Overview

Introduction

The 2008 financial crisis has highlighted the challenges associated with global financial integration and emphasized the importance of macro financial linkages. Specifically it has shown how the real sector (business cycles) can interact with and be amplified by the financial sector, resulting in high procyclicality and a buildup of systemic risk in the financial sector that manifests itself during economic downturns.

Although boom-bust cycles in asset prices and credit were observed prior to the recent global crisis, they did not seriously challenge the prevailing paradigm. In the macro arena, the general view was that keeping monetary policy focused on price and output stability would deliver the best feasible outcome (Bernanke and Gertler 1999, 2001), although some proponents argued in favor of "leaning against the wind" (Blanchard 2000; Borio and White 2004). In the financial sector, prudential policies in most economies focused narrowly on the soundness of individual financial institutions.

Policies in both the macroeconomic and financial sector arenas are now being debated and reviewed (see Blanchard, Dell'Ariccia, and Mauro 2010, 2013 for overviews). In the financial sector, attention is being directed toward macro prudential regulations that are geared toward the stability of the financial system as a whole. Some of the proposed measures under The Third Basel Accord (Basel III)[1] aim to dampen the procyclicality of the financial sector and to reduce cross-sectional systemic risks partly by introducing measures to address liquidity and issues of banks being too big to fail. In the macro arena, the facts that price stability was not sufficient to guarantee macroeconomic stability and that financial imbalances developed despite low inflation and small output gaps have highlighted the need for additional tools (macro prudential policies) to complement monetary policy in countercyclical management. They have also raised questions about the respective roles and interactions between the monetary and macro prudential policies when either policy operates imperfectly or is constrained.

The policy debate is currently taking place largely, if not exclusively, in the context of the advanced industrial countries. However, emerging markets face

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different conditions and have key structural features that can have a bearing on the relevance and efficacy of the measures being discussed. Also important, because they suffered earlier financial crises, many emerging markets have had greater experiences with macro prudential and other policies aimed at ensuring financial stability. As such, emerging markets can offer valuable lessons. The chapters in this volume discuss the challenges of dealing with macro financial linkages and explore the policy toolkit available for dealing with systemic risks with particular reference to emerging markets.

Macro Financial Linkages and Systemic Risk

What are the mechanics through which interactions between the financial and real sectors take place and how do these lead to a buildup of systemic risks?

The financial sector is inherently procyclical—that is, it amplifies the business cycle. Interactions between the financial sector and the real sector "causing" this procyclicality largely operate through changes in the value of assets and leverage. As Hyun Shin elucidates in chapter 1, financial intermediaries are not typical of the textbook rational portfolio optimizer who decides on the asset holdings based on an assessment of some fundamental value. Instead, banks and other financial intermediaries have quite perverse portfolio choice behavior—their asset holdings depend on their "balance sheet capacity" and their demand for an asset tends to rise when the price of the asset rises and falls when the price of the asset falls. Balance sheet capacity depends on two things: the amount of bank capital and the degree of permitted leverage. During a boom, balance sheet capacity is bolstered for two reasons. First, bank capital is bolstered by increased profitability of the bank, or the capital gains implied by the increase in asset prices. Second, lowered measured risks during the tranquil up-phase of the financial cycle raise banks' leverage. In particular, if the bank is managing asset risk through managing its value-at-risk (VaR), then a fall in measured risk translates directly into an increase in bank leverage, that is, leverage itself is procyclical. If all banks respond in the same way, the increased demand for assets raises their prices, further fuelling the cycle and leading to a generalized expansion of banks' assets (credit). The amplifying, procyclical nature of banking sector balance sheet management has far-reaching implications for financial stability.

Although banks' balance sheet management is a key element underlying the procyclicality of the financial sector, several other factors can give rise to market failures and externalities that exacerbate the generalized expansion of bank assets (or contraction in a downturn) as discussed by Viral Acharya in chapter 2 and Claessens, Ghosh, and Mihet in chapter 5. Indeed, some aspects of micro prudential regulations that are designed to ensure the stability of individual financial institutions can in fact aggravate both the cyclical and cross-sectional dimensions of systemic risks.

