes that the sector(s) at the source of financial vulnerabilities can be identified with sufficient confidence.

At the same time, some observers have argued that a better alternative to monetary policy would be strengthening macroprudential rules, using both standard instruments (such as reserve requirements, liquidity or leverage ratios, loan-to-value and debt-to-income ratios, and so on) and relatively new tools, such as countercyclical capital buffers linked to a measure of excessive credit growth (as envisaged under Basel III) or cyclically adjusted provisions. In fact, as discussed earlier, many of these instruments have been used in MICs for years and have proved to be relatively successful during and after the GFC. Rather than an argument in favour of greater reliance on monetary policy, this evidence could therefore be construed as a call for using macroprudential tools more aggressively or for adding new tools to the arsenal of policymakers.

However, it is important to recognise that even though there is now stronger evidence regarding the performance of some of the new countercyclical macroprudential tools that have recently been implemented (or envisaged under Basel III), there is still no consensus on their effectiveness. For instance, regarding the performance of dynamic loan provisioning systems, the conclusion from some of the studies for Latin America reviewed earlier is that even though these systems may succeed in making banks more resilient, they appear to have limited effectiveness when it comes to restraining credit growth. Moreover, the introduction of countercyclical capital buffers may create significant operational and institutional challenges, especially in MICs where the supervisory environment is weak to begin with. In particular, defining the variables to which buffers should be related during the build-up and release phases remains a matter of debate. Interactions among macroprudential tools also remain poorly understood; a case in point is the interplay between bank capital requirements and dynamic loan provisioning systems.¹⁰²

If the effectiveness of (some) existing or potential macroprudential tools is not well established, the potential role of monetary policy to contribute to maintaining financial stability is greater. At the same time, even when effectiveness is well established (as is the case for sectoral tools, such as loan-to-value ratios), too much reliance on a particular tool or set of tools may be counterproductive; there may be diminishing marginal returns to using any particular instrument. Specifically, if macroprudential policy constrains bank credit availability or leads to higher borrowing costs, it may foster financial disintermediation by promoting the development of shadow banks and the informal financial sector – making it in turn difficult to maintain financial stability. From that perspective, the scope and bluntness of the policy rate could be an advantage over macroprudential measures, because it is more difficult to circumvent a general increase in borrowing costs induced by a monetary policy contraction in the same way as regulations (see Dell’Ariccia et al (2012)).

5.3.4 External shocks and the scope for monetary policy response

As discussed in Chapter 1, MICs tend to be highly vulnerable to external shocks. Depending on the nature of these shocks, monetary policy may need to be conducted with caution, because of potentially

¹⁰¹ See Crowe et al (2011) for a discussion of policy options for dealing with real estate booms. However, it is important to recognise at the same time that targeted tools, although they may be less costly than an economy-wide increase in interest rates, could be easier to circumvent than broader measures.

¹⁰² The common view is that bank capital should cover for *unexpected* credit losses, whereas dynamic loan loss provisions are intended to cover for *expected* credit losses. However, introducing either one of those regulatory regimes while the other is present may change the behaviour of banks and thus the effectiveness of *both types* of tools. This may occur, for instance, if the reasons why banks hold (excess) capital buffers are altered by the introduction of loan loss provisions, and if capital buffers have a signalling role that affects market borrowing costs.

undesirable side effects. This is what occurs when a country is confronted with a sudden flood of private capital; that is, large inflows induced by changes in external market conditions (Agénor et al (2014, 2018)). Indeed, as noted earlier, sudden floods have been a source of macroeconomic instability in MICs on numerous occasions, having led to rapid credit and monetary expansion (when sterilisation is not complete), asset price pressures, real exchange rate appreciation, increased financial fragility, and widening current account deficits.

In such conditions, the scope for responding to the risk of macroeconomic and financial instability through monetary policy is limited because higher domestic interest rates relative to interest rates abroad may simply exacerbate the flood of private capital. Put differently, monetary policy loses its effectiveness and other instruments must be used to manage capital inflows and mitigate their destabilising effects on the domestic economy. Indeed, if financial imbalances are related to excessive credit growth, and if credit growth is fuelled by capital inflows, a comprehensive policy response could involve the use of both macroprudential tools and – at least temporarily – capital controls, or, to use a more politically correct term nowadays, following the paradigm shift at the IMF (2011a, 2012, 2016), capital flow management (CFM) measures. In the aftermath of the GFC, several countries in Latin America did impose or intensify CFM measures. Brazil, in particular, implemented a direct tax on fixed income and equity inflows (see Pereira da Silva et al (2012)). Colombia and Peru also imposed taxes on capital inflows. The case for imposing these controls has at times been based on their benefits in terms of financial stability (see Box 5).

Box 5

The rationale for capital controls

The conventional case for imposing capital controls is generally made on “second best” grounds (see Dooley (1996)). Distortions in the domestic financial system, for instance, may cause resources borrowed from abroad to be allocated in socially unproductive ways in the domestic economy. Moreover, in the absence of a well developed regulatory framework or adequate risk management practices in the financial sector, overborrowing can increase financial vulnerability. If the distortion causing the problem cannot be removed, a second best option may be to limit foreign borrowing.

Recent analytical contributions have instead focused on the role of capital controls as a prudential instrument, or as a tool to reduce the probability of financial crises. These contributions include Bianchi (2011), Bianchi and Mendoza (2011), Farhi and Werning (2012), De Paoli and Lipińska (2013), Costinot et al (2014), Brunnermeier and Sannikov (2015), Heathcote and Perri (2016), Korinek and Sandri (2016), Davis and Presno (2017) and Benigno et al (2016).

One strand of this literature advocates capital controls based on aggregate demand externalities in the presence of nominal frictions on the use of monetary policy. Farhi and Werning (2012) argue that a countercyclical capital controls policy can play a role in macroeconomic stabilisation in a small open economy with a fixed exchange rate. They also argue that capital controls can mitigate the effects of excess international capital movements caused by risk premium shocks. Using a two-country model, De Paoli and Lipińska (2013) show that restricting international capital flows through capital controls can be beneficial for individual countries, although it would limit international risk-sharing.

Another strand of this literature advocates capital controls based on the existence of pecuniary externalities. Benigno et al (2016) develop a model of foreign borrowing subject to collateral constraints and pecuniary externalities in the exchange rate that make the case for taxes on borrowing. By contrast, Bengui and Bianchi (2014) consider the implication of an environment in which the ability to enforce capital controls is limited. They show that while leakages create distortions that make capital controls undesirable, the social planner may find it optimal to tighten regulation on the regulated households in order to achieve higher gains from stabilisation. They also argue that there are important gains from capital controls despite the presence of leakages. Brunnermeier and Sannikov (2015) also study the implications of pecuniary externalities in a two-country world with incomplete markets. Short-term capital flows can be excessive because each firm does not internalise that an increase in production capacity undermines their output price, worsening their country's terms of trade. In such conditions, capital controls or domestic macroprudential measures that limit short-term borrowing can improve welfare.

Yet another strand characterises capital controls as a tool to manage the terms of trade. De Paoli and Lipińska (2013) describe a model in which import and export taxes and subsidies are not available, and capital controls are instead tightened and loosened as competing concerns about output fluctuations gain and lose importance over the business cycle. Costinot et al (2014) consider a world consisting of two countries, in which one country chooses optimal taxes on capital flows while the other country is passive. They show that it is optimal for the strategic country to tax capital inflows if it grows faster than the rest of the world and to tax capital outflows if it grows more slowly. Finally, Heathcote and Perri (2016) consider a two-country, two-good world in which international financial markets are incomplete, in the sense that the only asset traded internationally is a non-contingent bond. This creates *prima facie* a potential role for policy intervention. The intervention that they consider is an extreme form of capital controls, in which asset trade is ruled out altogether. Thus, they compare welfare when countries only trade a non-contingent non-defaultable one-period bond, to welfare under financial autarky, and find that capital controls can improve welfare.

Most of the literature discussed above has focused on capital controls on investors. By contrast, Agénor and Jia (2015) study the benefits of time-varying capital controls on bank-related capital flows. In line with Benigno et al (2016), they do so in a model with financial frictions. In their base experiment capital controls are related to changes in (aggregate) bank foreign borrowing; they are thus tantamount to a macroprudential instrument. Their analysis shows that temporary capital controls can indeed generate a significant welfare improvement in response to external financial shocks. They also study the joint determination of optimal simple, implementable countercyclical rules in terms of both reserve requirements and capital controls. They find that a more aggressive reserve requirement rule (which responds to credit growth) requires less reliance on capital controls. Thus, the two instruments are substitutes at the margin, at least in response to external financial shocks. This is an important result because a common criticism of capital controls (especially when they begin to take a more permanent form) is that private agents find ways to evade them. However, it may be more difficult to do so for reserve requirements.

The evidence regarding the effectiveness of capital controls in terms of their impact on the *volume* (as opposed to the *composition*) of capital flows remains mixed (see Box 6). It also appears that the effectiveness of any given measure gets eroded over time, as markets find new ways to circumvent the legislation. Nevertheless, temporary effectiveness may well be all that policymakers need when faced with sudden floods and neither monetary policy nor macroprudential policy can respond quickly. In addition, much of the existing literature has explored the use and effectiveness of controls in a context where preventing crises (rather than mitigating instability) is a key policy objective. Some of the recent evidence suggests that capital controls have proved effective, at least to some extent, in improving macroeconomic stability; but the question that remains unanswered is the extent to which they can help to improve financial stability and, if so, under what conditions. Some types of capital controls (such as exposure limits on foreign currency borrowing, or reserve requirements on foreign currency deposits in domestic banks) are tantamount to prudential measures – which are especially important (as noted in Chapter 1) when gross capital inflows are intermediated through the regulated financial system. The evidence on this issue is still limited.

Box 6

Effectiveness of capital controls: recent evidence

The effectiveness of capital controls depends in general on a wide range of factors, including whether controls are imposed on inflows or outflows and whether their coverage is comprehensive or partial. The effectiveness of controls is thus likely to differ both across countries and over time, making the task of drawing general conclusions difficult.

The evidence on the benefits of capital controls is mixed. Empirical studies conducted in the 1990s suggest that capital controls were only temporarily able to drive a wedge between foreign and domestic interest rates and to reduce pressures on the exchange rate in countries like Brazil, Chile, Colombia, Malaysia and Thailand (Ariyoshi et al (2000)). More recent studies include Forbes (2007), Edwards and Rigobon (2009), Binici et al (2010), Gochoco-Bautista

et al (2010), Glick and Hutchison (2011), Jongwanich et al (2011), Abhakorn and Tantisantiwong (2012), Ostry et al (2012), Ahmed and Zlate (2014), Ghosh et al (2014), Chamon and Garcia (2016), Forbes et al (2016), Giordani et al (2017) and Pasricha (2017), whereas literature reviews are provided in CGFS (2009), Habermeier et al (2011), IMF (2011a) and Agénor (2012).

Edwards and Rigobon (2009) find that capital controls in Chile did affect capital flows and the exchange rate. Also focusing on Chile, Forbes (2007) finds that capital controls increased financing costs, particularly for small and medium-sized enterprises. Binici et al (2010), dwelling on the broader data set described in Schindler (2009), find that capital controls may alter both the volume and the composition of capital flows, in line with Edwards and Rigobon. Using a large cross-country data set, Ostry et al (2012) find that both capital controls and foreign currency-related prudential measures are associated with a lower proportion of (potentially more volatile) portfolio debt in total external liabilities.

Gochoco-Bautista et al (2010) examine the effects of capital control measures on the volume and composition of capital flows using panel regressions for nine Asian countries (China, Hong Kong SAR, India, Indonesia, Korea, Malaysia, the Philippines, Singapore and Thailand) over the period 1995–2005. They find that capital controls did affect the composition of capital flows, with a stronger impact on capital outflows. However, restrictions on portfolio inflows appear ineffective in deterring inward flows. By contrast, Ahmed and Zlate (2014), in a study covering 12 MICs from Asia and Latin America over the period 2002–12, find that capital control measures did appear to have discouraged both total and portfolio inflows.

Jongwanich et al (2011) examine the impact of capital controls in Malaysia and Thailand during the period 2000–10. They studied not only the effects of restrictions on the volume of capital flows (aggregate, inflows, and outflows), but also on particular categories of flows (portfolio, direct, and other investment flows). They find that restrictions in Thailand had no significant effect on inflows but that liberalisation was effective for outflows, particularly FDI. This result is consistent with Gochoco-Bautista et al (2010). In Malaysia, capital relaxation had a significant impact on inward FDI and portfolio inflows. In another study on Thailand, Abhakorn and Tantisantiwong (2012) focus on the impact of the unremunerated reserve requirement (URR). They find that although the URR was successful in reducing the total of net capital inflows and altering their composition towards long-term investment, it was unsuccessful in reducing the accumulation of short-term private external debt.

Other econometric studies reviewed in Habermeier et al (2011) on the effectiveness of capital controls covering four MICs during the 2000s (Brazil, Columbia, Korea and Thailand) confirm that controls met with mixed success in terms of mitigating currency appreciation.¹⁰³ In the same vein, Jongwanich et al (2011) find that changes in capital account restrictions had no significant impact on the real exchange rate in either Malaysia or Thailand. Abhakorn and Tantisantiwong (2012) also find that the URR in Thailand was not completely effective in terms of stabilising the exchange rate. Glick and Hutchison (2011) find that capital controls were not very effective at preventing currency crises either.

Both Forbes et al (2016) and Chamon and Garcia (2016) focus on Brazil. Forbes et al (2016) find that Brazil's taxes on fixed income and equity aimed at stemming capital inflows into these markets diverted capital flows into other Latin American countries. Thus, just like tariffs, capital controls have a *beggar thy neighbour* aspect to them. Similar evidence for a broader group of countries is provided by Ghosh et al (2014) and Giordani et al (2017). To the extent that these flows have destabilising effects on recipient countries, capital controls in one country may create some significant negative externalities for others. Moreover, as noted by Ostry et al (2012), to the extent that widespread capital controls help countries to sustain undervalued currencies, they may also contribute to global imbalances.

Chamon and Garcia (2016) analyse the impact of the capital controls that Brazil has adopted since late 2009. They find that these policies had some success in segmenting Brazilian financial markets from global financial markets, as measured by the spread between onshore and offshore dollar interest rates. They also find that the two sets of measures adopted from late 2009 to mid-2011 did not translate into significant changes in the exchange rate, suggesting limited success in mitigating exchange rate appreciation (which was significant during that period, as noted in Chapter 1). However, the exchange rate strongly depreciated, by as much 10%, after a tax on the notional amount of

¹⁰³ Habermeier et al (2011) also find that prudential measures appear to have had more success in stemming credit growth and addressing financial stability concerns than capital controls. However, we do not share this view, as discussed earlier in the context of the pre-crisis experience in Latin America.

derivatives was adopted in mid-2011. This strong response may have reflected a combined effect, whereby the last measures complemented previous ones, in effect closing the remaining channels used by investors to bypass the initial tax on inflows. Overall, Chamon and Garcia's results suggest that capital controls can be effective, but only if they are very comprehensive. This may also explain why the estimated effect is much stronger than the results typically found in the literature on capital controls. At the same time, however, while more comprehensive controls can be more effective, they may also increase the associated costs – including stronger incentives to evade them.

Finally, Pasricha (2017) uses weekly data for 21 countries over the period 2001–15 and finds that macroprudential considerations have become a stronger rationale for the use of capital controls, especially on inflows. These results are in line with the recent theoretical literature discussed in Box 5.

Overall, the evidence suggests that capital controls appear to have had little effect (or, at best, a small effect) on the overall level of capital flows although they may have had some success in altering the composition of these flows. They also appear to have been able to mitigate somewhat currency appreciation during episodes of large inflows, at least in some countries. Nevertheless, the ability to implement them in many MICs remains limited. In particular, in countries that have pursued trade integration but did not sufficiently increase resources spent on monitoring and enforcement of capital controls, the effectiveness of these controls has eroded quickly due to increased opportunities for capital flight.¹⁰⁴ Even when they are successful in one jurisdiction, they may also generate undesirable cross-border effects. Policymakers should therefore continue to view them as a second, rather than first, line of defence.

5.3.5 Financial stability and monetary policy credibility

As discussed in Chapter 2, under imperfect credibility of an IT regime, inflation expectations can be viewed as a weighted average of past inflation and the inflation target. Depending on the relative weight attached by agents to these two components, convergence to the target following a temporary shock that raises observed inflation can be very slow. A high degree of inertia may therefore require large and prolonged movements in the policy rate to return expected inflation to target, raising in the process the output cost of disinflation. If the central bank's preference for output is high, or perceived as such, convergence will tend to be even slower. Moreover, if the degree of inertia (the weight attached to past inflation in the formation of inflation expectations) is itself a function of how long actual inflation deviates from the target (as noted earlier), a longer convergence period could weaken credibility significantly. In turn, this could impart greater inertia to inflation expectations and actual inflation, further exacerbating the credibility loss.

Suppose then that, to begin with, the central bank lacks credibility. What is the implication of adding a financial stability objective to monetary policy in that context? It may well confuse markets, weaken perceived commitment to price stability, and destabilise expectations – thereby making it more difficult to maintain low inflation. In such conditions, there may be a *stabilisation cost* associated with using monetary policy in a proactive manner. Indeed, consider again the case where policymakers are faced with a persistent, negative demand shock that lowers both output and inflation. In a standard IT regime, as discussed in Chapter 2, there is no trade-off between these two targets; the central bank just needs to lower the policy rate. But if doing so promotes risk-taking among lenders (by inducing a search for yield), as noted earlier, a conflict between macroeconomic and financial stability objectives emerges. If the central bank chooses to keep interest rates high to mitigate risk-taking, it must also accept the risk of deflation.

To internalise this trade-off, some observers have proposed to lengthen the horizon for achieving the inflation target. As noted in Chapter 2, this is the same response typically advocated in the case of a (persistent) supply shock, which entails a trade-off between output and inflation. However, as also noted earlier, concerns about systemic risk may be difficult to convey to agents, unlike other policy issues (such as the inflationary impact of an oil price shock). Indeed, as mentioned before, even though progress has been achieved in recent years, there is still no consensus on defining “financial stability” and how to

¹⁰⁴ To address this issue, Kawai et al (2012) advocate a regional approach to capital controls in the case of Asian countries. However, the practical difficulties involved should not be underestimated.

measure it in its various dimensions. If so, lengthening the target horizon may have adverse effects on inflation expectations and central bank credibility. Similar reasoning suggests that allowing instead a wider fluctuation band for the inflation target (while keeping the target horizon itself unchanged) could have equally detrimental effects on credibility.

At the same time, however, it is important to recognise that whether adding a financial stability objective may negatively impact central bank credibility depends in part on initial conditions. If, for instance, inflation is initially above target, a rise in the policy rate motivated by systemic risk concerns may actually be beneficial. What the “credibility problem” created by taking on a financial stability objective means is that there are new challenges for central banks in terms of *transparency* and *communication* of its policy decisions, and the indicators upon which they are based. But as discussed in Chapter 3, these challenges are not insurmountable. After all, when some central banks in IT-MICs initially adopted a measure of *core* inflation, as opposed to headline inflation, as their measure of price stability, they faced significant problems in conveying to the public the nature of their objective, and the reasons for making a particular choice – such as, for instance, which components of the price index are deemed too volatile and therefore need to be excluded from, or reweighted in, the index used to set the inflation target. A suspicious public could have legitimately suspected, and been concerned by, some opportunistic manipulation attempt by the central bank. Over time, with communication improving, these issues have become better understood by the public. Today, even in countries where the inflation target is based on a headline consumer price index, inflation reports routinely present and discuss alternative measures of core inflation. There is no reason to believe that the same may not occur with a financial stability target – even though, as noted earlier, there is no consensus yet on how to measure financial stability. Because the concept has proved elusive, defining financial stability as a final target is not a simple task; a sensible strategy perhaps is to follow as a first step an *operational* approach and respond to an *intermediate financial target*, as discussed in the next chapter.

5.3.6 Collective action problem, lobbying and political pressure

Finally, it is well documented that macroprudential policy can be subject to a collective action problem, which arises from uncertainty over the benefits of macroprudential action. This translates into the well known challenge of “taking the punch bowl away just as the party gets going”, which makes the containment of financial excesses politically difficult at a national level. Thus, more often than not, the collective action problem results in too little, rather than too much, macroprudential policy response, relative to the level that would be necessary to promote financial stability. Indeed, as noted by Viñals and Nier (2014), while the benefits of macroprudential policy decisions typically accrue over time and can be difficult to measure with certainty, the cost of such decisions is often felt immediately by both borrowers and lenders.¹⁰⁵ This makes it hard for financial regulators to demonstrate the determination to intervene. The resulting bias in favour of inaction, or insufficiently timely and forceful action, is often compounded by lobbying and political pressure.¹⁰⁶

When macroprudential policy is subject to lobbying and political pressure, the argument for relying on monetary policy (at least in a state-contingent fashion) to address financial stability concerns becomes stronger – especially in countries where the degree of operational independence of the central bank is high. Indeed, in such countries, it is difficult for particular groups to evade the consequences of a change in interest rates; such changes, as noted by some observers, “get through all the cracks”. Nevertheless,

¹⁰⁵ Indeed, as pointed out by Aizenman (2009), there is a paradox of prudential regulation – while the identity of agents who benefit directly from crisis avoidance is unknown, the cost and the burden of regulation are transparent. Hence, crises that have been avoided are imperceptible and are underrepresented in the public discourse, and the demand for prudential regulation declines during prolonged good times, thereby increasing the ultimate cost of eventual crises.

¹⁰⁶ A case in point is the worldwide reaction of the financial sector to the proposed new Basel rules for higher capital requirements, even though research (see Admati et al (2011), for instance, for the United States) suggested that this policy would be likely to lead to only a modest increase in the cost of credit.

precisely because of its indiscriminate nature, interest rate policy is too blunt an instrument to deal with financial fragilities (especially when they involve asset price bubbles), and because of its potential side effects (as a result of the link between credit and working capital needs discussed earlier, for instance). The use of sector-specific macroprudential instruments, when appropriate, remains essential, even though they may be subject to leakages.

5.4 Assessment

The foregoing discussion would seem at first to provide a mixed view on the issue of the complementarity of monetary and macroprudential policies. Fundamental to research on this issue is an understanding of the division of tasks between policy authorities; that is, institutional mandates. Many observers have argued that macroprudential policy cannot be a substitute for sound monetary policy, and that the priority for monetary policy should remain price stability. At the same time, macroprudential policy's primary focus should be on containing systemic financial risks. Macroprudential tools have at times proven effective in containing booms, and more often in limiting the consequences of busts, thanks to the buffers they help to build. Their more targeted nature limits their costs, although their associated distortions, should these tools be abused, can be severe. Such clear mandates serve to protect the independence that policymakers need to conduct countercyclical policies and simultaneously achieve or maintain price stability and financial stability. They also help to promote accountability, which in itself may help improve the quality of decision-making and enhance the credibility of the overall macroeconomic policy framework. Others, however, have argued that there are circumstances where monetary policy may still need to *lean against the wind* and respond to financial fragilities – because macroprudential policies alone may not be sufficiently effective in containing systemic risk arising from macroeconomic imbalances, or because, due to lobbying or political pressure, they are not used as forcefully as they should be – whereas macroprudential policy may be needed to maintain macroeconomic stability objectives (as in the case of sudden floods, as discussed earlier).

Nevertheless, the view that under a wide range of circumstances macroprudential and monetary policies are complements in achieving price and financial stability, and should therefore be coordinated, has gained greater acceptance in recent years. It has also been supported by some empirical evidence. Bruno et al (2017) for instance, in a study focusing on Asian economies, find that macroprudential policies tend to be more successful when they complement monetary policy, by reinforcing monetary tightening, rather than when they act in the opposite direction. In the same vein, Gambacorta and Murcia (2017) find that macroprudential policies that are used as complements of monetary policy have larger negative effects on credit growth than other types of measure. Both of these results are consistent with the view, discussed earlier, that the transmission mechanisms of monetary and macroprudential policies are closely interlinked. Naturally enough, the degree of complementarity between monetary and macroprudential policies depends on the type of policies implemented: policies with countercyclical objectives are more likely to exhibit complementarity with monetary policy than policies (involving, for instance, setting capital levels) that are more structural in nature. The IT regime that involves a close coordination between policy interest rates and countercyclical macroprudential policy is referred to, as in the first edition of this book, as *integrated inflation targeting* (IIT).

More formally, IIT can be defined as a flexible IT regime in which the central bank's mandate is explicitly extended to include a financial stability objective, the policy interest rate is set (in a state-contingent fashion, to reflect a hierarchical mandate or to minimise policy errors) to respond directly to excessive credit expansion, and monetary and macroprudential policies are calibrated *jointly* to achieve macroeconomic and financial stability. This calibration should be conducted in macroeconomic models that properly account for the fact that macroprudential regimes may alter the monetary transmission mechanism, and that monetary policy may affect key operational targets for financial stability, such as credit growth, interest rate spreads and asset prices. Calibration exercises can help to answer, on a case by case basis, a key question: does a more aggressive use of macroprudential policy obviate the need for

policy rates to lean against the wind; that is, to counter the build-up of financial imbalances? This combination of policies must be supplemented by a systematic use of sterilised intervention, which may itself be motivated in some circumstances by financial stability considerations and, as a last resort, by capital controls. The next chapter expands on the design and implementation of IIT regimes.

Chapter 6. Designing and implementing integrated inflation targeting regimes

Designing and implementing an IIT regime in MICs raises a number of challenges. This chapter considers some of the key analytical and operational issues that arise in that context, including the need to better understand how the regulatory regime alters the monetary transmission mechanism (both directly and indirectly), the design and practical implementation of integrated monetary and macroprudential policy rules in order to better inform policy decisions, and institutional reforms that may help to strengthen the overall framework for macroeconomic management.

6.1 The monetary transmission mechanism once again

As discussed earlier, some macroprudential tools may significantly alter the monetary transmission mechanism. The issue is further complicated by the fact that, in practice, the distinction between a stabilisation goal and the objective of mitigating systemic risk is not always clear-cut. Macroprudential policies aimed at dealing with systemic risk can contribute to macroeconomic stability by dampening the amplitude of the credit cycle, whereas the use of monetary policy to mitigate business cycle fluctuations can contribute to financial stability by preventing excessive movements in capital flows, thereby mitigating systemic risk.

Efforts aimed at understanding and quantifying the transmission process of monetary policy in MICs has in part been related to the transition to flexible exchange rates and the adoption of IT as a monetary policy framework. It was recognised early on that for an IT regime to perform as planned, the central bank needed to establish an inflation forecast and set its monetary instrument so as to steer inflation towards the announced target, and to do so the monetary transmission mechanism needed to be better understood. But the foregoing discussion suggests that if multiple instruments are indeed going to be used to achieve macroeconomic and financial stability, renewed effort is needed to understand how they interact in response to a range of shocks, real and financial, domestic and foreign. This requires using policy-oriented models that are appropriate for the economic environment of MICs. Using misspecified models may lead to costly policy mistakes. This is a fairly broad point; what it means from an operational standpoint is that using a model that does not adequately capture the channels through which macroprudential regulation affects the monetary transmission mechanism, and how monetary policy affects key financial variables, may generate biased inflation forecasts and may lead as a result to sub-optimal policy decisions.

As noted in Chapter 1, banks continue to play a dominant role in the financial system in MICs. Financial market imperfections are also pervasive in most of these countries (even more so than in AEs in several respects) and cover a broad spectrum. The importance of banks and credit market imperfections means that it is essential to develop models that account for their macroeconomic role in the transmission of policy and exogenous shocks, and use them to study how monetary and macroprudential policies interact and how effective these policies are in terms of achieving macroeconomic and financial stability.

There has been significant progress in that direction in recent years. In particular, the approach to bank-based economies with financial frictions discussed in Agénor and Montiel (2015, Chapter 6) and Agénor (2019) has proved useful to address a number of issues, in both closed and open economies. It has been used by Agénor and Pereira da Silva (2014, 2017) to study how reserve requirements and cyclically adjusted provisions, as well as interactions between these instruments, affect the monetary transmission process in a closed economy.¹⁰⁷ It has also been used to analyse the interactions between

¹⁰⁷ As noted earlier, reserve requirements are increasingly used for financial stability purposes, and could be seen as macroprudential to the extent that they help to mitigate liquidity risk.

monetary and macroprudential policies (in the form of reserve requirements or countercyclical capital requirements), and the possibility that these policies may complement each other in the presence of a trade-off between macroeconomic and financial stability goals, by Agénor et al (2012, 2013) for closed economies and by Agénor et al (2014, 2018) for open economies. As discussed in previous chapters, sudden floods of private capital have been a recurrent source of macroeconomic instability in MICs, as a result of rapid credit and monetary expansion, real exchange rate appreciation, and widening current account deficits. At the same time, the scope for responding to macroeconomic and financial stability risks through monetary policy is hampered by the fact that higher domestic interest rates vis-à-vis those prevailing abroad may exacerbate the flood of private capital. In such conditions, macroprudential policy (possibly in the form of restrictions on bank borrowing abroad) becomes a critical instrument of macroeconomic management.

Box 7, which is based on Agénor et al (2014, 2018), illustrates how these models work by discussing the extent to which countercyclical capital buffers can help to preserve macroeconomic and financial stability following a fall in world interest rates and a sudden inflow of capital in a small open economy. Simulation results show that (consistent with the evidence discussed earlier) a sudden flood generates pressure on asset prices and an economic boom – the magnitude of which depends on the degree of credit market imperfections and the nature of the bank regulatory regime. Countercyclical capital regulation, while effective at promoting both macroeconomic and financial stability, exhibits diminishing returns beyond a certain point – essentially because regulatory-induced volatility in capital holdings translates eventually into volatility in lending and other macroeconomic and financial variables. In the end, countercyclical capital regulation may not be sufficient to completely neutralise the adverse effects of volatile capital flows; this policy may need to be supplemented by other, more targeted, macroprudential instruments. One option, discussed by Agénor and Jia (2015), is to combine a tax on bank foreign borrowing (in effect, capital controls) with reserve requirements.¹⁰⁸ Indeed, a key challenge on the research agenda is to identify more systematically the short-term policy combinations (involving different types of macroprudential tools as well as other policies, such as sterilised intervention) that can help to mitigate the impact of external financial shocks, in an environment where the use of short-term policy rates is constrained by the need to balance internal and external stability objectives.

Box 7

External financial shocks and policy responses

As noted in the text, sudden floods have been a source of macroeconomic instability in MICs on numerous occasions, having been associated with rapid credit expansion, inflationary pressures, real exchange rate appreciation, and widening external imbalances. During such episodes central banks are confronted with a dilemma – responding to large capital inflows by raising short-term interest rates runs the risk of exacerbating capital inflows. A key issue therefore is what other policy instruments can be used to mitigate the impact of external financial shocks.

Agénor et al (2014, 2018) focus on the role of macroprudential regulation in mitigating the macroeconomic and financial instability that may be associated with sudden floods in private capital, in particular foreign bank borrowing. As discussed in Agénor and Pereira da Silva (2018), in recent years bank-related capital flows have accounted for a highly significant share of cross-border capital movements between AEs and MICs. There is therefore a risk that capital flows intermediated directly through the banking system may lead to the formation of credit-fuelled bubbles and foster financial instability.

The analysis in Agénor et al (2014) dwells on the closed-economy DSGE model with credit market imperfections and a risk-sensitive regulatory capital regime – with changes in repayment probabilities feeding into

¹⁰⁸ Agénor (2019) provides a comprehensive review and discussion of this literature, from the perspective of MICs.

changes in risk weights, and affecting the cost of issuing capital and bank pricing decisions – described in Agénor et al (2012, 2013). A key feature of that model is a direct link between house prices and credit growth, via the impact of housing wealth on collateral and interest rate spreads. This framework is extended to an open economy to account, first, for imperfect capital mobility – an assumption that accords well with the evidence for MICs (see Agénor and Montiel (2015)). Households face an upward-sloping supply curve of funds on world capital markets, and internalise the effect of capital market imperfections in making their portfolio decisions. Thus, unlike many other open-economy DSGE models, the external risk premium depends on the *individual household's* borrowing needs, not the *economy's* overall level of debt. As a result, the domestic bond rate is determined by the equilibrium condition of the money market, instead of being tied directly to foreign interest rates – as implied by uncovered interest rate parity under perfect capital mobility (see Agénor (1997, 1998)).

Second, the model considers a managed float and imperfect pass-through of nominal exchange rate changes to domestic prices. Both features are also well supported by the evidence, as discussed earlier. Third, banks are assumed to borrow on world capital markets, and their borrowing decisions also affect the terms at which they obtain funds. Bank funding sources, domestic and foreign, are imperfect substitutes. At the same time, domestic agents (namely, producers of intermediate goods and capital goods) borrow only from domestic banks. These assumptions are in contrast to a number of contributions in the literature, where it is assumed that firms borrow directly on world capital markets subject to a binding constraint determined by their net worth.¹⁰⁹

Fourth, the model considers the role of bank regulation as a policy to mitigate the adverse effects of sudden floods, under the assumption that monetary policy is constrained to follow a standard Taylor rule. The policy takes the form of a Basel III-type countercyclical rule for bank capital, similar to the rule specified in Agénor et al (2013); capital requirements are positively linked to credit growth gaps. Countercyclical regulation therefore aims to internalise potential trade-offs between the objectives of macroeconomic stability and financial stability. To measure financial stability, three alternative measures are used, based on the volatility of asset prices (house prices and the nominal exchange rate), the credit-to-GDP ratio, and the ratio of bank foreign borrowing to GDP.

Numerical simulations reported in Agénor et al (2014) show that a sudden flood in foreign capital, induced by a drop in the world risk-free interest rate, generates pressure on asset prices and an economic boom, the magnitude of which depends on bank pricing behaviour and the nature of the regulatory regime. Banks borrow more on world capital markets in foreign currency and less from the central bank in domestic currency. The inflow of foreign exchange is such that the monetary base (in the absence of full sterilisation) expands, and this requires a lower bond rate to maintain equilibrium in the money market. The drop in the bond rate (in both nominal and real terms, given that prices are sticky) stimulates current consumption through an intertemporal effect and the demand for housing services. In turn, this raises real estate prices, which increases the value of collateral that firms can pledge and lowers the loan rate, thereby stimulating investment. Sudden floods may therefore generate an economic boom that is magnified by a financial accelerator effect (in line with the basic mechanism emphasised in Bernanke et al (1999)), through their impact on collateral values and loan pricing decisions, above and beyond their direct effect on bank borrowing.

In this context, countercyclical capital regulation turns out to be quite effective – at least for the shock considered – at promoting both macroeconomic and financial stability. However, the gain in terms of reduced volatility exhibits diminishing returns beyond a certain point – essentially because regulatory-induced volatility in capital holdings translates into volatility in lending and other macroeconomic and financial variables, including foreign bank borrowing and the exchange rate. In the end, even an aggressive countercyclical capital regulatory rule may not be sufficient to completely offset the adverse effects associated with volatile capital flows.

The performance of countercyclical reserve requirements (an instrument used time and again in MICs, as discussed in the text) is studied in Agénor et al (2018), in an extension of the model presented in Agénor et al (2014). They analyse the performance of a simple countercyclical rule, based on deviations in the credit-to-output ratio. The model is used once again to study the effects of a temporary drop in the world risk-free interest rate. An optimal required reserve ratio, based on minimising a composite loss function similar to that used in Agénor et al (2014), helps to mitigate macroeconomic and financial volatility – with the latter defined in terms of both a narrow measure based on the credit-to-output ratio, the ratio of capital flows to output, and interest rate spreads, and a broader measure that includes real asset prices as well. Greater reliance on sterilisation implies a less aggressive optimal reserve requirements rule, implying that the two instruments are partial substitutes.

¹⁰⁹ See, for instance, Céspedes et al (2004), Choi and Cook (2004), Elekdag et al (2006) and Benigno et al (2011).

Another issue that has been studied using a similar framework is the role of controls on capital inflows. Capital controls, unlike prudential tools, typically involve discriminating between residents and non-residents. As discussed in Box 5, the evidence on their benefits is mixed; there is no firm support for the view that they can be effective at preventing financial instability and currency crises. However, existing studies do not consider the performance of a specific tax on bank borrowing abroad. The performance of such a tax (which can be viewed as both a capital control and a macroprudential instrument) is studied in Agénor and Jia (2015). Their calibration is such that the model replicates the stylised facts associated with a fall in world interest rates, alluded to earlier (capital inflows, real appreciation, credit boom, asset price pressures, and output expansion). The capital controls rule is defined in terms of either changes in bank foreign borrowing or cyclical output. An optimal, welfare-maximising rule is established numerically. They also solve jointly for optimal countercyclical reserve requirements and capital controls rules, and find that a more aggressive credit-based reserve requirement rule induces less reliance on capital controls. Thus, countercyclical reserve requirements and capital controls are partial substitutes in maximising welfare.

6.2 Integrated monetary and macroprudential policy rules

If indeed the balance of arguments is in favour of a more proactive role for monetary policy in an IIT regime in addressing financial stability concerns, to what should central banks react? Specifically, what is the form of the optimal interest rate policy rule, beyond accounting for current (or expected) inflation and output gaps? How should that rule be coordinated with a macroprudential rule? Should the macroprudential policy rule be limited only to financial stability considerations, or should it also account for output fluctuations? In principle, the optimal combination of monetary and macroprudential rules should be derived from an optimisation problem, involving maximising social welfare or minimising a policy loss function, subject to a model of the economy. The optimal rules would then be derived from the first-order conditions of this optimisation problem.¹¹⁰

Given the complexity of this issue, and the importance of using policy models that account for banks and the type of financial frictions observed in MICs (as noted earlier), an explicit derivation of these first-order conditions is generally difficult;¹¹¹ solving jointly for the optimal monetary and macroprudential policy rules must be done numerically. One step in that direction is the contribution of Agénor et al (2013), based on a calibrated DSGE model for MICs, which supports the view that a credit-augmented interest rate rule, combined with a countercyclical capital regulatory rule, is optimal for promoting macroeconomic and financial stability. Another contribution is Carrillo et al (2017).¹¹² However, more research on optimal joint policies, considering possible strategic interactions between policy authorities, should remain high on the agenda.

At a practical level, there is broad consensus that, from an operational standpoint, an aggregate that may serve as a proxy for financial stability is credit growth or the credit-to-GDP ratio. On that basis, credit can be viewed as a “summary” indicator or intermediate target, which can be used to calibrate the effect of macroprudential instruments and design policies to dampen destabilising swings in the credit cycle. From the perspective of monetary policy as well, there is much merit in focusing on an augmented interest rate rule involving the addition of a measure of the *private sector credit growth gap*, defined as the

¹¹⁰ See Svensson (1997) and Clark et al (1999) for a formal analysis under different expectational regimes. A conceptually more general solution would be to solve for the Ramsey policy, under which the objective of a social planner is to maximise social welfare, subject to the constraints imposed by competitive equilibrium. The Ramsey policy is a useful benchmark but it is often difficult to solve for in practice, when models are relatively large. See Agénor (2019, Chapter 5) for a more detailed discussion.

¹¹¹ Simple analytical models where an explicit solution for an augmented interest rate rule can be derived include Disyatat (2010) and Agénor and Pereira da Silva (2011).

¹¹² In DSGE models for AEs, Christiano et al (2007, 2010) also find that an interest rate response to credit growth can mitigate welfare-reducing boom-bust cycles in real and financial variables. Gelain et al (2012), however, find that although such a response can stabilise some economic variables, it can magnify the volatility of others, particularly inflation. From a broader perspective this suggests that there may be diminishing marginal returns in reacting to credit growth.

difference between the actual growth rate of that variable and a *reference* growth rate, which needs to be determined as an *equilibrium* rate of credit growth. This would allow monetary policy (which can address only the time dimension of systemic risk, as noted earlier) to mitigate accelerator mechanisms that fuel credit growth and inflate asset prices, which are common manifestations of financial imbalances. As discussed in Chapter 1, excessively rapid credit growth tends to be accompanied by a weakening of lending standards and credit quality, which tends to increase financial fragility in a downturn. There is also robust evidence to suggest that credit booms significantly raise the likelihood of an asset price bust or a financial crisis in MICs.