During an upturn or boom period, the financial system as a whole can become vulnerable, by becoming exposed to balance sheet weaknesses or mismatches such as liquidity, maturity, and foreign exchange. These vulnerabilities manifest

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themselves in the face of shocks (or a downturn in the economy). Thus, as leverage in the financial sector increases, bank portfolios can become highly exposed to particular asset classes (often real estate), and as discussed by Hyun Shin in chapter 1, on the liabilities side, the ratio of noncore-to-core liabilities tends to rise. Core liabilities can be defined as the funding on which the bank draws during normal times and which is sourced (in the main) domestically. What constitutes core funding will depend on the context and the economy in question, but retail deposits of the household sector are a key candidate. When banking assets are growing rapidly, core funding is likely to be insufficient to finance the rapid growth in new lending (because retail deposits tend to grow in line with aggregate household wealth). Thus, other sources of (noncore) funds need to be tapped—usually in the form of interbank liabilities or liabilities to a foreign creditor (capital inflows). As Shin documents in chapter 1, very often the source of the increase in noncore funds is from foreign creditors. Prior to the 2008 financial crisis, branches of foreign banks in the United States raised significant amounts of U.S. dollar funding in the U.S. capital markets that were then shipped to their headquarters. Although some of these borrowed dollars found their way back to the United States to finance purchases of mortgage backed securities (MBS) and other assets, much of it flowed to Europe, Asia, and Latin America where global banks are active local lenders. Even for liabilities to domestic creditors, if the creditor is another intermediary, the claim tends to be short term. The distinction between core and noncore liabilities becomes meaningful once there are differences in the empirical properties of the two types of liabilities, with noncore liabilities generally exhibiting less "stickiness" and greater volatility in the face of shocks.

As mentioned, the vulnerability then manifests itself in the face of a negative shock or downturn (fall in asset prices, stops in capital inflows, or sudden withdrawal of funds). Even a small shock, such as declines in collateral values during a downturn, can trigger systemwide problems once financial institutions' balance sheets become weak. If equity buffers are insufficient to absorb losses, for example, banks may be forced to deleverage, creating systemwide declines in the supply of external financing. The reduced credit extension, in turn, can exacerbate an economic slowdown, raising the probability of default for all other borrowers and can set off an adverse cycle of bank losses, further credit contraction and economic slowdown. Alternatively, a negative shock that shakes depositors' confidence can expose banks to the risk of runs, forcing them to hoard liquidity or sell assets at depressed market prices to meet withdrawals, if the systemwide maturity transformation (lending long and borrowing short) or reliance on wholesale funds (noncore funding) is high. Negative externalities related to fire sales can then come into play as a generalized sell-off of financial assets causes a decline in asset prices, which in turn further impairs the balance sheets of intermediaries, further amplifying the contractionary phase of the cycle.

The cross-sectional dimension of systemic risk arises from the interconnectedness of financial institutions and markets, as outlined by Acharya in chapter 2. Given their interconnectedness, the contemporary market-based financial sector

should be thought of not only as the deposit-taking, loan-making activities of commercial banks but also as investment banks, money-market funds, insurance firms, and potentially even hedge funds and private equity funds. Even though the financial sectors of emerging economies consist primarily of traditional commercial banks, recent evidence from China and India shows that when commercial banks are restricted in risk taking and leverage growth, emerging economies tend to have an outgrowth of "shadow banking," that is, nonbank financial intermediaries (money market funds and nonbank finance operations) that often remain outside the scope of regulators.

Several types of systemic risks can arise from the failure of interconnected financial institutions, such as counterparty risk, especially in interbank markets; spillover risk due to forced asset sales in asset- or market-based economies; the risk of runs on the shadow-banking system; or simply the inability to resolve failed banks by selling them to better-capitalized firms (given their dearth in a systemic crisis) leading to a credit crunch or regulatory forbearance and the creation of "zombie" institutions that do not allocate resources effectively given their debt overhang problems.

Unless the external costs of such systemic risks imposed on the rest of the financial sector as well as the rest of the economy are internalized by each financial institution, an incentive will remain to take risks whose costs are borne by others. A financial institution's risk is a negative externality on the entire system. Thus, financial regulation should be not only micro prudential but also macro prudential in nature, focused on limiting systemic risk. Absent such macro prudential regulation, economies run the risk of excessively large amplifiers over and above the normal cyclical macroeconomic fluctuation. However, the issue is often not so straightforward. For instance, even if a domestic regulator penalized a multinational financial firm for producing systemic risk locally, the impact of this penalty may not carry through to all the international markets in which the firm operates. This situation makes a case for more severe penalties for firms whose actions can lead to systemic consequences elsewhere. But financial institutions' propensity to conduct regulatory arbitrage across national jurisdictions (that is, if institutions are more strictly regulated in one jurisdiction they may move their base for financial intermediation services to jurisdictions that are more lightly regulated) means such institutions expose all jurisdictions to their risk taking. Individually, jurisdictions may prefer to be regulation "lite" in order to attract more institutions and thereby jobs.