Responding to a credit growth gap may be desirable not only for macroprudential reasons but also because of the unreliability of real-time (preliminary) output gap measures in MICs; by contrast, credit data are readily available and usually subject to only small revisions (if any) over time. Cusinato et al (2010), for instance, find that output gap measures (with trend output estimated with a standard Hodrick-Prescott filter) based on real time and final real GDP estimates for Brazil can differ substantially at times, with errors going in either direction. Similar results are obtained for other MICs.¹¹³ In the presence of large errors in the measurement of output gaps, it may in fact be optimal to *reduce* the weight attached to that variable in a real-time Taylor rule. At the same time, if the credit growth gap is closely related to final estimated output, the weight of that variable should be increased.¹¹⁴ In practice, many central banks in MICs already pay significant attention to credit growth in conducting monetary policy – without a doubt because of the importance of banks in the financial system and their role in financing economic activity, as discussed in Chapter 1. Errors in initial measures of GDP also militate in favour of using a credit growth gap, rather than a credit-to-GDP gap, as the proxy for financial vulnerabilities.

In a sense, the credit growth gap can be viewed as an *intermediate target*, concerns about which are easier to convey than those about a multifaceted and hard-to-define final target, financial stability. There appears therefore to be an asymmetry in defining the central bank's policy loss function in an IIT regime, given that stable inflation and output are often presented as final targets. In any case, because of the difficulty of defining financial stability as a final target (at least in the current state of affairs), using an intermediate target that is easier to define may facilitate communication with the public and alleviate some of the credibility issues mentioned earlier.

6.3 Implementing integrated policy rules

There are a number of challenges involved in the practical implementation of an augmented interest rate rule, which depends on (actual or expected) inflation deviations from target, the output gap, and the credit growth gap, combined with a macroprudential policy rule, which depends on the credit growth gap as well as possibly a measure of output stability.

A first issue is whether the central bank and the regulator should consider a real or a nominal credit gap, and whether it should consider a broad measure of credit or only a component of aggregate credit. As noted earlier, working capital loans are related to the supply side, not the demand side, of the economy. If the credit growth gap is to be used in part as a substitute for the output gap as a measure of excess aggregate demand, it might be argued that these loans should be excluded from the measure to which the central bank should respond. However, it may also be argued that working capital loans are substitutes for firms' internal resources (or cash flows), which can now be used to finance longer-term

¹¹³ Studies for AEs, such as Marcellino and Musso (2011), also find differences in the behaviour of revised and unrevised output gaps that can be quite significant as well – although, as argued in that study, they are not necessarily due to data revisions.

¹¹⁴ A similar argument is proposed by Scharnagl et al (2010), with respect to *money growth* in the euro area. Using numerical analysis, they find that the greater the degree of output gap uncertainty, the greater the benefits of incorporating a money growth response are in terms of reduced volatility in output, inflation and interest rates. They argue that the main reason for this is that real-time data on money growth contain valuable information on the true level of current output growth, which is not otherwise known to policymakers in real time with a sufficient degree of precision.

investment – thereby indirectly affecting aggregate demand. Moreover, it may be argued that, to the extent that all components of credit carry some risk of default, they could all create financial risks. From a financial stability perspective, both arguments would militate in favour of using a broad credit aggregate. Fungibility and evergreening problems are also important considerations in choosing between narrow and broad measures.

A second issue is whether the “reference” growth rate should be calculated as a trend, as proposed for instance in the calculation of the countercyclical capital buffer under Basel III (see BCBS (2011) and Drehmann and Tsatsaronis (2014)), or rather on the basis of an equilibrium credit-to-GDP ratio or a credit growth rate that is related to some fundamental determinants, such as population growth, urbanisation, and so on. Indeed, rising credit-to-GDP ratios or high growth rates of credit do not necessarily indicate that financial imbalances are building: they may also reflect financial deepening and rising living standards. The use of an equilibrium measure may therefore be more appropriate for MICs, because it would help to account for financial inclusion – an important consideration for countries where the scope of the formal financial system, and access to credit and other financial services, are limited to begin with. In fact, by reducing reliance on the unregulated financial system, and increasing opportunities for risk-sharing and consumption smoothing, financial inclusion may help to promote financial stability in the longer run (see Hawkins (2006)). Indeed, there is evidence to support that claim (see Ahamed and Mallick (2017)). In addition, as documented in Chapter 1, credit-to-GDP ratios remain on average relatively low in many MICs (particularly for Latin America), implying that a “catch-up” phenomenon is to be expected; using a trend measure would be too crude to determine the equilibrium value of credit growth.¹¹⁵

At the same time, it is important to keep in mind that both the credit growth gap and the credit-to-GDP ratio gap are noisy indicators; false signals are inevitable and may raise the risk of policy errors. For instance, a sudden increase in the credit growth rate can reflect (as noted earlier) either a supply side factor (higher demand for working capital loans, due to a positive productivity shock) or a demand side factor (higher demand for investment); in the first case it tends to mitigate inflationary pressures, whereas in the second it tends to magnify them. An increase in the policy rate, in the context of a credit-augmented Taylor rule, would be appropriate in the latter case but not in the former. Alternatively, an increase in the credit-to-GDP ratio may be because of a fall in the denominator (GDP) rather than an increase in the numerator (credit); this tends to occur in the early stages of a recession. The mechanical use of this indicator to set monetary and macroprudential policies would then produce unintended effects (Drehmann and Tsatsaronis (2014)).¹¹⁶ Both policy rules should therefore contain an *escape clause* and be contingent on the source and magnitude of the change in these variables.

Some observers have argued in favour of using a larger set of indicators (see Behn et al (2013), IMF (2013), and Bank of England (2014, 2015)). In addition to credit growth, IMF (2013), for instance, suggests using a range of other variables for systemic risk assessment, including prices of assets that are used as collateral for secured lending and that may contribute to feedback between increases in leverage and asset prices; leverage taken by borrowers in those asset markets, on average as well as on new loans, given that the latter will be a more timely measure of credit conditions; changes in lending standards, as captured by decreases in lending margins and increases in household and corporate leverage; measures of balance sheet vulnerabilities in household and corporate sectors, as captured by debt-to-income ratios for each sector; increases in exposure of the household and corporate sectors to interest rate and currency risks that create vulnerabilities to aggregate shocks; and measures of external imbalances, as reflected in current account deficits and a real exchange rate appreciation, which can raise the probability of crises.

¹¹⁵ To determine equilibrium credit growth, a good starting point could be the econometric framework developed by Guo and Stepanyan (2011), applied not to panel data sets but to individual countries, as for instance in Tan (2012). A more comprehensive approach is proposed by Buncic and Melecky (2014). Fundamentally, therefore, the issue is an empirical one.

¹¹⁶ This potential difficulty in interpreting movements in the credit-to-GDP ratio gap represents another argument in favour of using the credit growth gap as an intermediate target for financial stability.

However, this broader range of indicators creates at least two problems: first, the frequency of these data is not the same, implying that in real time policymakers must operate with incomplete information; and second, there is a risk of conflicting signals, which implies that policymakers must weigh each piece of information prior to taking decisions – a difficult process, in the best of times.

A third issue relates (again) to credibility and the possible disruption in the formation of expectations that the introduction of a modified reaction function for the central bank may cause among market participants. The implementation of a new policy regime rule is always a delicate issue because part of the process of anchoring inflation expectations depends on market participants becoming progressively familiar with it, including the policymaker's decision process, whether based on formal policy rules or not. An important component of this process has been the markets' ability to replicate the central bank's inflation forecasts using their own projection models. Another is the ritual (the Monetary Policy Committee and Financial Stability Committee meetings) through which the central bank's and regulator's analysis and policy stance are communicated to markets. The periodicity of these meetings allows markets to conduct their own assessment within a well known time frame, absorb policy signals and use the information available on the state of the economy and the financial system to feed into their own forecasts. Credibility is built in this complex interaction when market expectations and the predicted reaction of policymakers match to a significant extent what actually happens. Naturally, the convergence process may be noisy (due to differences in model specification and assumptions, calibration problems, and so on), but for it to occur markets must develop a reasonable understanding of when and how the monetary and regulatory authorities will react, and the thought process behind their decisions. In that sense, the shift to an IIT regime must be accompanied (as noted earlier) by a significant effort to improve transparency in the policy process and to better communicate with the public.

It is worth noting that in the foregoing discussion about the nature of IIT, and the design of joint policies under that regime, there has been no reference to the view that monetary policy should react to exchange rate fluctuations – despite the fact that, as discussed in Chapters 3 and 4, there is some evidence that central banks in IT-MICs have responded to these fluctuations in setting policy interest rates. On the contrary, in an IIT regime exchange rate stability should be addressed through sterilised foreign exchange market intervention – regardless of its motivation.¹¹⁷ Using the policy rate to mitigate undesirable movements in exchange rates could be potentially costly, because it may send (as noted earlier) confusing signals about the primacy of the inflation target, thereby undermining its credibility. Using sterilised intervention to manage the exchange rate might actually strengthen the credibility of the central bank's inflation target. In addition, rather than being motivated by a conventional fear of floating argument (related, for instance, to the goal of limiting real appreciation in a context of large capital inflows), intervention in an IIT regime may be motivated at times mainly by financial stability considerations, as for instance when concerns regarding the effect of exchange rate changes on the balance sheets of banks and their domestic borrowers are paramount. As noted in Chapter 4, this is consistent with some of the recent empirical evidence on the intent of intervention.

6.4 Other institutional reforms

Implementing an IIT regime requires two types of institutional reforms: those needed to conduct policy under that regime, and those needed to strengthen the macroeconomic policy framework in general. In that sense, an IIT regime also requires some degree of coordination between monetary and macroprudential policies with other policies, namely, fiscal policy.

¹¹⁷ If intervention is not sterilised (perhaps because of its cost), then the optimal policy mix would involve the joint setting of three instruments – the policy interest rate, the macroprudential instrument, and the degree of foreign exchange market intervention. However, this would significantly complicate the design of optimal policy rules.

6.4.1 Institutional arrangements for conducting IIT

In describing IIT, the preceding discussion has emphasised the need to solve jointly for monetary and macroprudential policies. However, while coordination is desirable in that setting, it does not imply that in practice both policies must be conducted by a single authority or by separate authorities. The question therefore does arise as to whether the charter of the central bank should be changed to reflect explicitly the adoption of a financial stability objective, whether separate entities should be responsible for each policy to improve transparency and accountability, or more generally who should carry the macroprudential function of monitoring and mitigation of risks and vulnerabilities of the financial system as a whole.

Since the GFC, there have been a number of changes in the institutional organisation of financial supervision, and the role played by central banks beyond their traditionally narrow mandate. These changes have led to a variety of institutional arrangements, which differ essentially in two dimensions (see Calvo et al (2018)): (i) their ability to exploit synergies across different functions by grouping them within a specific institution; and (ii) their power to minimise conflicts across objectives by assigning them to different authorities. The latter is, in principle, as important as the former, given that conflicting objectives within the same authority may lead to the subordination of one to the other in a way that may be socially sub-optimal.¹¹⁸ These arrangements include a *goal-integrated mandate*, in which the central bank is responsible for both monetary policy and macroprudential regulation, and *partially integrated mandates*, which group responsibilities in different authorities according to different criteria, including the setting of objectives and the choice of instruments.

The debate is still open regarding the costs and benefits of alternative institutional arrangements (see Box 4). In particular, it has been argued that a specific mandate to preserve financial stability may in effect deter the central bank from its fundamental goal, the pursuit of price stability, and may generate reputational or credibility costs that can jeopardise its ability to perform its core function effectively. Moreover, the accumulation of power within a single institution may pose issues of political legitimacy, which could end up being resolved by introducing excessive constraints on the monetary authority's mandates and operational procedures. At the other extreme, economic and financial stability cannot be viewed as two different objectives that could be effectively pursued by different agencies, acting separately, using different instruments (interest rates for the central bank, and macroprudential tools for the regulator).¹¹⁹ As noted earlier, a key argument in favour of an integrated mandate, with respect to both objectives and instruments, is the fact that there are close linkages between the transmission mechanisms of monetary and macroprudential policies, which suggests that it is generally optimal to solve jointly for these policies. Again, however, this argument is one for (close) coordination, and not necessarily for bestowing both responsibilities upon a single institution.

In practice, nevertheless, central banks have become the primary macroprudential authority in close to 60% of the jurisdictions surveyed by Calvo et al (2018), although often other authorities are also involved by participating in inter-agency committees. Furthermore, central banks also host the resolution authority in close to 60% of the surveyed countries. The GFC has strengthened somewhat the case for seeking more synergies across supervisory functions by pursuing a higher integration of responsibilities in the supervisory authorities. Central banks have gained competences in the microprudential, macroprudential, and resolution domains, consistent with a goal of ensuring an adequate coordination of the monetary policy function with other functions (prudential oversight, as well as emergency lending and resolution, in crisis situations). The implication is that in the current institutional environment it has become easier in several ways to implement IIT, which requires exploiting complementarities.

¹¹⁸ Examples of possible conflicts of objectives between monetary policy and macroprudential policy were discussed earlier.

¹¹⁹ At the same time, a number of proposals have been made to enhance transparency and accountability in central bank policies; see Balls et al (2016).

Another important issue is the horizon for achieving macroeconomic and financial stability objectives. As noted in Chapter 2, in most IT-MICs, inflation targets are set on an annual or biannual basis. However, financial stability is, in essence, a *continuous* objective; the goal is, at any point in time, to mitigate financial volatility and avoid a risk of financial crises. The issue then is whether this dichotomy between a time-defined objective and a continuous objective should be maintained, or if annual targets for inflation should be abandoned and replaced by a permanent target band, with or without a reference point, as is increasingly done in practice (Hammond (2012)). Moreover, in an IIT regime, credibility cannot be measured in the same way as under IT, for instance by the volatility of deviations of inflation expectations from target (see Chapter 3). Under an IIT policy regime credibility must also account for the public's perception of, or confidence in, the central bank's ability to achieve its financial stability objective. How to define such a composite measure (going possibly beyond deviations in credit growth, as discussed earlier) remains a matter of debate.

6.4.2 Design and transparency of IIT reports

As pointed out earlier, implementing and operating an IIT regime is more demanding in terms of communication and transparency than a standard IT regime. Explaining to the public the nature of the regime and the hierarchy of objectives is an essential step to avoid confusing markets and destabilising expectations. In addition, the fact that policymakers may potentially need to move monetary and macroprudential policies in opposite directions creates significant communication challenges. A possible practical implication of these challenges is that in an IIT regime policymakers, rather than issuing independent reports on inflation and financial stability, as is the case in most countries at the moment, should instead focus on issuing an integrated report. This would help to provide a unified view of the challenges that the central bank faces with respect to its objectives.

6.4.3 Fiscal discipline, fiscal rules, and stabilisation funds

In an IIT regime, just as in a standard IT regime (or any monetary policy regime for that matter), there is also a need to better coordinate with fiscal policy and assess its benefits for price and financial stability. The monetary regime influences the conduct of fiscal policy (as discussed earlier) but in return the framework guiding fiscal choices (including explicit constraints on fiscal discretion) has a bearing on monetary policy. Monetary policy in an IT regime can help to enhance fiscal discipline (see Box 8). Conversely, fiscal policy and fiscal credibility can have a significant impact on the effectiveness of monetary policy – as well as, possibly, macroprudential policy. A tight fiscal policy, for instance, may help restrain the build-up of imbalances during financial booms. As documented by Kohlscheen et al (2018), for instance, increases in sovereign risk premia (as measured by the spreads of the sovereign five-year credit default swaps, a proxy for aggregate risk) reduce bank profits in MICs; to the extent that poor bank profitability is a predictor of financial crises, this result underscores the role of credible fiscal frameworks in supporting overall financial stability. In addition, as documented in Chapter 3, public debt has risen in many IT-MICs and implicit liabilities remain high in many of them. In particular, contingent financial liabilities and the costs of ageing populations pose serious medium- to long-term fiscal risks to many IT-MICs. By implication, fiscal space may be limited in these countries, even though strengthening the financial system, and improved financial stability, may reduce contingent liabilities associated with a potential bailout.

In fact, the evidence suggests that fiscal management has often made the goal of macroeconomic stabilisation in MICs more, rather than less, difficult. Indeed, empirical studies by Adler and Sosa (2011), Calderón and Fuentes (2014), Alberola et al (2016) and Roch (2017) for three commodity exporters have documented that fiscal policy tends to be procyclical in MICs in general, and IT-MICs in particular. Adler and Sosa (2011), for instance, find that loose fiscal policy (combined with limited exchange rate flexibility and a weak external position) tends to amplify the negative effects of commodity price shocks on domestic output. At the same time, there is also evidence showing that the presence of fiscal rules tends to mitigate the degree of procyclicality of fiscal policy in commodity-exporting countries. Céspedes and Velasco (2014), for instance, find that, due to the presence of fiscal rules, fiscal policy tended to be more

countercyclical in the commodity price boom of the late 2000s. In the same vein, Medina (2016) shows that government expenditures in countries with fiscal rules respond less to commodity price shocks; this is notably the case in Chile, where expenditures respond very little to commodity price fluctuations. Roch (2017) also finds that the fiscal rule adopted by Chile has been more effective in terms of allowing for more countercyclical fiscal policy.

Box 8

Monetary policy and fiscal discipline

A large literature has focused on strategic interactions between monetary and fiscal policies, with an emphasis on the importance of coordination between these policies. Using a model where both monetary and fiscal instruments directly affect output and inflation, Dixit and Lambertini (2003), for instance, suggest that the adverse consequences of discrepancies between monetary and fiscal authorities' incentives may be so severe that it could be essential for both to agree on a common set of objectives. In their setup, fiscal discretion completely negates the benefits that could be expected from central bank independence. This points to the need to create a common *culture of stability*, that is, a common goal of economic stability supported by the adoption of IT and fiscal rules. However, this may be insufficient for countries that are highly exposed to fluctuations in world commodity prices, and where the government budget is highly dependent on commodity exports. In such conditions, as discussed in the text, a stabilisation fund may be an essential step.

The optimality of joint reforms of monetary and fiscal institutions is also at the core of the contribution by Castellani and Debrun (2005). In a model where both monetary and fiscal policies influence inflation, they show that establishing IT while preserving full fiscal discretion simply "relocates" the time inconsistency problem, with excessively loose fiscal policy "making up" for the lower inflationary bias. Assuming that fiscal authorities can credibly pre-commit to fiscal discipline (for instance, through a strict fiscal rule) is not sufficient to solve the problem. Indeed, a strict form of IT – where the central bank completely neglects other objectives – is needed in that case. Finally, if fiscal discretion remains, they show that a rules-based fiscal framework constraining discretion is required to allow IT to deliver the socially optimal inflation rate.

Mishkin (2000) was one of the first to argue that an independent central bank under IT could serve as an agency of restraint for fiscal policy because it is credibly insulated from the pressure to monetise the public debt, which hardens the government's budget constraint. As noted in the text, Minea and Tapsoba (2014) find evidence supporting such a discipline-enhancing effect of IT on fiscal policy, notably in developing countries. At the same time, fiscal discipline has been identified as a key requirement for the effectiveness of IT in achieving price stability. To the extent that adopting a fiscal rule coincides with a lasting shift toward greater fiscal discipline, the favourable effects on (lower) inflation attributed to IT in the literature may also be partly related to the presence of fiscal rules. By lowering the likelihood of fiscal dominance, fiscal rules can reinforce the credibility of the IT framework. Combes et al (2014) test this proposition by examining the joint impact of IT and fiscal rules on fiscal behaviour and inflation in a broad panel of advanced and developing economies over the period 1990–2009. They test the propositions that IT and fiscal rules complement each other by comparing their joint effects on inflation and fiscal behaviour to isolate their effects. They find that the combination of IT and fiscal rules does indeed deliver more disciplined macroeconomic policies than each of these institutions in isolation. Following the argument proposed by Leeper (2011), this is possibly because fiscal rules may contribute in important ways to anchoring inflation expectations.

More generally, a key issue facing policymakers in commodity-exporting countries is the fact that resource revenue is often difficult to manage due to highly volatile commodity prices. This volatility leads to high revenue fluctuations and overall macroeconomic instability as it creates boom-bust cycles. At the same time, as noted in previous chapters, a common and difficult problem for monetary policy is to respond to terms-of-trade shocks; it may be argued that the strategy for doing so is to rely more on fiscal policy to smooth fluctuations in activity and the real sector, and thus indirectly affect the behaviour of inflation. The best way to do so is to build buffers, which can be drawn upon to dampen the real and financial effects of external shocks. This is particularly important for IT-MICs which are also commodity

exporters, and thus exposed to large price fluctuations on world markets. In fact, these countries should go one step further and put in place a stabilisation fund. Indeed, as noted earlier, procyclical fiscal policy tends to amplify the adverse effects of commodity price shocks on domestic activity. In the absence of automatic stabilisers, it is thus important to pursue countercyclical policies during the boom phase of commodity price cycles, to prevent or limit the deterioration of the underlying fiscal position during the bust phase. A policy that channels a share of the windfall gains associated with improvements in the terms of trade to a stabilisation fund is useful from the perspective not only of fiscal policy (which can now play a more active role during the bust phase) but also monetary policy, because of its impact on perceptions of the overall consistency of the macroeconomic framework and therefore on inflation expectations. In fact, a stabilisation fund is even more important in a commodity-exporting country where fiscal rules are also in place. As documented in recent research, while fiscal rules are associated with greater fiscal discipline, and less volatility in response to terms-of-trade shocks, they are not sufficient to guarantee the credibility of fiscal policy and anchor medium-term fiscal expectations, because of the trade-off between credibility and flexibility that fiscal policy continues to face (see Agénor (2015)). The ability to access resources in a stabilisation fund may also reduce incentives to rely on sub-optimal policies aimed at stimulating activity in response to a negative shock, such as encouraging state banks to lend (as in Brazil in the aftermath of the GFC, for instance). Such policies are sub-optimal for two reasons – the increase in lending may be inefficiently allocated between borrowers (as a result of an adverse selection problem or privileged access) and it may be accompanied by an across-the-board weakening of lending standards. The consequence may be an increase in vulnerability of the financial system.

Given these potential benefits of a stabilisation fund, a key question is how resource windfalls associated with fluctuations in world commodity prices should be allocated between the government budget and such a fund. Agénor (2016) provides a methodological contribution on this issue, in a framework where the social loss function is defined in terms of consumption volatility (a core measure of welfare) and fiscal or (more generally) macroeconomic stability. The key insight is that the optimal allocation rule of resource windfalls involves internalising a *dynamic volatility trade-off*: spending less today tends to reduce volatility today in the economy, but the greater the proportion of the windfall that is saved, the greater the proceeds from saved assets that governments can use to increase spending later on, and the greater the volatility that is injected back into the economy at that time. The slope of this trade-off depends in general on the structure and parameters that characterise the economy, including the accumulation rule for foreign assets, and the social loss function. Nevertheless, for a given calibration, it is possible to solve for the optimal policy; that is, the optimal share of a resource windfall that must be accumulated today in a stabilisation fund. What is missing from the existing literature, however, is an analysis of the extent to which the optimal allocation policy, in the presence of banks and financial frictions, is a complement or a substitute to monetary and macroprudential policies in response to commodity price shocks.¹²⁰

6.4.4 International policy coordination

Most of the foregoing discussion has focused on decision-making at the individual country level. However, some of the issues that arise in an IIT regime relate to international policy interactions. Indeed, the GFC has also shown that differences in national regulatory regimes can trigger arbitrage-based behaviour across countries. In turn, cross-border regulatory arbitrage may lead to sharp swings in capital flows and magnify the international transmission of real and financial shocks. Such movements may therefore create

¹²⁰ Garcia-Cicco et al (2017) study the impact of monetary and macroprudential policies on financial and real sectors in four Latin American countries: Chile, Colombia, Mexico and Peru. They estimate a New Keynesian small open-economy model with frictions in the domestic financial intermediation sector and a commodity sector for each country. They find that in the case of a negative commodity price shock, macroprudential policies are less effective (in terms of limiting the impact of the shock on credit growth and its effect on real variables) but still useful as a complement for the tightening of monetary policy. However, their model does not account for a stabilisation fund.

challenges to macroprudential policies, with possibly unwelcome spillover effects weakening their domestic policy impact.

To curtail regulatory arbitrage requires some degree of coordination between macroprudential regulators across countries. Basel III's *Principle of reciprocity* with respect to countercyclical capital buffers – a mechanism whereby the home country is required to maintain at least the same countercyclical capital requirement as the host country for lending to the host country from its banks in that jurisdiction – is a step in that direction. However, it is only one instance of coordination of a macroprudential tool across borders.¹²¹ Broader coordination has so far proved elusive.

In general, the requirement to coordinate monetary and macroprudential policies presents a greater challenge at the international level. Monetary policy coordination across borders is more difficult because it is often less rules-based and mechanistic than *structural* macroprudential regulation – except in emergency situations.¹²² At the same time, a policy regime that involves *countercyclical* macroprudential and monetary responses introduces more discretion and judgment to a level above rules-based systems, with a greater demand on international coordination. But although in principle international coordination of countercyclical monetary and macroprudential policies may help, in practice it may compound the difficulties that typically emerge with respect to maintaining cooperative agreements – the incentive to renege, the divergence in views regarding how the world works and how policies affect it, and so on (see Agénor and Pereira da Silva (2018)).

¹²¹ In addition, mandatory reciprocity is only required for jurisdictions that are Basel Committee members and is meant to be applied to internationally active banks.

¹²² The creation of US dollar liquidity swap lines in December 2007, which involved central banks in both AEs and MICs, is a recent example of monetary policy cooperation at a time of crisis. In October 2013 these swap lines were converted to standing arrangements.

Chapter 7. Policy lessons

This book has provided a thorough discussion of the challenges that IT regimes have faced in middle-income countries (MICs), where banks continue to dominate the financial system and bank credit plays a critical role on both the supply and demand sides of the economy. As background for the analysis, a review of financial systems in MICs (with a focus on the role of bank credit), the domestic effects of capital flows, and the link between credit and financial crises was provided. Chapter 2 presented a review of the main characteristics of IT, commonly viewed prerequisites for IT, the inherent credibility problems that IT regimes face, the policy trade-offs that central banks must consider when responding to demand and supply shocks, and how IT differs from price level targeting and nominal income targeting. Chapter 3 provided a thorough review of the performance of IT regimes in MICs, whereas Chapter 4 discussed a number of challenges that IT has faced almost since its inception, and continues to face, especially with respect to fiscal dominance, exchange rate flexibility, and the need (following the broader debate on the role of monetary policy that followed the GFC) to add an explicit financial stability objective to monetary policy. The issue of complementarity between macroprudential regulation and monetary policy, in the context of an integrated IT (or IIT) regime, was taken up in Chapters 5 and 6. The nature of monetary policy rules in an IIT regime – assuming that a more proactive role is desirable – was discussed from an operational standpoint, in the context of renewed effort to understand the monetary transmission mechanism in MICs.

A key lesson of the analysis is that, where the aim is to achieve economic (macroeconomic and financial) stability, monetary and macroprudential policies are largely complementary. However, on balance, there is a good case for monetary policy in MICs to be more proactive and address the time dimension of systemic risk and for it to be combined with countercyclical macroprudential rules, including possibly those that are now part of the Basel III framework (such as countercyclical capital buffers). During episodes of high credit growth, for instance, combining higher capital requirements, loan-to-value ratios, and increases in interest rates may be more effective to mitigate financial risks. Monetary policy should follow a rule based not only on output gaps and inflation, but also on credit gaps in the context of IIT. Specifically, IIT was defined as a flexible IT regime in which (a) the central bank holds an explicit financial stability mandate; (b) the policy interest rate responds directly, but possibly in a state-contingent fashion, to excessively rapid credit growth; and (c) monetary and macroprudential policies are calibrated jointly to achieve macroeconomic and financial stability, to ensure that interactions between these policies are accounted for. At the same time, the implementation of an IIT regime requires careful preparation in terms of modelling tools and communication strategies in order to avoid adverse effects on monetary policy credibility. Table 7.1 summarises the main features of IIT compared to flexible IT. While targeting an inflation rate remains central in both cases, there are five major differences between the two frameworks. Let us elaborate further on these points.

First, the central bank should account, in a state-contingent fashion, for credit developments in setting policy interest rates, and calibrate monetary policy jointly with macroprudential instruments. There are indeed robust arguments in favour of monetary policy in MICs reacting to an adequate measure of the credit growth gap (rather than asset prices) to mitigate systemic risk. The credit growth gap therefore acts as an *intermediate target*, which might require modelling instruments (to determine an “equilibrium” or reference growth rate and not just a “trend” obtained by statistical filters), but is easier to explain to the public than the more elusive final target of financial stability. By making the policy response contingent on the magnitude of the credit growth gap itself, the primacy of the macroeconomic stability target in “normal” times would be maintained and credibility problems mitigated. Another important argument for responding to the credit growth gap is the high degree of uncertainty in these countries about real-time estimates of the output gap. In that sense, the credit growth gap may act also as a more reliable proxy for excess aggregate demand. In fact, there is evidence that central banks in MICs have long paid attention to credit growth indicators for that reason. Nevertheless, as stated earlier, it is important to find the right “gap” vis-à-vis the right equilibrium rate, which could itself

evolve. In many MICs rapid credit growth has been the result of a combination of financial deepening (which reflects greater demand for financial services as living standards increase), with quasi-fiscal policies taking the form of using public sector banks to inject credit into the whole economy or into specific targeted sectors or even firms. Disentangling structural growth (which may actually help to promote financial stability) from political economy effects is therefore important to properly calibrate the policymaker's reaction function. At the same time, the joint calibration of monetary and macroprudential policies is a key aspect of an IIT regime. The magnitude of the coefficient attached to the credit growth gap in the reaction function of the central bank needs to be calibrated jointly and carefully, in the context of models that account for financial market imperfections, and for the fact that macroprudential policy regimes may alter the way the monetary transmission mechanism operates.

Second, the central bank should have an explicit financial stability mandate. In countries considering an extension of the mandate of the central bank to officially reflect a financial stability objective, whether hierarchical or concurrent with price and output stability, there is a risk of confusing markets and weakening credibility at first, given the lack of a reasonable consensus around the definition of "financial stability". This cost could be large in MICs where the central bank's perceived commitment to low inflation is not firmly established. However, the cost does not need to be permanent if sufficient effort is made to explain: (a) the reason(s) for the change in mandate to the public and the reasons why there should be a more prominent focus on credit growth developments; and (b) the contingent nature of the monetary policy response. Improving transparency and communication is thus essential for the performance of an IIT regime. Naturally enough, the change in the official mandate of the central bank, should it be made, should occur in a stable economic and financial environment.

Third, the central bank should use countercyclical macroprudential tools as complements to monetary policy, depending on the nature of economic shocks. This complementarity is particularly important during episodes of sudden floods (large inflows of capital) induced by external shocks, in which case the scope for raising policy interest rates to maintain macroeconomic stability may be limited. In such conditions, countercyclical macroprudential tools (including countercyclical capital buffers and reserve requirements), as well as possibly temporary capital controls or CFMs, may be essential to skew the composition of capital inflows away from volatile short-term flows and prevent the build-up of financial vulnerabilities. However, there is a different credibility cost when CFMs are used to reduce either inflows or outflows. In particular, past experience has shown that their usage is ineffective during episodes of large outflows triggered by a loss of credibility, caused by the accumulation of large imbalances that markets perceive as unsustainable. More generally, because monetary policy cannot address the cross section dimension of systemic risk (that is, how risk is distributed within the financial system at a point in time), a combination of these two policies is inescapable. At the same time, experience with some of the new macroprudential tools that are currently being contemplated (including countercyclical capital buffers, dynamic loan loss provisions, minimum liquidity coverage ratios, and so on), and *interactions* between these tools, is growing but remains limited and will require careful evaluation before they are deployed – especially in those MICs where regulatory and supervisory capacity may be limited.

		Flexible IT	Integrated IT
Objectives: macroeconomic stability	<i>Price stability</i>	Inflation target (point/centre of band) using Taylor rule for short-term interest rate	Inflation target (point/centre of band) using state-contingent, augmented Taylor rule for jointly calibrated short-term rate with macroprudential and with financial/credit argument
	<i>Output stability</i>		
	<i>Financial stability</i>	Microprudential	Macroprudential instruments + floating exchange rate with FX interventions, not peg/fix, but smooth volatility and impact on balance sheets
		Floating exchange rate	
Institutional arrangement	<i>Price stability</i>	Monetary Policy Committee	Monetary Policy Committee
	<i>Financial stability</i>	Prudential Authority	Financial Stability Committee
	<i>Location</i>	Two independent agencies	Mostly within same agency (central bank)
	<i>Operational modus</i>	Separation	Coordination
Supportive policies	<i>Fiscal, debt sustainability</i>	Fiscal rule on consolidated public sector deficit	Fiscal rule on consolidated public sector deficit + stabilisation fund (commodity exporters) + prudential rules on private sector debt, especially FX-denominated
	<i>Capital flows</i>	Open capital account, floating exchange rate	Open capital account, floating exchange rate with: (upswing) ER appreciation, macroprudential instruments up to CFM; (downturn) ER depreciation, FX intervention for smoothing, not to set level
			Spillovers and spillbacks of policies including macroprudential instruments call for some international coordination
		Reserve accumulation and (IFIs) external credit lines	Reserve accumulation and (IFIs) external credit lines and bilateral/regional swap lines

Source: Authors.

Fourth, the central bank should maintain a flexible exchange rate regime but be ready to combine macroprudential instruments with foreign exchange market interventions. Macroprudential instruments should avoid excessive borrowing in foreign currency especially during periods of appreciation that could lead to unhedged exposures and currency mismatches. In addition, foreign exchange interventions should not aim at pegging or fixing the exchange rate at any particular level, but to smooth volatility and mitigate the destabilising impact of abrupt swings on the balance sheets of highly indebted domestic borrowers. Indeed, mitigating exchange rate variability has remained a major concern for MICs – in most cases since the very moment they implemented an IT regime. This has been exacerbated by the effects of unconventional monetary policies in the immediate aftermath of the GFC. MICs have now accumulated significant experience through a combination of direct interventions in spot and futures markets for foreign exchange, usage of macroprudential measures, and communication and

moral suasion. It is essential not to forget that the flexible exchange rate regime is the first line of defence against abrupt currency movements and that foreign exchange market interventions that try to signal a preference for a specific value of the currency are unlikely to be able to overcome market forces. However, because the effectiveness of foreign exchange intervention has proved insufficient at times, there may be a need for the monetary authority to react to real exchange rate changes as well, although perhaps in a more symmetric way. In fact, experience shows clearly that for the past few years this is precisely what central banks have been doing in MICs, for a variety of reasons – which include concerns about competitiveness and financial stability considerations.

Fifth, to achieve and maintain macroeconomic and financial stability, monetary policy should be supported by fiscal discipline; for commodity exporters, the scope for countercyclical policy could be enhanced by the adoption of a stabilisation fund. A strong fiscal position is also important for the performance of an IIT regime, for two main reasons. First, as discussed earlier, population ageing and pension needs may put considerable pressure on fiscal accounts in many MICs in the coming years. If adequate reforms are not implemented to mitigate the fiscal burden associated with these liabilities, concerns about public debt sustainability and the extent to which deficits tomorrow may be monetised could – through higher risk premia, as discussed in Chapter 3 – affect inflation expectations today, thereby weakening the signalling effect of inflation targets and hampering the ability of monetary policy to anchor inflation expectations. In turn, if higher inflation expectations push market interest rates higher today, this could worsen fiscal imbalances and limit the ability of monetary policy to manipulate policy interest rates, especially in downturns. Anchoring beliefs about medium-term fiscal positions (through formal fiscal rules, pension reform, independent fiscal councils, and so on) may therefore be an important step for the conduct and performance of monetary policy today. Second, healthy public sector accounts may provide some fiscal space for policymakers to step up and mitigate the risks associated with large and volatile capital flows when needed. In some MICs, the degree of flexibility in budget outlays may be limited (given the high share of wages and other non-discretionary spending), and delays in approving and implementing fiscal policy changes may be unduly long, given their often politically contentious nature. In others, however, there may be significant scope for a timely, countercyclical response. By helping to stabilise aggregate demand and real exchange rate pressures during episodes of booms and downswings, fiscal policy may serve as an important complement to monetary policy.¹²³ For commodity exporters, fiscal buffers should be put in place in the form of a stabilisation fund. A comprehensive framework that comprises both monetary and fiscal and macroprudential policies might therefore be the best way to secure both price and financial stability in MICs.

Finally, there are several practical operational issues – in addition to those already mentioned, such as communication and transparency requirements, and the need to develop a proper methodology for estimating credit gaps – which need to be addressed to make an IIT regime operational. The first is at the level of the instruments themselves: with what macroprudential tools, specifically, should monetary policy be coordinated? This is a difficult question to answer at this stage because these tools cover a relatively wide range and because some of them (as noted earlier) have not yet proved their effectiveness in terms of mitigating procyclicality of the financial system. In addition, the effectiveness of some of these tools may depend on the state of the economy, the source of instability, or the institutional environment. The best practical combination of tools may thus vary over time and across countries.

The second issue is the institutional setup that would best promote the coordination between monetary and macroprudential policies. Various institutional arrangements are being put in place at the moment, in both AEs and MICs, and broad lessons are not yet available. Nevertheless, what is clear is that if monetary and macroprudential policies must indeed be determined jointly, as should be the case under

¹²³ Indeed, in the immediate aftermath of the GFC a number of MICs (especially in Latin America) implemented an aggressive countercyclical fiscal policy, just as in AEs. Estimates suggest for instance that the fiscal impulse, measured by the change in the cyclically- and commodity-adjusted primary budget balance, amounted to 0.7% of GDP in Brazil and reached more than 5 percentage points of GDP in Chile in 2009. See Daude and Melguizo (2012).

the IIT regime defined earlier, coordination between the central bank (or its Monetary Policy Committee, MPC) and the macroprudential authority (or its Financial Stability Committee, FSC) must be close and the ritual of their communication to markets carefully thought through (notably by issuing a single economic stability report, as opposed to a separate inflation report and financial stability report). In particular, a ritual similar to that of the MPC for the FSC would help to signal to markets the current stance of policymakers vis-à-vis the objective of financial stability and improve the predictability of the macroprudential regulation regime. The regularity of these meetings, and transparency in their outcomes, would be important for markets to understand and foresee changes in the regulatory stance, as well as their implications for inflation and economic activity.

The third issue is related to the target horizon for price or macroeconomic stability, on the one hand, and financial stability, on the other. In several IT-MICs (such as Brazil, Ghana and Turkey), inflation targets are set on an annual basis, as a point value plus a tolerance band (see Hammond (2012)). They therefore carry a *temporal dimension*, which provides some flexibility to the central bank to react to anticipated changes in the process driving inflation or the nature of shocks that may affect it. By contrast, financial stability is a *continuous* target. A question that arises then is whether such a dichotomy should be maintained in an IIT regime and, if not, how costly would be the loss of flexibility that countries would face by moving to two continuous targets.

The fourth issue is how credibility should be measured in an IIT framework. As discussed earlier, common measures of credibility in a standard IT regime are based on the volatility of inflation expectations and the degree of persistence in (actual and expected) inflation over time. However, if financial stability also becomes an objective of the central bank, an adequate measure of credibility should also involve a measure of progress (or lack thereof) with respect to financial stability, not only price stability. In addition, if the financial stability objective is hierarchical as opposed to concurrent with the objective of macroeconomic stability, a proper set of weights – which should presumably reflect social welfare considerations – must be developed to measure overall credibility. These are difficult questions but ones that the profession must tackle head-on in the coming years to be able to eventually evaluate the performance of IIT regimes.

The IIT framework that was described earlier is meant to address the challenges that IT has faced since its inception as well as some of the shortcomings that have emerged since the GFC. If we observe the current trends and try to look into the future, 10 years now from the start of the GFC, what are the challenges that monetary policy is likely to confront? We see three important ones: the role that new technologies in the financial sector (fintech) will have in providing more instantaneous information about the state of macroeconomic and financial stability in a country; the need to overcome slow productivity growth to escape from the accumulation of too much debt that remains a threat to financial stability; and the need to place the new IIT framework in the context of more international cooperation.

With regard to the first challenge, it is likely that the way monetary policy reacts to its objectives (including a measure of financial stability) will evolve with the new technologies and availability of enormous amounts of information (big data) about the business and financial cycles. It is already possible to access almost instant information about significant segments of the evolution of prices and production in an economy, meaning that inflation and output gaps can be determined, in principle, without lags. It is quite possible that similar progress will be available for the financial cycle in the future. In that context, central banks will benefit from more timely information to inform their policy decisions and act more pre-emptively, before excessive vulnerabilities accumulate in the financial sector.

Second, part of the task of maintaining financial stability implies growing at a faster pace to reduce the ratio of financial liabilities to output. Thus, the other nostrum for financial stability is to strengthen growth potential by enacting structural reforms, improving the overall institutional framework, making the public sector balance sheet more sustainable in the medium to long run, and increasing the flexibility of factor markets. This goes well beyond monetary policy. At the same time, implementing these reforms might require a degree of socio-political consensus that may be hard to achieve.