Systemic risk concerns caused by interconnected firms are as important, if not more so, in emerging markets as in advanced economies. As the role of emerging markets in the global economy rises, the importance of risk spillovers across these markets has also grown. It is thus important to look for emerging pockets of macro prudential risk, not just within economies but also outside them. Acharya discusses in greater detail such potential spillovers and global linkages and provides a possible blueprint for achieving better international coordination of macro prudential regulation.

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Often, cyclical and cross sectional systemic risks grow in tandem. In a boom, when credit is growing rapidly, the growth of bank balance sheets outstrips the growth in the pool of retail deposits. As a result, the growth of bank lending results in greater lending and borrowing between the intermediaries themselves, or results in "sucking in" of foreign debt. Thus, the "cross-section" dimension of risk, in which banks are vulnerable to a common shock, is closely related to the "time-series" dimension of risk having to do with procyclicality of the balance sheet where assets are larger during the peak of the financial cycle.

Are the Challenges of Macro Financial Linkages Greater in Emerging Markets?

The contributions of Shin and Acharya provide the theoretical foundations for the use of macro prudential policies. The adoption and application of these tools, however, remains at an early stage of analysis. Nonetheless, it seems clear that emerging markets are more likely to need such tools.

Although the 2008 global financial crisis originated in the advanced economies—highlighting the fact that reaping the benefits of financial integration without incurring the costs remains a key challenge for all economies[2]—Stijn Claessens and Swati R. Ghosh argue in chapter 3 that, in general, emerging markets (EMs) tend to face even greater challenges with respect to managing the implications of macro financial linkages, notably with regard to procyclicality. This tendency is for two reasons: their greater exposure to shocks and their institutional characteristics.

Not only are EMs more prone to shocks—particularly capital flows, surges, and stops, but also commodity-price and terms-of-trade shocks—but the magnitude of these shocks, both positive and negative, is often large relative to their domestic economies and the size and depth of their financial sectors. For example, on average, total net private capital flows relative to M2[3] over 2000–10 has been some factor 100 times that for advanced countries (ACs). As a share of local capital markets, financial flows in EMs are thus much larger than in ACs, and certainly more volatile. Also foreign bank presence is greater—more than double—in EMs than in ACs. Unsurprisingly, therefore, shocks to capital flows and foreign banks' operations can have significant impacts on EMs' domestic financial and real sectors. Perhaps more importantly, the amplification of shocks tends to be larger in EMs.

In turn, both susceptibility to external shocks and amplifying transmission mechanisms can, to a significant extent, be traced to structural and financial market characteristics generally prevailing in emerging markets as well as to their institutional environments and policies.

One reason is because financial sectors in most EMs are still largely bank dominated and bank lending against collateral is generally more prevalent than in ACs. In EMs and developing countries, 72–85 percent of loans require collateral, higher than in ACs. Hence, when asset prices and collateral values change, other things being equal, they are more likely to affect lending by banks in EMs

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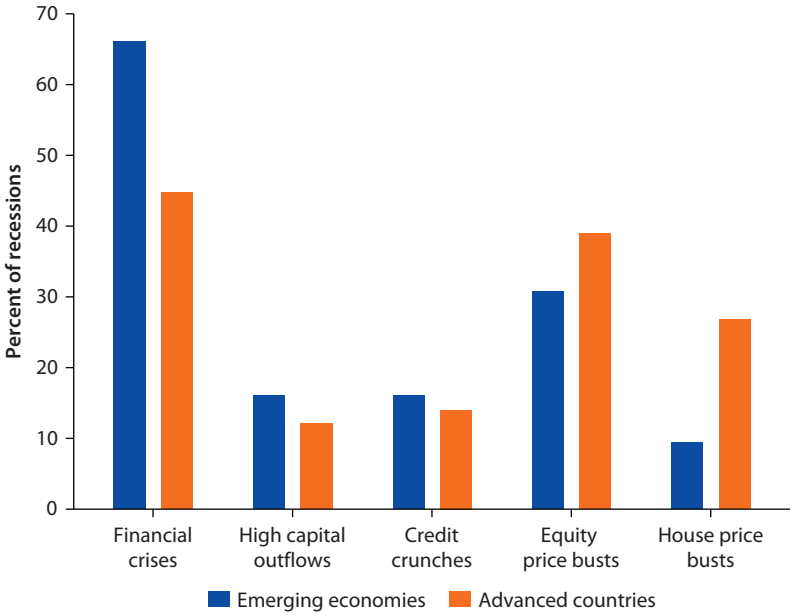
than those in ACs. Because borrowers are otherwise constrained, that is, given more limited alternative sources of financing, this change in bank lending is likely to have a greater impact on the real economy in EMs.