Finally, the advance in global financial integration over the last three decades has turned cross-border financial spillovers into a two-way street – from high-income economies to the rest of the world, but also and increasingly from a group of large MICs to the rest of the world, including major AEs. These increased spillbacks have strengthened incentives for advanced economies to internalise the impact of their policies on these countries, and the rest of the world in general. Although stronger spillovers and spillbacks are not in and of themselves an argument for greater policy coordination between these economies, the fact that they may exacerbate financial risks – especially when countries are in different phases of their economic and financial cycles – and threaten global financial stability is. The disconnect between the global scope of financial markets and the national scope of financial regulation has become increasingly apparent, through leakages and cross-border arbitrage through global banks. In fact, the financial trilemma implies that it has become increasingly difficult to maintain domestic financial stability without enhancing cross-border macroprudential policy coordination, at least in its structural dimension. Avoiding the leakages stemming from international regulatory arbitrage and open capital markets requires cooperation, but addressing cyclical risks requires coordination. Therefore, divergent policies and policy preferences contribute to global financial risks. In the absence of a centralised macroprudential authority, coordination needs to rely on an international macroprudential regime that promotes global welfare. Yet, divergence in national interests can make coordination unfeasible. This suggests that, in a financially integrated world, a reflection about international coordination of monetary and macroprudential policies may not only be valuable, but also essential, for macroprudential instruments to be effective at the national level. Further empirical and analytical work on the benefits of international macroprudential policy coordination could play a significant role in promoting more awareness of the potential gains associated with global financial stability, and how such gains may affect the design of IIT regimes.

References

- Abhakorn, P and N Tantisantiwong (2012): "A reexamination of capital controls' effectiveness: recent experience of Thailand", *Journal of Asian Economics*, vol 23, no 1, February, pp 26–38.
- Abo-Zaid, S and D Tuzemen (2012): "Inflation targeting: a three-decade perspective", *Journal of Policy Modeling*, vol 34, no 5, September, pp 621–45.
- Acuña-Roa, L and J Parra-Polania (2016): "Price-level targeting versus inflation targeting in a new Keynesian model with inflation persistence", *Journal of Applied Economics*, vol 19, no 2, November, pp 249–69.
- Adler, G, R Lama and J Medina (2016): "Foreign exchange intervention under policy uncertainty", *IMF Working Papers*, no 16/67, March.
- Adler, G and R Mano (2016): "The cost of foreign exchange intervention: concepts and measurement", *IMF Working Papers*, no 16/89, April.
- Adler, G and S Sosa (2011): "Commodity price cycles: the perils of mismanaging the boom", *IMF Working Papers*, no 11/283, December.
- Adler, G and C Tovar (2014): "Foreign exchange interventions and their impact on exchange rate levels", CEMLA, mimeo.
- Admati, A, P DeMarzo, M Hellwig and P Pfleiderer (2011): "Fallacies, irrelevant facts, and myths in the discussion of capital regulation: why bank equity is not expensive", Stanford University, mimeo.
- Adrian, T and N Liang (2018): "Monetary policy, financial conditions, and financial stability", *International Journal of Central Banking*, vol 14, no 1, January, pp 73–131.
- Adrian, T and H S Shin (2010): "Financial intermediaries and monetary economics", in B Friedman and M Woodford (eds), *Handbook of Monetary Economics*, vol 3, North Holland.
- Agénor, P-R (1997): "Capital-market imperfections and the macroeconomic dynamics of small indebted economies", *Princeton Studies in International Finance*, no 82, June.
- (1998): "Capital inflows, external shocks, and the real exchange rate", *Journal of International Money and Finance*, vol 17, no 5, October, pp 713–40.
- (2002): "Monetary policy under flexible exchange rates: an introduction to inflation targeting", in N Loayza and R Soto (eds), *Inflation targeting: design, performance, challenges*, Central Bank of Chile.
- (2006): "Market sentiment and macroeconomic fluctuations under pegged exchange rates", *Economía*, vol 73, no 292, November, pp 579–604.
- (2012): "International financial integration: benefits, costs, and policy challenges", in H Baker and L Riddick (eds), *International finance: a survey*, Oxford University Press.
- (2015): "Règles budgétaires et soutenabilité des finances publiques", *OCP Policy Papers*, no PP-15/17, May.
- (2016): "Optimal fiscal management of commodity price shocks", *Journal of Development Economics*, vol 122, September, pp 183–96.
- (2019): *Monetary policy and macroprudential regulation with financial frictions*, MIT Press, forthcoming.
- Agénor, P-R and J Aizenman (1999): "Volatility and the welfare costs of financial market integration", in P-R Agénor, M Miller, D Vines and A Weber (eds), *The Asian financial crisis: causes, contagion and consequences*, Cambridge University Press.

Agénor, P-R and K Alper (2012): "Monetary shocks and central bank liquidity with credit market imperfections", *Oxford Economic Papers*, vol 64, no 3, July, pp 563–91.

Agénor, P-R, K Alper and L Pereira da Silva (2012): "Capital requirements and business cycles with credit market imperfections", *Journal of Macroeconomics*, vol 34, no 3, September, pp 687–705.

——— (2013): "Capital regulation, monetary policy and financial stability", *International Journal of Central Banking*, vol 9, no 3, September, pp 198–243.

——— (2014): "Sudden floods, macroprudential regulation and stability in an open economy", *Journal of International Money and Finance*, vol 48, part A, November, pp 68–100.

——— (2018): "External shocks, financial volatility and reserve requirements in an open economy", *Journal of International Money and Finance*, vol 83, May, pp 23–43.

Agénor, P-R and N Bayraktar (2010): "Contracting models of the Phillips curve: empirical estimates for middle-income countries", *Journal of Macroeconomics*, vol 32, no 2, June, pp 555–70.

Agénor, P-R and K El Aynaoui (2010): "Excess liquidity, bank pricing rules and monetary policy", *Journal of Banking and Finance*, vol 34, no 5, May, pp 923–33.

Agénor, P-R and A Flamini (2016): "Institutional mandates for macroeconomic and financial stability", *Centre for Growth and Business Cycle Research Discussion Paper Series*, no 231, December.

Agénor, P-R and P Jia (2015): "Capital controls and welfare with cross-border bank capital flows", *Centre for Growth and Business Cycle Research Discussion Papers*, no 212, September.

Agénor, P-R and P Montiel (2008): "Monetary policy analysis in a small open credit-based economy", *Open Economies Review*, vol 19, no 4, September, pp 423–55.

——— (2015): *Development Macroeconomics*, 4th ed, Princeton University Press.

Agénor, P-R and L Pereira da Silva (2010): "Reforming international standards for bank capital requirements: a perspective from the developing world", in S Kim and M McKenzie (eds), *International banking in the new era: post-crisis challenges and opportunities*, Emerald Group Publishing Limited.

——— (2011): "Monetary policy and credit growth gaps", University of Manchester, mimeo.

——— (2012a): "Cyclical effects of bank capital requirements with imperfect credit markets", *Journal of Financial Stability*, vol 8, no 1, January, pp 43–56.

——— (2012b): "Macroeconomic stability, financial stability, and monetary policy rules", *International Finance*, vol 15, no 2, September, pp 205–24.

——— (2014): "Macroprudential regulation and the monetary transmission mechanism", *Journal of Financial Stability*, vol 13, August, pp 44–63.

——— (2016): "Reserve requirements and loan loss provisions as countercyclical macroprudential instruments: a perspective from Latin America", *Inter-American Development Bank Policy Brief*, no IDB-PB-250, February.

——— (2017): "Cyclically adjusted provisions and financial stability", *Journal of Financial Stability*, vol 28, February, pp 143–62.

——— (2018): "Financial spillovers, spillbacks, and the scope for international macroprudential policy coordination", *BIS Papers*, no 97, April.

Aghion, P, P Bacchetta, R Rancière and K Rogoff (2009): "Exchange rate volatility and productivity growth: the role of financial development", *Journal of Monetary Economics*, vol 56, no 4, May, pp 494–513.

Agosin, M and F Huaita (2012): "Overreaction in capital flows to emerging markets: booms and sudden stops", *Journal of International Money and Finance*, vol 31, no 5, September, pp 1140–55.

- Ahamed, M and S Mallick (2017): "Is financial inclusion good for bank stability? International evidence", University of Sussex, mimeo. Forthcoming, *Journal of Economic Behavior and Organization*.
- Ahmed, S, B Coulibaly and A Zlate (2017): "International financial spillovers to emerging market economies: how important are economic fundamentals?", *Journal of International Money and Finance*, vol 76, September, pp 133–52.
- Ahmed, S and A Zlate (2014): "Capital flows to emerging market economies: a brave new world?", *Journal of International Money and Finance*, vol 48, part B, November, pp 221–48.
- Ahrend, R (2010): "Monetary ease: a factor behind financial crises? Some evidence from OECD countries", *Economics*, vol 4, no 2010-12, April, pp 1–30.
- Ahrend, R, A Goujard and C Schwellnus (2012): "International capital mobility: which structural policies reduce financial fragility?", *OECD Economic Policy Papers*, no 2, June.
- Aikman, D, A Haldane and B Nelson (2015): "Curbing the credit cycle", *Economic Journal*, vol 125, no 585, June, pp 1072–109.
- Aizenman, J (2008): "Large hoarding of international reserves and the emerging global economic architecture", *Manchester School*, vol 76, no 5, September, pp 487–503.
- (2009): "On the paradox of prudential regulations in the globalized economy: international reserves and the crisis: a reassessment", *NBER Working Papers*, no 14779, March.
- Aizenman, J, M Binici and M Hutchison (2016): "The transmission of Federal Reserve tapering news to emerging financial markets", *International Journal of Central Banking*, vol 12, no 2, June, pp 317–56.
- Aizenman, J and R Glick (2009): "Sterilization, monetary policy, and global financial integration", *Review of International Economics*, vol 17, no 4, September, pp 777–801.
- Aizenman, J, M Hutchison and I Noy (2011): "Inflation targeting and real exchange rates in emerging markets", *World Development*, vol 39, no 5, May, pp 712–24.
- Aizenman, J and D Riera-Crichton (2006): "Real exchange rate and international reserves in the era of growing financial and trade integration", *NBER Working Papers*, no 12363, July.
- Ajello, A, T Laubach, D Lopez-Salido and T Nakata (2016): "Financial stability and optimal interest-rate policy", *FEDS Paper 2016-067*, Board of Governors of the Federal Reserve System.
- Akinci, O (2013): "Global financial conditions, country spreads and macroeconomic fluctuations in emerging countries", *Journal of International Economics*, vol 91, no 2, November, pp 358–71.
- Akinci, O and J Olmstead-Rumsey (2018): "How effective are macroprudential policies? An empirical investigation", *Journal of Financial Intermediation*, vol 33, January, pp 33–57.
- Aktas, Z, N Kaya and Ü Özlale (2010): "Coordination between monetary policy and fiscal policy for an inflation targeting emerging market", *Journal of International Money and Finance*, vol 29, no 1, February, pp 123–38.
- Akyurek, C, A Kutan and H Yilmazkuday (2011): "Can inflation targeting regimes be effective in developing countries? The Turkish experience", *Journal of Asian Economics*, vol 22, no 5, October, pp 343–55.
- Alberola, E, I Kataryniuk, A Melguizo and R Orozco (2016): "Fiscal policy and the cycle in Latin America: the role of financing conditions and fiscal rules", *BIS Working Papers*, no 543, January.
- Aldasoro, I, C Borio and M Drehmann (2018): "Early warning indicators of banking crises: expanding the family", *BIS Quarterly Review*, March, pp 29–45.
- Aleem, A and A Lahiani (2010): "Monetary policy credibility and exchange rate pass-through: some evidence from emerging countries", University of Orléans, mimeo.

- Alpanda, S and A Honig (2014): "The impact of central bank independence on the performance of inflation targeting regimes", *Journal of International Money and Finance*, vol 44, June, pp 118–35.
- Amador, J, C Gaitán-Maldonado, J Gómez-González, M Villamizar-Villegas, H Zárate (2014): "Credit and business cycles: an empirical analysis in the frequency domain", Bank of the Republic, Colombia, *Borradores de Economía*, no 843, June.
- Ambler, S (2009): "Price-level targeting and stabilisation policy: a survey", *Journal of Economic Surveys*, vol 23, no 5, December, pp 974–97.
- Amri, P, G Richey and T Willett (2016): "Capital surges and credit booms: how tight is the relationship?", *Open Economies Review*, vol 27, no 4, September, pp 637–70.
- Anand, R, E Prasad and B Zhang (2015): "What measure of inflation should a developing country central bank target?", *Journal of Monetary Economics*, vol 74, September, pp 102–16.
- Angelini, P, S Neri and F Panetta (2014): "The interaction between capital requirements and monetary policy", *Journal of Money, Credit and Banking*, vol 46, no 6, September, pp 1073–112.
- Anundsen, A, F Hansen, K Gerdrup and K Kragh-Sørensen (2014): "Bubbles and crises: the role of house prices and credit", *Norges Bank Working Papers*, no 14/2014, November.
- Apergis, N (2017): "Monetary policy and macroprudential policy: new evidence from a world panel of countries", *Oxford Bulletin of Economics and Statistics*, vol 79, no 3, June, pp 395–410.
- Araujo, A and B Funchal (2005): "Bankruptcy law in Latin America: past and future", *Economía*, vol 6, no 1, September, pp 149–216.
- Araújo, C, C Azevedo and S Costa (2012): "Fiscal consolidation and macroeconomic challenges in Brazil", in "Fiscal policy, public debt and monetary policy in emerging market economies", *BIS Papers*, no 67, October, pp 91–102.
- Ardakani, O, N Kishor and S Song (2018): "Re-evaluating the effectiveness of inflation targeting", *Journal of Economic Dynamics and Control*, vol 90, May, pp 76–97.
- Ariss, R (2010): "On the implications of market power in banking: evidence from developing countries", *Journal of Banking and Finance*, vol 34, no 4, April, pp 765–75.
- Ariyoshi, A, K Habermeier, B Laurens, I Otker-Robe, J Canales-Kriljenko and A Kirilenko (2000): "Capital controls: country experiences with their use and liberalization", *IMF Occasional Papers*, no 190, May.
- Armas, A, P Castillo and M Vega (2014): "Inflation targeting and quantitative tightening: effects of reserve requirements in Peru", *IDB Working Papers*, no 499, April.
- Arregui, N, S Elekdag, G Gelos, R Lafarguette and D Seneviratne (2018): "Can countries manage their financial conditions amid globalization?", *IMF Working Papers*, no 18/15, January.
- Ascari, G, A Florio and A Gobbi (2017): "Transparency, expectations anchoring and inflation target", *European Economic Review*, vol 91, January, pp 261–73.
- Assenmacher-Wesche, K and S Gerlach (2010): "Monetary policy and financial imbalances: facts and fiction", *Economic Policy*, vol 25, no 63, July, pp 437–82.
- Avdjiev, S, L Gambacorta, L Goldberg and S Schiaffi (2017): "The shifting drivers of global liquidity", *BIS Working Papers*, no 644, June.
- Baak, S, A Al-Mahmood and S Vixathep (2007): "Exchange rate volatility and exports from East Asian countries to Japan and the USA", *Applied Economics*, vol 39, no 8, pp 947–59.
- Balakrishnan, R, S Nowak, S Panth and Y Wu (2012): "Surging capital flows to emerging Asia: facts, impacts, and responses", *IMF Working Papers*, no 12/130, May.

- Balima, H, E Kilama and R Tapsoba (2017): "Settling the inflation targeting debate: lights from a meta-regression analysis", *IMF Working Papers*, no 17/213, September.
- Ball, C and J Reyes (2004): "Inflation targeting or fear of floating in disguise: the case of Mexico", *International Journal of Finance and Economics*, vol 9, no 1, January, pp 49–69.
- (2008): "Inflation targeting or fear of floating in disguise? A broader perspective", *Journal of Macroeconomics*, vol 30, no 1, March, pp 308–26.
- Balls, E, J Howat and A Stansbury (2016): "Central bank independence revisited: after the financial crisis, what should a model central bank look like?", *M-RCBG Associate Working Paper Series*, no 67, November.
- Bank for International Settlements (2018): *Annual Economic Report 2018*, June.
- Bank of England (2011): "Instruments of macroprudential policy", discussion paper, December.
- (2014): "How might macroprudential capital policy affect credit conditions?", mimeo.
- (2015): "The framework of capital requirements for UK banks", supplement to the December 2015 *Financial Stability Report*.
- Bank of England and the Procyclicality Working Group (2014): "Procyclicality and structural trends in investment allocation by insurance companies and pension funds", discussion paper.
- Barajas, A, R Steiner, L Villar and C Pabón (2014): "Inflation targeting in Latin America", *IDB Working Papers*, no 473, January.
- Barro, R and D Gordon (1983): "A positive theory of monetary policy in a natural rate model", *Journal of Political Economy*, vol 91, August, pp 589–610.
- Barroso, J (2014): "Realized volatility as an instrument to official intervention", *Central Bank of Brazil Working Papers*, no 363, September.
- Barroso, J, L Pereira da Silva and A Soares (2016): "Quantitative easing and related capital flows into Brazil: Measuring its effects and transmission channels through a rigorous counterfactual evaluation", *Journal of International Money and Finance*, vol 67, October, pp 102–22.
- Barth, J, G Caprio and R Levine (2004): "Bank regulation and supervision: what works best", *Journal of Financial Intermediation*, vol 13, no 2, April, pp 205–48.
- (2008): "Bank regulations are changing: for better or worse?", *World Bank Policy Research Working Papers*, no 4646, June.
- Basel Committee on Banking Supervision (2004): *Basel II: International convergence of capital measurement and capital standards: a revised framework*, Bank for International Settlements, June.
- (2011): *Basel III: A global regulatory framework for more resilient banks and banking systems*, revised version, June.
- (2012a): "The policy implications of transmission channels between the financial system and the real economy", *BCBS Working Papers*, no 20, May.
- (2012b): "Models and tools for macroprudential analysis", *BCBS Working Papers*, no 21, May.
- (2013): *Basel III: The Liquidity Coverage Ratio and liquidity risk monitoring tools*, January.
- (2017): *Basel III: Finalising post-crisis reforms*, December.
- Bean, C, M Paustian, A Penalver and T Taylor (2010): "Monetary policy after the fall", Bank of England, mimeo.
- Behn, M, C Detken, T Peltonen and W Schudel (2013): "Setting countercyclical capital buffers based on early warning models: would it work?", *ECB Working Papers*, no 1604, November.

- Beirne, J and C Friedrich (2017): "Macroprudential policies, capital flows, and the structure of the banking sector", *Journal of International Money and Finance*, vol 75, July, pp 47–68.
- Bengui, J and J Bianchi (2014): "Capital flow management when capital controls leak", University of Wisconsin, mimeo.
- Benigno, G, H Chen, C Otrok, A Rebucci and E Young (2011): "Monetary and macro-prudential policies: an integrated analysis", London School of Economics, mimeo.
- (2016): "Optimal capital controls and real exchange rate policies: a pecuniary externality perspective", *Journal of Monetary Economics*, vol 84, December, pp 147–65.
- Benigno, G, N Converse and L Fornaro (2015): "Large capital inflows, sectoral allocation, and economic performance", *Journal of International Money and Finance*, vol 55, July, pp 60–87.
- Ben Naceur, S, D Bakardzhieva and B Kamar (2012): "Disaggregated capital flows and developing countries' competitiveness", *World Development*, vol 40, no 2, February, pp 223–37.
- Berganza, J and C Broto (2012): "Flexible inflation targets, forex interventions and exchange rate volatility in emerging countries", *Journal of International Money and Finance*, vol 31, no 2, March, pp 428–44.
- Bernanke, B (2010): "Monetary policy and the housing bubble", speech to the American Economic Association, Atlanta, Georgia, January.
- Bernanke, B and M Gertler (2001): "Should central banks respond to movements in asset prices?", *American Economic Review*, vol 91, no 2, May, pp 253–57.
- Bernanke, B, M Gertler and S Gilchrist (1999): "The financial accelerator in a quantitative business cycle framework", in J Taylor and M Woodford (eds), *Handbook of Macroeconomics*, vol 1, North Holland, Amsterdam.
- Best, G (2013): "Fear of floating or monetary policy as usual? A structural analysis of Mexico's monetary policy", *North American Journal of Economics and Finance*, vol 24, January, pp 45–62.
- Bhandari, P and J Frankel (2017): "Nominal GDP targeting for developing countries", *Research in Economics*, vol 71, no 3, September, pp 491–506.
- Bianchi, J (2011): "Overborrowing and systemic externalities in the business cycle", *American Economic Review*, vol 101, no 7, December, pp 3400–26.
- Bianchi, J and E Mendoza (2011): "Overborrowing, financial crises and 'macroprudential' policy", *IMF Working Papers*, no 11/24, February.
- Binici, M, M Hutchison and M Schindler (2010): "Controlling capital? Legal restrictions and the asset composition of international financial flows", *Journal of International Money and Finance*, vol 29, no 4, June, pp 666–84.
- Black, B, A de Carvalho and É Gorga (2010): "Corporate governance in Brazil", *Emerging Markets Review*, vol 11, no 2, March, pp 21–38.
- Blanchard, O (2005): "Fiscal dominance and inflation targeting: lessons from Brazil", in F Giavazzi, I Goldfajn and S Herrera (eds), *Inflation targeting, debt, and the Brazilian experience*, MIT Press.
- Blanchard, O, G Adler and I de Carvalho Filho (2015): "Can foreign exchange intervention stem exchange rate pressures from global capital flow shocks?", *Peterson Institute for International Economics Working Papers*, no 15-18, November.
- Bleaney, M, H-A Lee and T Lloyd (2013): "Testing the trilemma: exchange rate regimes, capital mobility, and monetary independence", *Oxford Economic Papers*, vol 65, no 4, October, pp 876–97.
- Bleich, D, R Fendel and J-C Rülke (2012): "Inflation targeting makes the difference: novel evidence on inflation stabilization", *Journal of International Money and Finance*, vol 31, no 5, September, pp 1092–105.

- Blinder, A (2010): "How central should the central bank be?", *Journal of Economic Literature*, vol 48, no 1, March, pp 123–33.
- Bloom, N, M Floetotto, N Jaimovich, I Saporta-Eksten and S Terry (2012): "Really uncertain business cycles", *NBER Working Papers*, no 18245, July.
- Bolaños, A and S Cadavid-Sánchez (2018): "Did the introduction of inflation targeting represent a regime switch of monetary policy in Latin America?", CEMLA, mimeo.
- Bordo, M and P Siklos (2014): "Central bank credibility, reputation and inflation targeting in historical perspective", *NBER Working Papers*, no 20693, November.
- Borio, C and H Zhu (2012): "Capital regulation, risk-taking and monetary policy: a missing link in the transmission mechanism?", *Journal of Financial Stability*, vol 8, no 4, December, pp 236–51.
- Branch, W and G Evans (2017): "Unstable inflation targets", *Journal of Money, Credit and Banking*, vol 49, no 4, June, pp 767–806.
- Brito, R and B Bystedt (2010): "Inflation targeting in emerging economies: panel evidence", *Journal of Development Economics*, vol 91, no 2, March, pp 198–210.
- Brito, S, Y Carriere-Swallow and B Gruss (2018): "Disagreement about future inflation: understanding the benefits of inflation targeting and transparency", *IMF Working Papers*, no 18/24, January.
- Broner, F, T Didier, A Erce and S Schmukler (2013): "Gross capital flows: dynamics and crises", *Journal of Monetary Economics*, vol 60, no 1, January, pp 113–33.
- Broto, C (2011): "Inflation targeting in Latin America: empirical analysis using GARCH models", *Economic Modelling*, vol 28, no 3, May, pp 1424–34.
- Broto, C, J Díaz-Cassou and A Erce (2011): "Measuring and explaining the volatility of capital flows to emerging countries", *Journal of Banking and Finance*, vol 35, no 8, August, pp 1941–53.
- Brunnermeier, M and Y Sannikov (2015): "International credit flows and pecuniary externalities", *American Economic Journal: Macroeconomics*, vol 7, no 1, January, pp 297–338.
- Bruno, V, I Shim and H S Shin (2017): "Comparative assessment of macroprudential policies", *Journal of Financial Stability*, vol 28, February, pp 183–202.
- Bruno, V and H Shin (2014): "Assessing macroprudential policies: case of South Korea", *Scandinavian Journal of Economics*, vol 116, no 1, January, pp 128–57.
- (2015): "Capital flows and the risk-taking channel of monetary policy", *Journal of Monetary Economics*, vol 71, April, pp 119–32.
- Buch, C and L Goldberg (2015): "International banking and liquidity risk transmission: lessons from across countries", *IMF Economic Review*, vol 63, no 3, November, pp 377–410.
- (2017): "Cross-border prudential policy spillovers: how much? How important? Evidence from the International Banking Research Network", *International Journal of Central Banking*, vol 13, March, pp 505–58.
- Buffie, E, M Airaud and F Zanna (2018): "Inflation targeting and exchange rate management in less developed countries", *Journal of International Money and Finance*, vol 81, March, pp 159–84.
- Buncic, D and M Melecky (2014): "Equilibrium credit: the reference point for macroprudential supervisors", *Journal of Banking and Finance*, vol 41, April, pp 135–54.
- Bussière, M, S Delle Chiaie and T Peltonen (2014): "Exchange rate pass-through in the global economy: the role of emerging market economies", *IMF Economic Review*, vol 62, no 1, pp 146–78.

- Caballero, R (2010): "Macroeconomics after the crisis: time to deal with the pretense-of-knowledge syndrome", *Journal of Economic Perspectives*, vol 24, no 4, September, pp 85–102.
- Caballero, R and K Cowan (2007): "Financial integration without the volatility", *MIT Department of Economics Working Papers*, no 08-04, May.
- Caballero, R and A Krishnamurthy (2004): "Smoothing sudden stops", *Journal of Economic Theory*, vol 119, no 1, November, pp 104–27.
- Calani, M, K Cowan and P García (2011): "Inflation targeting in financially stable economies: has it been flexible enough?", in L Céspedes, R Chang and D Saravia (eds), *Monetary policy under financial turbulence*, Central Bank of Chile.
- Calderón, C and J Fuentes (2014): "Have business cycles changed over the last two decades? An empirical investigation", *Journal of Development Economics*, vol 109, July, pp 98–123.
- Calvo, D, J C Crisanto, S Hohl and O Pascual Gutiérrez (2018): "Financial supervisory architecture: what has changed after the crisis?", *FSI Insights on Policy Implementation*, no 8, April.
- Calvo, G and C Reinhart (2002): "Fear of floating", *Quarterly Journal of Economics*, vol 117, no 2, May, pp 379–408.
- Canarella, G and S Miller (2017): "Inflation targeting and inflation persistence: new evidence from fractional integration and cointegration", *Journal of Economics and Business*, vol 92, July, pp 45–62.
- Capistrán, C and M Ramos-Francia (2010): "Does inflation targeting affect the dispersion of inflation expectations?", *Journal of Money, Credit and Banking*, vol 42, no 1, February, pp 113–34.
- Caputo, R and L Herrera (2017): "Following the leader? The relevance of the fed funds rate for inflation targeting countries", *Journal of International Money and Finance*, vol 71, March, pp 25–52.
- Cardarelli, R, S Elekdag and S Lall (2009): "Financial stress, downturns, and recoveries", *IMF Working Papers*, no 09/100, May.
- Carney, M (2017): "Lambda", speech at the London School of Economics, 16 January, available online at www.bankofengland.co.uk/news/speeches.
- Carrière-Swallow, Y and B Gruss (2016): "Implications of global financial integration for monetary policy in Latin America", in Y Carrière-Swallow, H Faruquee, L Jácome and K Srinivasan (eds), *Challenges for central banking: perspectives from Latin America*, International Monetary Fund, Washington DC, October.
- Carrière-Swallow, Y, B Gruss, N Magud and F Valencia (2016): "Monetary policy credibility and exchange rate pass-through", *IMF Working Papers*, no 16/240, December.
- Carrillo, J, E Mendoza, V Nuguer and J Roldán-Peña (2017): "Tight money-tight credit: coordination failure in the conduct of monetary and financial policies", Inter-American Development Bank, *Discussion Papers*, no IDB-DP-516, May.
- Castellani, F and X Debrun (2005): "Designing macroeconomic frameworks: a positive analysis of monetary and fiscal delegation", *International Finance*, vol 8, no 1, March, pp 87–117.
- Catão, L and A Pagan (2011): "The credit channel and monetary transmission in Brazil and Chile: a structured VAR approach", in L Céspedes, R Chang and D Saravia (eds), *Monetary policy under financial turbulence*, Central Bank of Chile.
- Cavoli, T and R Rajan (2006): "Monetary policy rules for small and open developing economies: a counterfactual policy analysis", *Journal of Economic Development*, vol 31, no 1, June, pp 89–111.
- Cecchetti, S, H Genberg, J Lipsky and S Wadhvani (2000): "Asset prices and central bank policy", *Geneva Reports on the World Economy 2*, International Center for Monetary and Banking Studies, London.

- Cecchetti, S and M Kohler (2012): "When capital adequacy and interest rate policy are substitutes (and when they are not)", *BIS Working Papers*, no 379, May.
- Cecchetti, S, T Mancini-Griffoli and M Narita (2017): "Does prolonged monetary policy easing increase financial vulnerability?", *IMF Working Papers*, no 17/65, February.
- Cecchetti, S, M Mohanty and F Zampolli (2011): "The real effects of debt", *BIS Working Papers*, no 352, September.
- Cerisola, M and G Gelos (2009): "What drives inflation expectations in Brazil? An empirical analysis", *Applied Economics*, vol 41, no 10, December, pp 1215–27.
- Cerutti, E, S Claessens and L Laeven (2017a): "The use and effectiveness of macroprudential policies: new evidence", *Journal of Financial Stability*, vol 28, February, pp 203–24.
- Cerutti, E, S Claessens and A Rose (2017b): "How important is the global financial cycle? Evidence from capital flows", *BIS Working Papers*, no 661, August.
- Cesa-Bianchi, A and A Rebucci (2015): "Does easing monetary policy increase financial instability?", *IMF Working Papers*, no 15/139, June.
- Céspedes, L, R Chang and A Velasco (2004): "Balance sheets and exchange rate policy", *American Economic Review*, vol 94, no 4, September, pp 1183–93.
- Céspedes, L and A Velasco (2014): "Was this time different? Fiscal policy in commodity republics", *Journal of Development Economics*, vol 106, January, pp 92–106.
- Chamon, M (2015): "The effects of FX intervention in Mexico", in "Mexico: selected issues", *IMF Country Reports*, no 15/314, November, pp 62–69.
- Chamon, M and M Garcia (2016): "Capital controls in Brazil: effective?", *Journal of International Money and Finance*, vol 61, March, pp 163–87.
- Chamon, M, M Garcia and L Souza (2017): "FX interventions in Brazil: a synthetic control approach", *Journal of International Economics*, vol 108, September, pp 157–68.
- Chang, R and A Velasco (2000): "Liquidity crises in emerging markets: theory and policy", in B Bernanke and J Rotemberg (eds), *NBER Macroeconomics Annual 1999*, MIT Press.
- Chen, M, J Wu, B N Jeon and R Wang (2017): "Monetary policy and bank risk-taking: evidence from emerging economies", *Emerging Markets Review*, vol 31, June, pp 116–40.
- Choi, S, D Furceri, P Loungani, S Mishra and M Poplawski-Ribeiro (2017a): "Oil prices and inflation dynamics: evidence from advanced and developing economies", *IMF Working Papers*, no 17/196, September.
- Choi, W G, and D Cook (2004): "Liability dollarization and the bank balance sheet channel", *Journal of International Economics*, vol 64, no 2, December, pp 247–75.
- Choi, W G, T Kang, G-Y Kim and B Lee (2017b): "Global liquidity transmission to emerging market economies, and their policy responses", *Journal of International Economics*, vol 109, November, pp 153–66.
- Christensen, I, C Meh and K Moran (2011): "Bank leverage regulation and macroeconomic dynamics", *Staff Working Papers*, no 2011-32, Bank of Canada.
- Christiano, L, C Ilut, R Motto and M Rostagno (2010): "Monetary policy and stock market booms", *NBER Working Papers*, no 16402, September.
- Christiano, L, R Motto and M Rostagno (2007): "Two reasons why money and credit may be useful in monetary policy", *NBER Working Papers*, no 13502, October.

- Chutasripanich, N and J Yetman (2015): "Foreign exchange intervention: strategies and effectiveness", *BIS Working Papers*, no 499, March.
- Civcir, I and A Akçağlayan (2010): "Inflation targeting and the exchange rate: does it matter in Turkey?", *Journal of Policy Modeling*, vol 32, no 3, May, pp 339–54.
- Claessens, S (2015): "An overview of macroprudential policy tools", *Annual Review of Financial Economics*, vol 7, December, pp 397–422.
- (2017): "Global banking: recent developments and insights from research", *Review of Finance*, vol 21, no 4, July, pp 1513–55.
- Claessens, S, R Herring and D Schoenmaker (2010): "A safer world financial system: improving the resolution of systemic institutions", *Geneva Reports on the World Economy*, no 12, July.
- Claessens, S and M Kose (2014): "Financial crises: explanations, types, and implications", in S Claessens, M Kose, L Laeven and F Valencia (eds), *Financial crises: causes, consequences, and policy responses*, International Monetary Fund, Washington DC, February.
- Claessens, S, M Kose and M Terrones (2011a): "How do business and financial cycles interact?", *IMF Working Papers*, no 11/88, April.
- (2011b): "Recessions and financial disruptions in emerging markets: a bird's eye view", in L Céspedes, R Chang and D Saravia (eds), *Monetary policy under financial turbulence*, Central Bank of Chile.
- Clarida, R, J Galí and M Gertler (1999): "The science of monetary policy: a New Keynesian perspective", *Journal of Economic Literature*, vol 37, no 4, December, pp 1661–707.
- (2000): "Monetary policy rules and macroeconomic stability: evidence and some theory", *The Quarterly Journal of Economics*, vol 115, no 1, pp 147–80.
- (2002): "A simple framework for international monetary policy analysis", *Journal of Monetary Economics*, vol 49, no 5, July, pp 879–904.
- Clark, P, C Goodhart and H Huang (1999): "Optimal monetary policy rules in a rational expectations model of the Phillips curve", *Journal of Monetary Economics*, vol 43, no 2, April, pp 497–520.
- Claro, S and C Soto (2012): "Macro policies and public debt in Chile", in "Fiscal policy, public debt and monetary policy in emerging market economies", *BIS Papers*, no 67, October, pp 103–12.
- (2013): "Exchange rate policy and exchange rate interventions: the Chilean experience", in "Market volatility and foreign exchange intervention in EMEs: what has changed?", *BIS Papers*, no 73, October, pp 81–93.
- Clements, B, D Coady, F Eich, S Gupta, A Kangur, B Shang and M Soto (2011): "The challenge of public pension reform in advanced and emerging economies", *IMF Policy Papers*, Washington DC.
- Cobham, D (2018): "A comprehensive classification of monetary policy frameworks for advanced and emerging economies", *MPRA Papers*, no 84737, February, University Library of Munich.
- Collard, F, H Dellas, B Diba and O Loisel (2017): "Optimal monetary and prudential policies", *American Economic Journal: Macroeconomics*, vol 9, no 1, January, pp 40–87.
- Combes, J-L, X Debrun, A Minea and R Tapsoba (2014): "Inflation targeting and fiscal rules: do interactions and sequencing matter?", *IMF Working Papers*, no 14/89, May.
- Committee on the Global Financial System (2009): "Capital flows and emerging market economies", *CGFS Papers*, no 33, January.
- (2010): "Macroprudential instruments and frameworks: a stocktaking of issues and experiences", *CGFS Papers*, no 38, May.

- Cordella, T, P Federico, C Végh and G Vuletin (2014): "Reserve requirements in the brave new macroprudential world", World Bank, *Policy Research Working Papers*, no 6793, February.
- Costinot, A, G Lorenzoni and I Werning (2014): "A theory of capital controls as dynamic terms-of-trade manipulation", *Journal of Political Economy*, vol 122, no 1, February, pp 77–128.
- Crowe, C, G Dell'Ariccia, D Igan and P Rabanal (2011): "Policies for macrofinancial stability: options to deal with real estate booms", *IMF Staff Discussion Notes*, no 11/02, February.
- Cukierman, A (1992): *Central bank strategy, credibility, and independence*, MIT Press.
- (2015): "The choice of flexibility in targeting inflation during normal times and during disinflations", *Research in Economics*, vol 69, no 4, December, pp 494–502.
- Cusinato, R, A Minella and S da Silva Porto Jr (2010): "Output gap and GDP in Brazil: a real-time data analysis", *Central Bank of Brazil Working Papers*, no 203, April.
- Daude, C, E Levy Yeyati and A Nagengast (2016): "On the effectiveness of exchange rate interventions in emerging markets", *Journal of International Money and Finance*, vol 64, June, pp 239–61.
- Daude, C and A Melguizo (2012): "Fiscal policy in Latin America: How much room for manoeuvre?", *VoxEU*, 11 September, www.voxeu.org/article/fiscal-policy-latin-america-space-manoevre.
- Davis, S and I Presno (2017): "Capital controls and monetary policy autonomy in a small open economy", *Journal of Monetary Economics*, vol 85, January, pp 114–30.
- de Carvalho Filho, I (2011): "28 months later: how inflation targeters outperformed their peers in the Great Recession", *B.E. Journal of Macroeconomics*, vol 11, no 1, January, Article 22.
- Degryse, H and S Ongena (2008): "Competition and regulation in the banking sector: a review of the empirical evidence on the sources of bank rents", in A Thakor and A Boot (eds), *Handbook of Financial Intermediation and Banking*, Elsevier.
- Dell'Ariccia, G, D Igan, L Laeven and H Tong (2012): "Policies for macrofinancial stability: how to deal with credit booms", *IMF Staff Discussion Notes*, no 12/06, June.
- Dell'Ariccia, G and R Marquez (2006): "Lending booms and lending standards", *Journal of Finance*, vol 61, no 5, October, pp 2511–46.
- de Mello, L and D Moccerro (2011): "Monetary policy and macroeconomic stability in Latin America: the cases of Brazil, Chile, Colombia and Mexico", *Journal of International Money and Finance*, vol 30, no 1, February, pp 229–45.
- Demirgüç-Kunt, A and E Detragiache (2005): "Cross-country empirical studies of systemic bank distress: a survey", *National Institute Economic Review*, vol 192, no 1, April, pp 68–83.
- Demirgüç-Kunt, A, E Detragiache and T Tressel (2008): "Banking on the Principles: compliance with Basel Core Principles and bank soundness", *Journal of Financial Intermediation*, vol 17, no 4, October, pp 511–42.
- De Paoli, B and A Lipińska (2013): "Capital controls: a normative analysis", Federal Reserve Bank of New York, *Staff Reports*, no 600, February.
- De Paoli, B and M Paustian (2017): "Coordinating monetary and macroprudential policies", *Journal of Money, Credit, and Banking*, vol 49, no 2–3, March, pp 319–49.
- Devenow, A and I Welch (1996): "Rational herding in financial economics", *European Economic Review*, vol 40, April, pp 603–15.
- Diamond, D and R Rajan (2012): "Illiquid banks, financial stability, and interest rate policy", *Journal of Political Economy*, vol 120, no 3, June, pp 552–91.