More broadly, shocks tend to get amplified and propagated more easily in EMs because of their structural and institutional characteristics. Although EMs have made substantial progress, they still lag behind ACs in measures of overall quality of institutions and have weaker legal regimes and enforcement. Market discipline of financial institutions may not work as well in EMs, given lower information disclosure and transparency, and greater prevalence of insider-type corporate governance arrangements, including firms often linked to financial institutions. These factors, in addition to narrower investor bases and less developed capital markets, and greater financial sector limitations and imperfections, such as limited availability of hedging instruments, tend to amplify and transmit shocks more easily. In the face of uncertainty or a shock, investor confidence fluctuates significantly or can even evaporate. Capital inflows and the potential for sudden stops are especially key sources of risk and shocks for EMs.

Claessens and Ghosh explore and document what these factors mean for the nature of the links between various financial cycles—domestic credit cycles, asset price cycles, and private capital movements—financial crises, and domestic business cycles in emerging markets and contrast them with those in advanced economies. They find that, indeed, the interaction of real and financial cycles tends to be greater in EMs (both in terms of an overlap of recessions with financial events and of recoveries with financial events) (figures O.1 and O.2).

Figure O.1 Recessions Associated with Different Financial Events



Source: Based on data in chapter 3, calculated from table 3.1.

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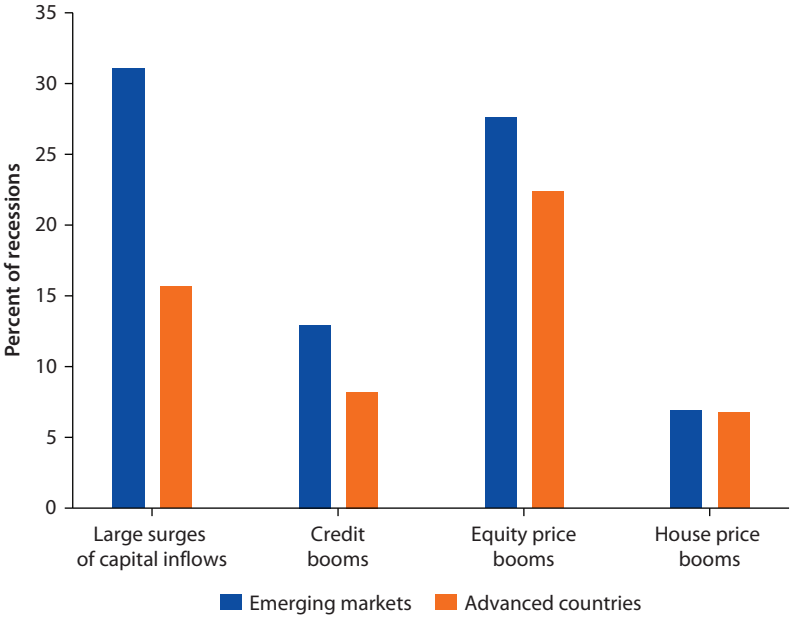
Figure O.2 Recoveries Associated with Different Financial Events



Source: Based on data in chapter 3, calculated from table 3.1.

Moreover, the impact in terms of both favorable and adverse outcomes is much larger in EMs. The stronger link is probably because gyrations in domestic financial markets are often associated with large swings in the direction and volume of capital flows. Indeed, in terms of adverse events, the worst outcomes in EMs are associated with sudden capital outflows where output declines by some 9.5 percent, whereas large capital outflows in advanced economies are associated with a mean drop in output of 2.8 percent; likewise cumulative output losses are 19.4 and 5.8 percent for EMs and ACs respectively (figure O.3).

Broad Policy Toolkit: Monetary and Macro Prudential Policies and their Interactions

How has the global financial crisis and growing recognition of systemic risks altered views on what constitutes an appropriate policy framework? In chapter 4, Otaviano Canuto and Matheus Cavallari discuss the new paradigm for monetary and macro prudential policies. Their discussion takes stock of where monetary and exchange rate policies are heading as a result of recent experiences and revisit theoretical monetary tenets. As they note, the precrisis principles for a monetary policy framework did not give due attention to how financial markets and their channels of interconnectivity affect macro stability. Although many argued in favor of monetary policy "leaning against the wind" from financial developments, the prevalent opinion was that difficulties in detecting bubbles would outweigh the advantages of doing so and that furthermore, monetary

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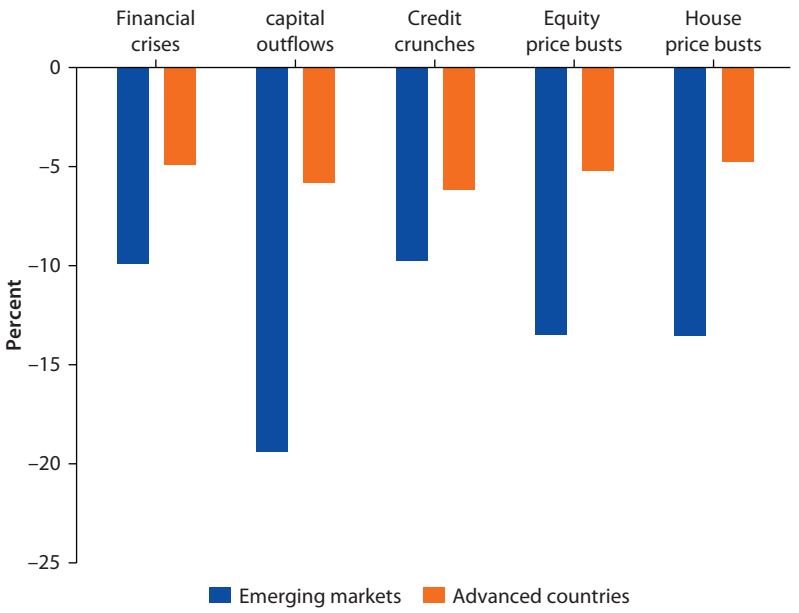
Figure O.3 Cumulative Output Losses Associated with Different Adverse Financial Events



Source: Based on data in chapter 3, calculated from table 3.1.

policy tools would be too blunt to curb the rise of bubbles, because correspondingly sharp interest rate hikes would have harmful unintended consequences on output growth and volatility. Thus, the best approach would be to have monetary policy react only if and when "mopping up" or "cleaning up" the financial mess after bubble bursts was necessary.

Since the crisis, there is growing recognition that a framework of flexible inflation targeting and micro prudential regulations is not sufficient to ensure financial and ultimately macroeconomic stability. Given the high costs associated with asset price busts, including the possibility of protracted negative feedback between unsound private balance sheets and public sector imbalances and/or foregone employment and gross domestic product, attention is now being directed toward addressing this failure. Canuto and Cavalleri explore whether or not addressing this failure implies that central banks should incorporate indicators of financial stability into their reaction function in an "augmented Taylor rule." They then consider whether macro prudential policies alone can reduce financial instability and guarantee both financial and macro stabilities.

As they note, most practitioners have expressed the view that a combined (articulate) use of both monetary and macro prudential policies is superior to a standalone implementation of either (Canuto 2011). Both policies are needed as neither one alone can achieve the two objectives. Monetary policy alone cannot achieve financial stability because the causes of financial instability are not always related to the degree of liquidity (which monetary policy can fix). Mitigating the effects of financial distortions or pricking an asset price bubble can require large changes in policy rates and when financial distortions (individual

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behavior that is distorted giving rise to excessive risk taking and externalities) are more acute in some sectors of the economy than others, monetary policy is too blunt a tool. Conversely, the use of macro prudential policies primarily for managing aggregate demand may in fact cause additional distortions by imposing constraints on behavior beyond areas where financial distortions originate (Claessens and Valencia 2013).

At the same time, the two policies can have impacts on each other's objectives. For instance, monetary policy can affect financial stability when it pursues its primary objective by (1) shaping ex ante risk-taking incentives of individuals through leverage, short-term borrowing or foreign currency borrowing; or (2) affecting ex post the tightness of borrowing constraints and possibly exacerbating asset price and exchange-rate externalities and leverage cycles. Macro prudential policies also have side effects. By constraining borrowing and hence expenditures in one or more sectors of the economy, macro prudential policies affect overall output (Claessens and Valencia 2013).

The existence of side effects implies that the new paradigm needs to take into account how the conduct of both policies is affected in the presence of their interactions. If macro prudential policies have strong effects on output, more accommodative monetary policy can offset these effects as necessary. If changes in the monetary stance affect incentives too much, the relevant macro prudential policies would need to be tightened.