- Disyatat, P (2010): "Inflation targeting, asset prices, and financial imbalances: contextualizing the debate", *Journal of Financial Stability*, vol 6, no 3, September, pp 145–55.
- Dixit, A and L Lambertini (2003): "Interactions of commitment and discretion in monetary and fiscal policies", *American Economic Review*, vol 93, no 5, December, pp 1522–42.
- Djankov, S, O Hart, C McLiesh and A Shleifer (2008): "Debt enforcement around the world", *Journal of Political Economy*, vol 116, no 6, December, pp 1105–49.
- Domanski, D, E Kohlscheen and R Moreno (2016): "Foreign exchange market intervention in EMEs: what has changed?", *BIS Quarterly Review*, September, pp 65–79.
- Dooley, M (1996): "A survey of literature on controls over international capital transactions", *IMF Staff Papers*, vol 43, no 4, December, pp 639–87.
- Drazen, A and E Helpman (1990): "Inflationary consequences of anticipated macroeconomic policies", *The Review of Economic Studies*, vol 57, no 1, January, pp 147–64.
- Drazen, A and Paul Masson (1994): "Credibility of policies versus credibility of policymakers", *Quarterly Journal of Economics*, vol 109, no 3, August, pp 735–54.
- Drehmann, M, C Borio and K Tsatsaronis (2012): "Characterising the financial cycle: don't lose sight of the medium term!", *BIS Working Papers*, no 380, June.
- Drehmann, M and K Tsatsaronis (2014): "The credit-to-GDP gap and countercyclical capital buffers: questions and answers", *BIS Quarterly Review*, March, pp 55–73.
- Dufrénot, G, V Mignon and A Péguin-Feissolle (2011): "The effects of the subprime crisis on the Latin American financial markets: an empirical assessment", *Economic Modelling*, vol 28, issue 5, September, pp 2342–57.
- Ebeke, C and D Fouejieu (2015): "Inflation targeting and exchange rate regimes in emerging markets", *IMF Working Papers*, no 15/228, October.
- Edwards, S (2004): "Financial openness, sudden stops, and current-account reversals", *American Economic Review*, vol 94, no 2, May, pp 59–64.
- (2007): "The relationship between exchange rates and inflation targeting revisited", in F Mishkin and K Schmidt-Hebbel (eds), *Monetary policy under inflation targeting*, Central Bank of Chile.
- Edwards, S and R Rigobon (2009): "Capital controls on inflows, exchange rate volatility and external vulnerability", *Journal of International Economics*, vol 78, no 2, July, pp 256–67.
- Eichengreen, B (2004): "Can emerging markets float? Should they inflation target?", in R Driver, P Sinclair and C Thoenissen (eds), *Exchange rates, capital flows and policy*, Routledge.
- Eickmeier, S and B Hofmann (2013): "Monetary policy, housing booms, and financial (im)balances", *Macroeconomic Dynamics*, vol 17, no 4, June, pp 830–60.
- Elekdag, S, A Justiniano and I Tchakarov (2006): "An estimated small open economy model of the financial accelerator", *IMF Staff Papers*, vol 53, no 2, June, pp 219–41.
- Escudero, M, M Gonzalez-Rozada and M Sola (2014): "Towards a 'new' inflation targeting framework: the case of Uruguay", Northwestern University, mimeo.
- Farhi, E and I Werning (2012): "Dealing with the trilemma: optimal capital controls with fixed exchange rates", *NBER Working Papers*, no 18199, June.
- Faust, J and L Svensson (2001): "Transparency and credibility: monetary policy with unobservable goals", *International Economic Review*, vol 42, no 2, May, pp 369–97.

- Favero, C and F Giavazzi (2004): "Inflation targeting and debt: lessons from Brazil", *NBER Working Papers*, no 10390, March.
- Federico, P, C Végh and G Vuletin (2014): "Reserve requirement policy over the business cycle", *NBER Working Papers*, no 20612, October.
- Fendel, R, M Frenkel and J-C Rülke (2011): "'Ex-ante' Taylor rules and expectation forming in emerging markets", *Journal of Comparative Economics*, vol 39, no 2, June, pp 230–44.
- Fernández, A, A Rebucci and M Uribe (2015): "Are capital controls countercyclical?", *Journal of Monetary Economics*, vol 76, November, pp 1–14.
- Fernandez-Arias, E and P Montiel (1996): "The surge in capital inflows to developing countries: an analytical overview", *World Bank Economic Review*, vol 10, no 1, January, pp 51–77.
- Fernandez-Corugedo, E, M McMahon, S Millard and L Rachel (2011): "Understanding the macroeconomic effects of working capital in the United Kingdom", *Bank of England Working Papers*, no 422, April.
- Ferreira de Mendonça, H and G de Guimarães e Souza (2012): "Is inflation targeting a good remedy to control inflation?", *Journal of Development Economics*, vol 98, no 2, July, pp 178–91.
- Ferreira de Mendonça, H and K de Siqueira Galveas (2013): "Transparency and inflation: what is the effect on the Brazilian economy?", *Economic Systems*, vol 37, no 1, March, pp 69–80.
- Fielding, D and J Rewilak (2015): "Credit booms, financial fragility and banking crises", *Economics Letters*, vol 136, November, pp 233–36.
- Filardo, A and P Rungcharoenkitkul (2016): "A quantitative case for leaning against the wind", *BIS Working Papers*, no 594, December.
- Financial Services Authority (2009): *The Turner Review: a regulatory response to the global banking crisis*, March.
- Financial Stability Board (2011): "Macroprudential policy tools and frameworks: update for G20 finance ministers and central bank governors", mimeo.
- Financial Stability Board, International Monetary Fund and Bank for International Settlements (2016): *Elements of effective macroprudential policies: lessons from international experience*, report to the G20, August.
- Fonseca, A, F González and L Pereira da Silva (2010): "Cyclical effects of bank capital buffers with imperfect credit markets: international evidence", *Central Bank of Brazil Working Papers*, no 216, October.
- Forbes, K (2007): "One cost of the Chilean capital controls: increased financial constraints for smaller traded firms", *Journal of International Economics*, vol 71, no 2, April, pp 294–323.
- Forbes, K, M Fratzscher, T Kostka and R Straub (2016): "Bubble thy neighbour: portfolio effects and externalities from capital controls", *Journal of International Economics*, vol 99, March, pp 85–104.
- Forbes, K, M Fratzscher and R Straub (2015): "Capital-flow management measures: what are they good for?", *Journal of International Economics*, vol 96, supplement 1, July, pp s76-s97.
- Forbes, K, D Reinhardt and T Wieladek (2017): "The spillovers, interactions, and (un)intended consequences of monetary and regulatory policies", *Journal of Monetary Economics*, vol 85, January, pp 1–22.
- Forbes, K and F Warnock (2012): "Capital flow waves: surges, stops, flight, and retrenchment", *Journal of International Economics*, vol 88, issue 2, November, pp 235–51.
- Frankel, J (2011): "A comparison of monetary anchor options, including product price targeting for commodity-exporters in Latin America", *Economía*, vol 12, May, pp 1–57.

——— (2012): "The death of inflation targeting", *VoxEU*, 19 June, www.voxeu.org/article/inflation-targeting-dead-long-live-nominal-gdp-targeting.

Frappa, S and J-S Mésonnier (2010): "The housing price boom of the late 1990s: did inflation targeting matter?", *Journal of Financial Stability*, vol 6, no 4, December, pp 243–54.

Fratzscher, M (2012): "Capital flows, push versus pull factors and the global financial crisis", *Journal of International Economics*, vol 88, no 2, November, pp 341–56.

Fratzscher, M, L Menkhoff, L Sarno and T Stöhr (2018): "When is foreign exchange intervention effective? Evidence from 33 countries", *American Economic Journal: Macroeconomics*, forthcoming.

Freixas, X, L Laeven and J-L Peydró (2015): *Systemic risk, crises, and macroprudential regulation*, MIT Press.

Frisch, H and S Staudinger (2003): "Inflation targeting versus nominal income targeting", *Journal of Economics*, vol 78, no 2, February, pp 113–37.

Furceri, D, S Guichard and E Rusticelli (2011): "The effect of episodes of large capital inflows on domestic credit", *OECD Economics Department Working Papers*, no 864, May.

Gabaix, X and M Maggiori (2015): "International liquidity and exchange rate dynamics", *Quarterly Journal of Economics*, vol 130, no 3, August, pp 1369–420.

Gadanecz, B, A Mehrotra and M Mohanty (2014): "Foreign exchange intervention and the banking system balance sheet in emerging market economies", *BIS Working Papers*, no 445, March.

Galati, G and R Moessner (2013): "Macroprudential policy – a literature review", *Journal of Economic Surveys*, vol 27, no 5, December, pp 846–78.

Galindo, A, A Izquierdo and L Rojas-Suárez (2010): "Financial integration and foreign banks in Latin America: how do they impact the transmission of external financial shocks?", *IDB Working Paper Series*, no IDB-WP-116, January.

Gambacorta, L and A Murcia (2017): "The impact of macroprudential policies and their interaction with monetary policy: an empirical analysis using credit registry data", *BIS Working Papers*, no 636, May.

Gambacorta, L and F Signoretti (2014): "Should monetary policy lean against the wind? An analysis based on a DSGE model with banking", *Journal of Economic Dynamics and Control*, vol 43, June, pp 146–74.

Garcia, C, J Restrepo and S Roger (2011): "How much should inflation targeters care about the exchange rate?", *Journal of International Money and Finance*, vol 30, no 7, November, pp 1590–617.

García, G (2012): "Fiscal institutions to strengthen countercyclical policies and fiscal sustainability", in A Corbacho (ed), *The fiscal institutions of tomorrow*, Inter-American Development Bank.

Garcia, M (2011): "Can sterilized FX purchases under inflation targeting be expansionary?", PUC-Rio Department of Economics *Texto para discussão*, no 589, October.

Garcia, M and T Volpon (2014): "DNDFs: a more efficient way to intervene in FX markets?", *SCID Working Papers*, no 501, May.

Garcia-Cicco, J, M Kirchner, J Carrillo, D Rodríguez, F Perez, R Gondo, C Montoro and R Chang (2017): "Financial and real shocks and the effectiveness of monetary and macroprudential policies in Latin American countries", *BIS Working Papers*, no 668, October.

Garín, J, R Lester and E Sims (2016): "On the desirability of nominal GDP targeting", *Journal of Economic Dynamics and Control*, vol 69, August, pp 21–44.

Gelain, P, K Lansing and C Mendicino (2012): "House prices, credit growth, and excess volatility: implications for monetary and macroprudential policy", *Federal Reserve Bank of San Francisco Working Paper Series*, no 2012-11, August.

- Gerdesmeier, D, H-E Reimers and B Roffia (2010): "Asset price misalignments and the role of money and credit", *International Finance*, vol 13, no 3, December, pp 377–407.
- Gerlach, S and P Tillmann (2012): "Inflation targeting and inflation persistence in Asia-Pacific", *Journal of Asian Economics*, vol 23, no 4, August, pp 360–73.
- Gertler, M and P Karadi (2011): "A model of unconventional monetary policy", *Journal of Monetary Economics*, vol 58, no 1, January, pp 17–34.
- Ghosh, A (2013): "Exchange rate pass through, macro fundamentals and regime choice in Latin America", *Journal of Macroeconomics*, vol 35, March, pp 163–71.
- Ghosh, A, J Kim, M Qureshi and J Zalduendo (2012): "Surges", *IMF Working Papers*, no 12/22, January.
- Ghosh, A, J Ostry and M Chamon (2016): "Two targets, two instruments: monetary and exchange rate policies in emerging market economies", *Journal of International Money and Finance*, vol 60, February, pp 172–96.
- Ghosh, A, J Ostry and M Qureshi (2017): "Managing the tide: how do emerging markets respond to capital flows?", *IMF Working Papers*, no 17/69, March.
- Ghosh, A, M Qureshi and N Sugawara (2014): "Regulating capital flows at both ends: does it work?", *IMF Working Papers*, no 14/188, October.
- Giese, J, B Nelson, M Tanaka and N Tarashev (2013): "How could macroprudential policy affect financial system resilience and credit? Lessons from the literature", Bank of England, *Financial Stability Papers*, no 21, May.
- Giordani, P, M Ruta, H Weisfeld and L Zhu (2017): "Capital flow deflection", *Journal of International Economics*, vol 105, March, pp 102–18.
- Glick, R and M Hutchison (2011): "The illusive quest: do international capital controls contribute to currency stability?", *International Review of Economics & Finance*, vol 20, no 1, January, pp 59–70.
- Glocker, C and P Towbin (2012): "Reserve requirements for price and financial stability: When are they effective?", *International Journal of Central Banking*, vol 8, no 1, March, pp 65–114.
- Gochoco-Bautista, M, J Jongwanich and J-W Lee (2010): "How effective are capital controls in Asia?", *ADB Economics Working Paper Series*, no 224, October.
- Gómez, E, A Lizarazo, J Mendoza and A Murcia (2017): "Evaluating the impact of macroprudential policies on credit growth in Colombia", *BIS Working Papers*, no 634, May.
- Gonçalves, C and J Salles (2008): "Inflation targeting in emerging economies: what do the data say?", *Journal of Development Economics*, vol 85, February, pp 312–18.
- Gonzalez, R, D Khametshin, J-L Peydró and A Polo (2018): "Hedger of last resort: evidence from Brazilian FX interventions, local credit and global financial cycles", Central Bank of Brazil, mimeo.
- Gonzalez, R, J Lima and L Marinho (2015): "Business and financial cycles: An estimation of cycles' length focusing on macroprudential policy", *Central Bank of Brazil Working Papers*, no 385, April.
- Gopinath, G, O Itskhoki and R Rigobon (2010): "Currency choice and exchange rate pass-through", *American Economic Review*, vol 100, no 1, pp 304–36.
- Gourinchas, P-O and M Obstfeld (2012): "Stories of the twentieth century for the twenty-first", *American Economic Journal: Macroeconomics*, vol 4, March, pp 226–65.
- Gourio, F, A Kashyap and J Sim (2018): "The trade offs in leaning against the wind", *IMF Economic Review*, vol 66, no 1, March, pp 70–115.

Guender, A and J Tam (2004): "On the performance of nominal income targeting as a strategy for monetary policy in a small open economy", *Journal of International Money and Finance*, vol 23, no 2, March, pp 143–63.

Guo, K and V Stepanyan (2011): "Determinants of bank credit in emerging market economies", *IMF Working Papers*, no 11/51, March.

Ha, J, M Kose, F Ohnsorge and H Yilmazkuday (2019): "Sources of inflation: global and domestic drivers", in J Ha, M Kose and F Ohnsorge (eds), *Inflation in emerging and developing economies*, World Bank Publications.

Habermeier, K, A Kokenyne and C Baba (2011): "The effectiveness of capital controls and prudential policies in managing large inflows", *IMF Staff Discussion Notes*, no 11/14, August.

Hammond, G (2012): "State of the art of inflation targeting", *CCBS Handbooks*, no 29, Bank of England.

Hartmann, M and J Roestel (2013): "Inflation, output and uncertainty in the era of inflation targeting – a multi-economy view on causal linkages", *Journal of International Money and Finance*, vol 37, October, pp 98–112.

Hawkins, P (2006): "Financial access and financial stability", in *Central banks and the challenge of development*, Bank for International Settlements, Basel, May.

Heathcote, J and F Perri (2016): "On the desirability of capital controls", *IMF Economic Review*, vol 64, no 1, May, pp 75–102.

Hellmann, T, K Murdock and J Stiglitz (1997): "Financial restraint: towards a new paradigm", in M Aoki et al (eds), *The role of government in East Asian economic development: comparative institutional analysis*, Clarendon Press.

Herrmann, S and D Mihaljek (2013): "The determinants of cross-border bank flows to emerging markets: new empirical evidence on the spread of financial crises", *Economics of Transition*, vol 21, no 3, July, pp 479–508.

Hilbers, P, I Otker-Robe, C Pazarbasioglu and G Johnsen (2005): "Assessing and managing rapid credit growth and the role of supervisory and prudential policies", *IMF Working Papers*, no 05/151, July.

Hofmann, B and B Bogdanova (2012): "Taylor rules and monetary policy: A global 'Great Deviation'?", *BIS Quarterly Review*, September, pp 37–49.

Hofmann, B, H S Shin and M Villamizar-Villegas (2018): "Sterilised foreign exchange intervention as reverse QE", BIS, mimeo.

Hoggarth, G, L Mahadeva and J Martin (2010): "Understanding international bank capital flows during the recent financial crisis", *Bank of England Financial Stability Papers*, no 8, September.

Horváth, R and J Matějů (2011): "How are inflation targets set?", *CNB Working Papers*, no 6/2011, July.

Hutchison, M and I Noy (2006): "Sudden stops and the Mexican Wave: currency crises, capital flow reversals and output loss in emerging markets", *Journal of Development Economics*, vol 79, no 1, February, pp 225–48.

Ibarra, C (2011): "Capital flows and real exchange rate appreciation in Mexico", *World Development*, vol 39, no 12, December, pp 2080–90.

Institute of International Finance (2012): *'Shadow banking': a forward-looking framework for effective policy*, IIF, Washington DC, June.

Inter-American Development Bank (2005): *Unlocking credit: the quest for deep and stable bank lending*, Johns Hopkins University Press.

International Monetary Fund (2009): "Lessons for monetary policy from asset price fluctuations", *World Economic Outlook*, October, Chapter 3.

——— (2011a): "Recent experiences in managing capital inflows – cross-cutting themes and possible policy framework", Strategy, Policy and Review Department, mimeo.

——— (2011b): "Macroprudential policy: an organizing framework", Monetary and Capital Markets Department, mimeo.

——— (2011c): "Target what you can hit: commodity price swings and monetary policy", *World Economic Outlook*, September, Chapter 3.

——— (2012): "The liberalization and management of capital flows: an institutional view", *IMF Policy Papers*, November.

——— (2013): "Key aspects of macroprudential policy", *IMF Policy Papers*, June.

——— (2015): "Monetary policy and financial stability", mimeo.

——— (2016): "Capital flows – review of experience with the institutional view", *IMF Policy Papers*, November.

——— (2018): *Annual Report on Exchange Arrangements and Exchange Restrictions 2017*, April.

Ismailov, S, M Kakinaka and H Miyamoto (2016): "Choice of inflation targeting: some international evidence", *North American Journal of Economics and Finance*, vol 36, April, pp 350–69.

Jean Louis, R and F Balli (2013): "Low-inflation-targeting monetary policy and differential unemployment rate: is monetary policy to be blamed for the financial crisis? Evidence from major OECD countries", *Economic Modelling*, vol 30, January, pp 546–64.

Jensen, H (2002): "Targeting nominal income growth or inflation?", *American Economic Review*, vol 92, no 4, September, pp 928–56.

Jiménez, G and J Saurina (2006): "Credit cycles, credit risk, and prudential regulation", *International Journal of Central Banking*, vol 2, no 2, June, pp 65–98.

Jongwanich, J (2010): "Capital flows and real exchange rates in emerging Asian countries", *ADB Economics Working Paper Series*, no 210, Asian Development Bank, July.

Jongwanich, J, M Gochoco-Bautista and J-W Lee (2011): "When are capital controls effective? Evidence from Malaysia and Thailand", *ADB Economics Working Paper Series*, no 251, March.

Joyce, J and M Nabar (2009): "Sudden stops, banking crises and investment collapses in emerging markets", *Journal of Development Economics*, vol 90, no 2, November, pp 314–22.

Kandil, M (2015): "The adverse effects of real exchange rate variability in Latin America and the Caribbean", *Journal of Applied Economics*, vol 18, no 1, May, pp 99–120.

Kashyap, A and J Stein (2012): "The optimal conduct of monetary policy with interest on reserves", *American Economic Journal: Macroeconomics*, vol 4, no 1, January, pp 266–82.

Kawai, M, M Lamberte and S Takagi (2012): "Managing capital flows: lessons from the recent experiences of emerging Asian economies", in K Gallagher, S Griffith-Jones and J Antonio Ocampo (eds), *Regulating global capital flows for long-run development*, Pardee Center.

Kim, J and D Henderson (2005): "Inflation targeting and nominal-income-growth targeting: when and why are they suboptimal?", *Journal of Monetary Economics*, vol 52, no 8, November, pp 1463–95.

Kim, S and A Mehrotra (2018): "Effects of monetary and macroprudential policies – evidence from four inflation targeting economies", *Journal of Money, Credit and Banking*, vol 50, no 5, August, pp 967–92.

Kohlscheen, E, A Murcia and J Contreras (2018): "Determinants of bank profitability in emerging markets", *BIS Working Papers*, no 686, January.

Kontonikas, A and C Ioannidis (2005): "Should monetary policy respond to asset price misalignments?", *Economic Modelling*, vol 22, no 6, December, pp 1105–21.

Korinek, A (2018): "Regulating capital flows to emerging markets: an externality view", *Journal of International Economics*, vol 111, March, pp 61–80.

Korinek, A and D Sandri (2016): "Capital controls or macroprudential regulation?", *Journal of International Economics*, vol 99, supplement 1, March, s27-s42.

Kose, M, H Matsuoka, U Panizza and D Vorisek (2019): "Inflation expectations: review and evidence", in J Ha, M Ayhan Kose and F Ohnsorge (eds), *Inflation in emerging and developing economies*, World Bank Publications.

Kose, M, E Prasad, K Rogoff and S-J Wei (2006): "Financial globalization: a reappraisal", *IMF Working Papers*, no 06/189, August.

Kremer, S, A Bick and D Nautz (2011): "Inflation and growth: new evidence from a dynamic panel threshold analysis", University of Frankfurt, mimeo.

Krugman, P (2008): "The international finance multiplier", Princeton University, mimeo.

Krznar, I and T Matheson (2017): "Financial and business cycles in Brazil", *IMF Working Papers*, no 17/12, January.