A number of models surveyed by the International Monetary Fund suggest that when both policies are available, it is desirable to keep monetary policy primarily focused on price stability and macro prudential policies focused on financial stability, while taking into account the impact that each has on the other's objectives. In particular, these models suggest that the optimal calibration of the reaction to monetary policy to output and inflation does not change markedly when macro prudential policy is also used, even when different shocks are considered. In other words, the sole presence of side effects has no major implications for the conduct of both policies.

However, as Claessens and Valencia highlight, these models assume that both policies operate perfectly. In practice, policies face constraints. Macro prudential policies may not operate perfectly, especially given the still-limited knowledge about their quantitative impact, which makes calibration difficult, and they may not fully offset financial shocks or distortions; institutions are imperfect and time inconsistencies can arise. Should these weaknesses prove important, monetary policy may have to take a greater role in preserving financial stability and accept the associated trade-offs. Similarly, where monetary policy is constrained—as within currency boards and in many small open economies—there will be greater demands on macro prudential policies. Thus, as Canuto and Cavalleri note in their chapter, "instead of a corner solution where one instrument is devoted entirely to one objective, the macro stabilization exercise must be viewed as a joint optimization problem where monetary and regulatory policies are used in concert in pursuit of both objectives" (CIEPR 2011).

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In chapter 4, Canuto and Cavalleri also explore the challenges of dealing with cross-country spillovers in the context of the new policy paradigm. As they mention, cross-border capital flows and the potential transmission of asset price booms and busts via interconnected balance sheets imply additional layers of complexity as opposed to purely domestic asset price cycles. Canuto and Cavalleri propose that capital controls and exchange rate interventions can be seen as options to be combined with monetary and macro prudential policies, options that can even increase, or at least help, with the effectiveness of the latter. Claessens and Ghosh, who also look at the challenges of dealing with cross-border flows in emerging markets in chapter 3 and document how large surges of capital inflows are associated with increased financial sector vulnerability across several dimensions, also reach the conclusion that for most EMs receiving large inflows, it is likely that a combination of macroeconomic, macro prudential, and capital flow management policies is needed to avoid trade-offs and limitations associated with each individual policy instrument. Both chapters emphasize that the appropriate combination will clearly depend on the vulnerability identified, country-specific conditions, and constraints on individual policies. Canuto and Cavalleri conclude chapter 4 with a discussion on the new challenges faced broadly by central banking in emerging markets.

Macro Prudential Framework and Efficacy of Macro Prudential Measures

In chapters 1 and 2, Shin and Acharya discuss what constitutes a macro prudential framework. They highlight that it requires two elements: a set of indicators that can inform judgments on the degree of vulnerability to financial instability and hence serves as the informational basis for policy actions; and the associated macro prudential policy tools or automatic stabilizers that can kick in when circumstances warrant to anticipate and mitigate the vulnerabilities.

From a procyclicality perspective, given the centrality of the banking sector and its potential for amplifying business cycles and exacerbating systemic vulnerability in the process, as Shin notes, the pace of asset growth is of first-order interest. The challenge for policy makers, therefore, is knowing when asset growth may be "excessive" and finding policy tools that can address and counter excessive growth in a timely and effective manner.

Various potential indicators of vulnerability are discussed. Given that noncore liabilities play a key role in the funding of financial institutions' asset expansion during a cyclical upturn, a key indicator of vulnerability discussed in the chapter is the ratio of noncore-to-core liabilities. As Shin points out in chapter 1, what constitutes core and noncore liabilities will vary from country to country and will be context specific; he explores what may be relevant for an economy such as the Republic of Korea and also what may be relevant in countries where regulations restrict the banking sector from having access to the global banking system.

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From a cross-sectional perspective, Acharya highlights in chapter 2 the value of using market-based signals of systemic risks. These measures are generally based on stock market data because it is most regularly available and least affected by bailout expectations. For instance, the marginal expected shortfall (MES) measure estimates the loss that the equity of a given firm can expect if the broad market experiences a large fall. A firm with both a high MES and high leverage will find its capital most depleted in a financial crisis relative to required minimum solvency standards and, therefore, faces high risk of bankruptcy or regulatory intervention. It is such undercapitalization of financial firms that leads to systemic risk. Notably he shows how the MES can be used to identify institutions that can pose risks to the system as a whole and shows how the information can be used to guide regulation in the U.S. banking system. Similar results are applicable for European institutions. He also explores how these measures may be adapted and used in emerging markets.

Efficacy of Macro Prudential Measures: Empirical Evidence to Date

Little empirical evidence exists to date on the efficacy of macro prudential policies, notably as to what policies work best in a country-specific context. This issue is explored in chapter 5 by Claessens, Ghosh, and Roxana Mihet. They first review the motivations for macro prudential policies. Then, following a review of the empirical literature on the effectiveness of various macro prudential policies, they report the results of their own analysis, based on an econometric estimation involving a sample of 2,800 banks in 48 countries (advanced and emerging) during the period 2000–10. In particular, they examine the effectiveness of different macro prudential policies—limits on loan-to-value (LTV) ratios, caps on debt-to-income (DTI) ratios, limits on credit growth, limits on foreign currency lending, reserve requirements, restrictions on profit distribution, countercyclical capital requirements, and dynamic provisioning—on reducing financial sector vulnerabilities. Their analysis looks at three dimensions through which the financial sector can become vulnerable: namely increase in leverage, growth in assets, and increase in noncore-to-core liabilities. In assessing the effectiveness of macro prudential policies they also distinguish by the stage of the financial cycle (upturn or downturn), on emerging-versus-advanced economies and in open-versus-closed capital account economies.

Their regression results suggest that many of the macro prudential measures can help control banking system vulnerabilities. However, their analysis also suggests that macro prudential policies are much more effective in booms than in busts, with many coefficients statistically significant in expansionary periods and much fewer in contractionary periods. In principle, tools such as reserve requirements could provide liquidity cushions, while dynamic provisioning could help build capital buffers during upturns, supporting lending during downturns. Other tools such as limits on profit redistribution could also have countercyclical, buffer effects, helping banks' willingness to maintain, or at least reduce less,

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their balance sheets in bad times. However, their regressions show that very few policies affect with any statistical significance the speed of decline when the credit cycle reverses. There are actually some negative signs, meaning that having a policy in place worsens the declines.

As they note, the fact that macro prudential policies are mostly effective only in expansionary times may not be surprising, since most macro prudential policies are not designed to mitigate contractionary periods. It could even be that tools like LTV limits actually act perversely during periods of credit contractions and asset price declines. Unless these limits are adjusted quickly in a rightly calibrated manner, that is, without unduly increasing systemic risks, their effects may be perverse.

Regarding the differences in effectiveness of macro prudential policies in emerging markets versus advanced economies, and in open- versus closed-capital-account economies, they do find some differences—including that LTVs are less effective in reducing asset growth in open economies and DTIs are less effective in reducing leverage growth in emerging markets and open economies.

Case Studies: Brazil and the Republic of Korea

The two final chapters deal with the country experiences of Brazil and the Republic of Korea, which deployed macro prudential policies to address their unique macro financial challenges.

In chapter 6, Luiz Perriera da Silva and Ricardo Harris analyze and document Brazil's experience. Brazil fared well during the global financial crisis. By 2010, its GDP was growing at 7.5 percent year-on-year (YOY) and its investment at over 11 percent YOY. But the strong V-shaped recovery—coupled with increased global liquidity, high commodity prices, and strong capital inflows—began to give rise to inflationary pressures, and by 2011 the economy was showing signs of overheating. In addition, an intensified flow of foreign financing increased the potential of financial instability within the economy, which was already going through an extended period of rapid credit expansion (over 22 percent per year between 2005 and 2011).

In this context, Pereira da Silva and Harris outline Brazil's unique experience deploying macro prudential policy to complement existing monetary and fiscal policy tools to address its financial challenges. Brazil increased bank reserve requirements to dampen the transmission of excessive global liquidity to domestic credit markets; increased credit requirements for specific segments of the credit market to address with the aim of stemming the deterioration in the quality of loan origination; and enacted reserve requirements on banks' short-spot foreign exchange positions and taxed specific inflows to correct imbalances in the foreign exchange market as well as to address intensified, volatile inflows of capital. Enacted in addition to policy rate hikes and credible commitments to reduce the public-debt-to-GDP ratio, these measures were successful in reducing the growth of household credit to a more sustainable pace. They affected not

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only the volume of new loans but also their interest rates and average maturities.

Global financial deterioration in the second half of 2011 (and extending into 2012) gave Brazil an opportunity to fine-tune its deployed macro prudential regulations to tailor them to the new economic outlook, but this proved a difficult task. Indeed, Brazil's experience in this regard is indicative of the incomplete understanding of the economics profession of how systemic financial risks develop and how macro prudential tools impact those risks, particularly in emerging markets. For example, the bulk of the macro prudential regulations enacted by Brazil dealt with the time-series dimension of systemic risk, that is, with the procyclicality of the financial system. However, given the high degree of conglomeration in the Brazilian financial system, experience quickly showed that that cross-section risks arising from the interconnectedness of the financial system and the real economy also would need to be addressed.