Kuersteiner, G, D Phillips and M Villamizar-Villegas (2018): "Effective sterilized foreign exchange intervention? Evidence from a rule-based policy", *Journal of International Economics*, vol 113, July, pp 118–38.

Leeper, E (2011): "Anchors aweigh: how fiscal policy can undermine 'good' monetary policy", in L Céspedes, R Chang and D Saravia (eds), *Monetary policy under financial turbulence*, Central Bank of Chile.

Levin, G, C López and F Lopez-Gallo (2016): "The impact of expected losses provisioning on credit growth: the case of Mexico", Bank of Mexico, mimeo.

Levy Yeyati, E and F Sturzenegger (2016): "Classifying exchange rate regimes: 15 years later", *CID Working Papers*, no 319, June.

Lignonniere, S (2018): "Trilemma, dilemma and global players", *Journal of International Money and Finance*, vol 85, July, pp 20–39.

Lin, S and H Ye (2009): "Does inflation targeting make a difference in developing countries?", *Journal of Development Economics*, vol 89, no 1, May, pp 118–23.

Maertens, O, L Ricardo, P Castillo and G Rodriguez (2012): "Does the exchange rate pass-through into prices change when inflation targeting is adopted? The Peruvian case study between 1994 and 2007", *Journal of Macroeconomics*, vol 34, no 4, December, pp 1154–66.

Marcellino, M and A Musso (2011): "The reliability of real-time estimates of the euro area output gap", *Economic Modelling*, vol 28, no 4, July, pp 1842–56.

Mariscal, R, A Powell and P Tavella (2018): "On the credibility of inflation targeting regimes in Latin America", *Economía*, forthcoming.

McCauley, R, A Bénétrix, P McGuire and G von Peter (2017): "Financial deglobalisation in banking?", *BIS Working Papers*, no 650, June.

Medina, L (2016): "The effects of commodity price shocks on fiscal aggregates in Latin America", *IMF Economic Review*, vol 64, no 3, August, pp 502–25.

- Mendoza, E (2016): "Macroprudential policy: promise and challenges", *NBER Working Papers*, no 22868, November.
- Mendoza, E and M Terrones (2012): "An anatomy of credit booms and their demise", *NBER Working Papers*, no 18379, September.
- Minaya, E, J Lupú and M Cabello (2017): "Macroprudential policies in Peru: the effects of dynamic provisioning and conditional reserve requirements", *BIS Working Papers*, no 675, November.
- Minea, A and R Tapsoba (2014): "Does inflation targeting improve fiscal discipline?", *Journal of International Money and Finance*, vol 40, pp 185–203.
- Minella, A and N Souza-Sobrinho (2013): "Monetary policy channels in Brazil through the lens of a semi-structural model", *Economic Modelling*, vol 30, January, pp 405–19.
- Mishkin, F (2000): "Inflation targeting in emerging-market countries", *American Economic Review*, vol 90, no 2, May, pp 105–9.
- (2011): "Monetary policy strategy: lessons from the crisis", *NBER Working Papers*, no 16755, February.
- Mishkin, F and N Westelius (2008): "Inflation band targeting and optimal inflation contracts", *Journal of Money, Credit and Banking*, vol 40, no 4, June, pp 557–82.
- Mizen, P and S Tsoukas (2012): "The response of the external finance premium in Asian corporate bond markets to financial characteristics, financial constraints and two financial crises", *Journal of Banking and Finance*, vol 36, no 11, November, pp 3048–59.
- Mohanty, M and M Klau (2004): "Monetary policy rules in emerging market economies: issues and evidence", *BIS Working Papers*, no 149, March.
- Mollick, A, R Cabral and F Carneiro (2011): "Does inflation targeting matter for output growth? Evidence from industrial and emerging economies", *Journal of Policy Modeling*, vol 33, no 4, July, pp 537–51.
- Montes, G (2013): "Credibility and monetary transmission channels under inflation targeting: an econometric analysis from a developing country", *Economic Modelling*, vol 30, January, pp 670–84.
- Montoro, C and R Moreno (2011): "The use of reserve requirements as a policy instrument in Latin America", *BIS Quarterly Review*, March, pp 53–65.
- Montoro, C, E Takáts and J Yetman (2012): "Is monetary policy constrained by fiscal policy?", in "Fiscal policy, public debt and monetary policy in emerging market economies", *BIS Papers*, no 67, October, pp 11–30.
- Morón, E and D Winkelried (2005): "Monetary policy rules for financially vulnerable economies", *Journal of Development Economics*, vol 76, no 1, February, pp 23–51.
- Moura, M and A de Carvalho (2010): "What can Taylor rules say about monetary policy in Latin America?", *Journal of Macroeconomics*, vol 32, no 1, March, pp 392–404.
- Mundell, R (1963): "Capital mobility and stabilization policy under fixed and flexible exchange rates", *Canadian Journal of Economics and Political Science*, vol 29, no 4, November, pp 475–85.
- Nahon, B and R Meurer (2009): "Measuring Brazilian central bank credibility under inflation targeting", *International Research Journal of Finance and Economics*, no 27, May, pp 72–81.
- Nedeljkovic, M and C Saborowski (2017): "The relative effectiveness of spot and derivatives based intervention: the case of Brazil", *IMF Working Papers*, no 17/11, January.
- Neuenkirch, M and P Tillmann (2014): "Inflation targeting, credibility, and non-linear Taylor rules", *Journal of International Money and Finance*, vol 41, March, pp 30–45.

- Nogueira, R and M León-Ledesma (2009): "Fear of floating in Brazil: did inflation targeting matter?", *North American Journal of Economics and Finance*, vol 20, no 3, December, pp 255–66.
- Nordstrom, A, R Scott, M Stone, S Shimizu, T Kisinbay and J Restrepo (2009): "The role of the exchange rate in inflation-targeting emerging economies; targeting emerging economies", *IMF Occasional Papers*, no 267, November.
- Obstfeld, M (2015): "Trilemmas and tradeoffs: living with financial globalization", in C Raddatz, D Saravia and J Ventura (eds), *Global liquidity, spillovers to emerging markets and policy responses*, Central Bank of Chile, pp 13–78.
- Obstfeld, M, K Clinton, O Kamenik, D Laxton, Y Ustyugova and H Wang (2016): "How to improve inflation targeting in Canada", *IMF Working Papers*, no 16/192, September.
- Obstfeld, M, J Ostry and M Qureshi (2017): "A tie that binds: revisiting the trilemma in emerging market economies", *IMF Working Papers*, no 17/130, June.
- Obstfeld, M and A Taylor (1998): "The Great Depression as a watershed: international capital mobility over the long run", in M Bordo, C Goldin and E White (eds), *The defining moment: The Great Depression and the American economy in the 20th century*, Chicago University Press and NBER, January, pp 353–402.
- Okada, K (2013): "The interaction effects of financial openness and institutions on international capital flows", *Journal of Macroeconomics*, vol 35, March, pp 131–43.
- Olaberría, E (2012): "Capital inflows and booms in asset prices: evidence from a panel of countries", *Central Bank of Chile Working Papers*, no 675, August.
- Ostry, J, A Ghosh and M Chamon (2015): "Sterilized foreign exchange interventions under inflation targeting", in C Raddatz, D Saravia and J Ventura (eds), *Global liquidity, spillovers to emerging markets and policy responses*, Central Bank of Chile, pp 223–44.
- Ostry, J, A Ghosh, M Chamon and M Qureshi (2012): "Tools for managing financial-stability risks from capital inflows", *Journal of International Economics*, vol 88, no 2, November, pp 407–21.
- Ouyang, A, R Rajan and J Li (2016): "Exchange rate regimes and real exchange rate volatility: does inflation targeting help or hurt?", *Japan and the World Economy*, vol 39, September, pp 62–72.
- Pasricha, G (2017): "Policy rules for capital controls", *BIS Working Papers*, no 670, November.
- Patel, N and A Villar (2016): "Measuring inflation", in "Inflation mechanisms, expectations and monetary policy", *BIS Policy Papers*, no 89, November, pp 9–21.
- Pavasuthipaisit, R (2010): "Should inflation-targeting central banks respond to exchange rate movements?", *Journal of International Money and Finance*, vol 29, no 3, April, pp 460–85.
- Pedersen, M (2011): "Propagation of shocks to food and energy prices: an international comparison", *Central Bank of Chile Working Papers*, no 648, December.
- Pereira da Silva, L (2016): "How can emerging market economies best cope with the current complex global economic environment?", remarks at the XVIII Annual Inflation Targeting Seminar of the Central Bank of Brazil, Rio de Janeiro, 20 May, www.bis.org/speeches/sp160520.htm.
- Pereira da Silva, L and R Harris (2012): "Sailing through the Global Financial Storm: Brazil's recent experience with monetary and macroprudential policies to lean against the financial cycle and deal with systemic risks", *Central Bank of Brazil Working Papers*, no 290, August.
- Pereira da Silva, L, A Sales and W Gaglianone (2012): "Financial stability in Brazil", *Central Bank of Brazil Working Papers*, no 289, August.
- Pericoli, M and M Sbracia (2003): "A primer on financial contagion", *Journal of Economic Surveys*, vol 17, no 4, September, pp 571–608.

- Pontines, V (2011): "The nexus between inflation targeting and exchange rate volatility", *SEACEN Centre Staff Papers*, no 84, August.
- Pozsar, Z, T Adrian, A Ashcraft and H Boesky (2013): "Shadow banking", *Federal Reserve Bank of New York Economic Policy Review*, vol 19, no 2, December, pp 1–16.
- Prasertnukul, W, D Kim and M Kakinaka (2010): "Exchange rates, price levels, and inflation targeting: evidence from Asian countries", *Japan and the World Economy*, vol 22, no 3, August, pp 173–82.
- Rajan, R (2005): "Has financial development made the world riskier?", in *The Greenspan era: lessons for the future*, Federal Reserve Bank of Kansas.
- Razin, A and E Sadka (2004): "A Brazilian-type debt crisis: simple analytics", *IMF Staff Papers*, vol 51, no 1, April, pp 148–53.
- Reinhardt, D and S Riddiough (2014): "The two faces of cross-border banking flows: an investigation into the links between global risk, arms-length funding and internal capital markets", *Bank of England Working Papers*, no 498, April.
- Reinhardt, D and R Sowerbutts (2016): "Regulatory arbitrage in action: evidence from banking flows and macroprudential policy", Bank of England, mimeo.
- Reinhart, C and K Rogoff (2008): "Banking crises: an equal opportunity menace", *NBER Working Papers*, no 14587, December.
- Rennhack, R (2009): "Global financial regulatory reform: implications for Latin America and the Caribbean", *IMF Staff Position Note*, no SPN/09/19, July.
- Rey, H (2015): "Dilemma not trilemma: the global financial cycle and monetary policy independence", *NBER Working Papers*, no 21162, May.
- Reyes, J (2007): "Exchange rate passthrough effects and inflation targeting in emerging economies: what is the relationship?", *Review of International Economics*, vol 15, no 3, August, pp 538–59.
- Roch, F (2017): "The adjustment to commodity price shocks in Chile, Colombia, and Peru", *IMF Working Papers*, no 17/208, September.
- Roger, S (2009): "Inflation targeting at 20 - achievements and challenges", *IMF Working Papers*, no 09/236, October.
- Roger, S, C Garcia and J Restrepo (2009): "Hybrid inflation targeting regimes", *IMF Working Papers*, no 09/234, October.
- Rubio, M and J Carrasco-Gallego (2014): "Macroprudential and monetary policies: implications for financial stability and welfare", *Journal of Banking and Finance*, vol 49, December, pp 326–36.
- (2016): "The new financial regulation in Basel III and monetary policy: a macroprudential approach", *Journal of Financial Stability*, vol 26, October, pp 294–305.
- Sá, F, P Towbin and T Wieladek (2011): "Low interest rates and housing booms: the role of capital inflows, monetary policy and financial innovation", *Bank of England Working Papers*, no 411, February.
- Saborowski, C (2010): "Inflation targeting as a means of achieving disinflation", *Journal of Economic Dynamics and Control*, vol 34, December, pp 2510–32.
- Sánchez, M (2010): "What does South Korean inflation targeting target?", *Journal of Asian Economics*, vol 21, no 6, December, pp 526–39.
- Saurina, J (2009): "Dynamic provisioning: the experience of Spain", *Crisis Response Note*, no 7, International Finance Corporation, July.

- Scharnagl, M, C Gerberding and F Seitz (2010): "Should monetary policy respond to money growth? New results for the euro area", *International Finance*, vol 13, no 3, December, pp 409–41.
- Schindler, M (2009): "Measuring financial integration: a new data set", *IMF Staff Papers*, vol 56, no 1, April, pp 222–38.
- Schoenmaker, D (2011): "The financial trilemma", *Economics Letters*, vol 111, no 1, April, pp 57–59.
- Schou-Zibell, L, J Albert and L Song (2010): "A macroprudential framework for monitoring and examining financial soundness", *ADB Working Paper Series on Regional Economic Integration*, no 43, March.
- Schularick, M and A Taylor (2012): "Credit booms gone bust: monetary policy, leverage cycles, and financial crises, 1870–2008", *American Economic Review*, vol 102, no 2, April, pp 1029–61.
- Silver, M (2006): "Core inflation measures and statistical issues in choosing among them", *IMF Working Papers*, no 06/97, April.
- Sims, C (2005): "Limits to inflation targeting", in B Bernanke and M Woodford (eds), *The inflation-targeting debate*, University of Chicago Press.
- Siregar, R and S Goo (2010): "Effectiveness and commitment to inflation targeting policy: evidence from Indonesia and Thailand", *Journal of Asian Economics*, vol 21, no 2, April, pp 113–28.
- Smith, A (2016): "When does the cost channel pose a challenge to inflation targeting central banks?", *European Economic Review*, vol 89, October, pp 471–94.
- Stein, J (2012): "Monetary policy as financial stability regulation", *The Quarterly Journal of Economics*, vol 127, no 1, February, pp 57–95.
- (2013): "Overheating in credit markets: origins, measurement, and policy responses", remarks at a research symposium on "Restoring household financial stability after the Great Recession: why household balance sheets matter", sponsored by the Federal Reserve Bank of St Louis, St Louis, February.
- Steiner, A (2017): "Central banks and macroeconomic policy choices: relaxing the trilemma", *Journal of Banking and Finance*, vol 77, April, pp 283–99.
- Sula, O and T Willett (2009): "The reversibility of different types of capital flows to emerging markets", *Emerging Markets Review*, vol 10, no 4, December, pp 296–310.
- Svensson, L (1997): "Inflation forecast targeting: implementing and monitoring inflation targets", *European Economic Review*, vol 41, no 6, June, pp 1111–46.
- (2009): "Flexible inflation targeting: lessons from the financial crisis", speech at the workshop "Towards a new framework for monetary policy? Lessons from the crisis", organised by the Netherlands Bank, Amsterdam, 21 September.
- (2010a): "Inflation targeting", in B Friedman and M Woodford (eds), *Handbook of Monetary Economics*, vol 3, North Holland.
- (2010b): "Inflation targeting and financial stability", keynote lecture at the CEPR/ESI 14th Annual Conference on "How has our view of central banking changed with the recent financial crisis?", hosted by the Central Bank of Turkey, Izmir, October.
- (2014): "Inflation targeting and 'leaning against the wind'", *International Journal of Central Banking*, vol 10, no 2, June, pp 103–14.
- (2017): "Cost-benefit analysis of leaning against the wind", *Journal of Monetary Economics*, vol 90, October, pp 193–213.
- Tan, T (2012): "Determinants of credit growth and interest margins in the Philippines and Asia", *IMF Working Papers*, no 12/123, May.

- Tashu, M (2014): "Motives and effectiveness of forex interventions: evidence from Peru", *IMF Working Papers*, no 14/217, December.
- Taylor, A (2015): "Credit, financial stability, and the macroeconomy", *NBER Working Papers*, no 21039, March.
- Taylor, J (2000): "Low inflation, pass-through, and the pricing power of firms", *European Economic Review*, vol 44, no 7, June, pp 1389–408.
- Teles, V and M Zaidan (2010): "Taylor principle and inflation stability in emerging market countries", *Journal of Development Economics*, vol 91, no 1, January, pp 180–83.
- Tillmann, P (2016): "Unconventional monetary policy and the spillovers to emerging markets", *Journal of International Money and Finance*, vol 66, September, pp 136–56.
- Tobal, M and R Yslas (2016): "Two models of FX market interventions: the cases of Brazil and Mexico", *Banco de México Working Papers*, no 2016-14, August.
- Tovar, C, M Garcia-Escribano and M Martin (2012): "Credit growth and the effectiveness of reserve requirements and other macroprudential instruments in Latin America", *IMF Working Papers*, no 12/142, June.
- Tucker, P (2016): "Macroprudential policy regimes: definition and institutional implications", in O Blanchard, R Rajan, K Rogoff and L Summers (eds), *Progress and confusion: the state of macroeconomic policy*, MIT Press, pp 89–98.
- Vargas, H, A González and D Rodríguez (2013): "Foreign exchange intervention in Colombia", *Bank of the Republic, Colombia Working Papers*, no 757, February.
- Vargas, H, C Varela, Y Betancourt and N Rodríguez (2010): "Effects of reserve requirements in an inflation targeting regime: the case of Colombia", Bank of the Republic, Colombia, *Borradores de Economía*, no 587, March.
- Vazquez, F, B Tabak and M Souto (2012): "A macro stress test model of credit risk for the Brazilian banking sector", *Journal of Financial Stability*, vol 8, no 2, April, pp 69–83.
- Viñals, J and E Nier (2014): "Collective action problems in macroprudential policy and the need for international coordination", Bank of France, *Financial Stability Review*, no 18, April, pp 39–46.
- Wadhwani, S (2008): "Should monetary policy respond to asset price bubbles? Revisiting the debate", *National Institute Economic Review*, vol 206, no 1, October, pp 25–34.
- Walsh, C (1995): "Is New Zealand's Reserve Bank Act of 1989 an optimal central bank contract?", *Journal of Money, Credit and Banking*, vol 27, no 4, November, pp 1179–91.
- (1999): "Announcements, inflation targeting and central bank incentives", *Economica*, vol 66, no 262, May, pp 255–69.
- (2009): "Inflation targeting: what have we learned", *International Finance*, vol 12, no 2, June, pp 195–233.
- (2011): "The future of inflation targeting", *Economic Record*, vol 87, September, pp 23–36.
- Wezel, T (2010): "Dynamic loan loss provisions in Uruguay: properties, shock absorption capacity and simulations using alternative formulas", *IMF Working Papers*, no 10/125, May.
- Williams, J (2012a): "Efficiency and market power in Latin American banking", *Journal of Financial Stability*, vol 8, no 4, December, pp 263–76.
- Williams, N (2012b): "Monetary policy under financial uncertainty", *Journal of Monetary Economics*, vol 59, no 5, July, pp 449–65.

Woodford, M (2003): *Interest and prices: foundations of a theory of monetary policy*, Princeton University Press.

——— (2010) "Financial intermediation and macroeconomic analysis", *The Journal of Economic Perspectives*, vol 24, no 4, September, pp 21–44.

——— (2012): "Inflation targeting and financial stability", *NBER Working Papers*, no 17967, April.

World Bank (2018): *Global Financial Development Report 2017/2018: Bankers without Borders*.

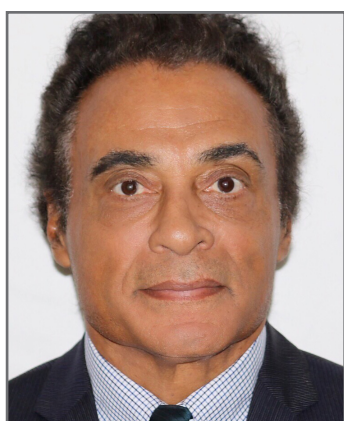
Yamada, H (2013): "Does the exchange rate regime make a difference in inflation performance in developing and emerging countries? The role of inflation targeting", *Journal of International Money and Finance*, vol 32, February, pp 968–89.

Yigit, T (2010): "Inflation targeting: an indirect approach to assess the direct impact", *Journal of International Money and Finance*, vol 29, no 7, November, pp 1357–68.

Zhang, L and E Zoli (2016): "Leaning against the wind: macroprudential policy in Asia", *Journal of Asian Economics*, vol 42, February, pp 33–52.

Zoli, E (2005): "How does fiscal policy affect monetary policy in emerging market countries?", *BIS Working Papers*, no 174, April.

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