Brazil's experience as outlined by Pereira da Silva and Harris is illuminating, especially for emerging markets. Brazil was innovative during and after the peak of the global financial crisis, not least in exploring the boundaries of Tinbergen's separation principle, using two instruments (the base rate and a set of macro prudential tools) to address two objectives (price stability and financial stability). The country's experience exemplifies the need for regulators and central bankers to be "ahead of the curve" in dealing with ongoing financial stress in the present context of the global economy.

This mindset may be illustrated by the experience of Korea, as described by Jong Kyu Lee in chapter 7. Korea operated several macro prudential policy instruments prior to the advent of the financial crisis in 2008. Although not based on the concept of financial stability as currently discussed, these instruments did take forms similar to those now in vogue. For example, as part of its systematic macro prudential framework, Korea applied several types of liquidity ratio regulations as early as 1997 aimed at addressing potential weakness in domestic banking and foreign exchange transactions. Later, with a housing boom becoming apparent, Korean authorities also introduced an LTV ratio and, finally, a DTI ratio.

These arguably prudent measures notwithstanding, Korea faced a round of crisislike events in 2008. The economy had accumulated a new type of financial imbalance in domestic banking as well as in foreign exchange transactions, associated in part with the housing market boom. Banks had raised funds through noncore liabilities and expanded their lending to households in line with strong housing prices. Meanwhile, to meet the growing demand for foreign exchange derivatives transactions, banks had simultaneously begun to rely increasingly on short-term foreign borrowing. Lee thus assesses that the macro prudential measures "were unable to achieve the ultimate goal of 'preventing systemic events.'"

Lee identifies a number of factors to which this failure may be attributed. The micro rather than macro prudential objectives of the measures are noted first. Another reason may have been the governance of the measures. Supervisory

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authorities, whose purview rests in micro prudential territory, were responsible for handling these measures and, thus, were not targeting macro level variables or events critical to financial stability. Chapter 7 outlines these and other factors in more detail, providing lessons for the rapidly evolving macro prudential policy arena.

That being said, Lee does find that these policy measures had some impact. He finds that the limits on LTV and DTI ratios helped maintain the soundness of financial institutions during the global crisis, but that these measures had only a temporary effect in dampening housing prices and housing loan volumes in the period prior to the crisis.

The Korean experience offers important lessons about the potential as well as the limitations of these types of regulations. Above all, the Korean experience serves as a basis for evaluating several macro prudential measures from a variety of viewpoints. For a well-defined macro prudential framework, the objective, scope, and other elements of the policy need to be specified. The choices of operational options, such as single versus multiple measures, broad-based versus targeted risks, and fixed versus time-varying application can also impact the effectiveness of macro prudential tools. In this regard, the Korean experience is a good illustration of not only how macro prudential tools may be deployed but also what can go wrong in the deployment of macro prudential measures with respect to the factors outlined above.

Notes

1. The Third Basel Accord is a global, voluntary regulatory standard on bank capital adequacy, stress testing, and market liquidity risk.
2. The buildup of banking systems vulnerabilities in advanced economies prior to the global crisis took place through complex chains of financial intermediation and involved large gross capital flows. Global banks, particularly European banks, were key players in this process, raising funds in U.S. wholesale markets and then lending these back to U.S. residents through purchases of securitized claim on U.S. borrowers, mostly related to residential mortgages. While net capital flows—that is, the net of gross inflows and outflows—were relatively small, gross exposures ended up being very large. The shock that originated in the U.S. subprime market quickly affected many financial systems around the world. As banks were vulnerable on their funding side to wholesale markets and developments in the U.S. dollar shadow-banking system, liquidity shortages quickly spread. These disturbances lead to major real sector dislocations as the tightening of funding spurred a downward cycle of balance sheet contractions and deleveraging declining asset prices and declining economic activity (Claessens and others 2012).
3. M2 is the sum of currency held by the public and transaction deposits at depository institutions (which are financial institutions that obtain their funds mainly through deposits from the public, such as commercial banks, savings and loan associations, savings banks, and credit unions), savings deposits, small-denomination time deposits (those issued in amounts of less than $100,000), and retail money market mutual fund shares.

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