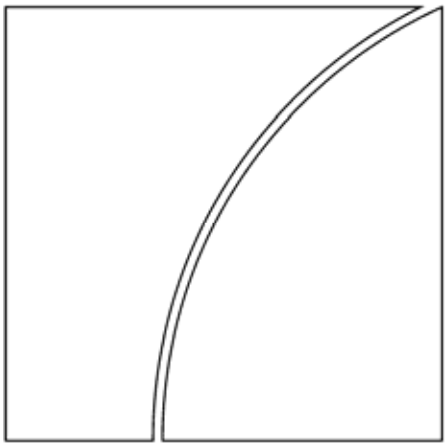
BANK FOR INTERNATIONAL SETTLEMENTS



# BIS Working Papers

No 242

# What can (macro-)prudential policy do to support monetary policy?

by Claudio E V Borio and Ilhyock Shim

Monetary and Economic Department

December 2007

BIS Working Papers are written by members of the Monetary and Economic Department of the Bank for International Settlements, and from time to time by other economists, and are published by the Bank. The views expressed in them are those of their authors and not necessarily the views of the BIS.

Copies of publications are available from:

Bank for International Settlements

Press & Communications

CH-4002 Basel, Switzerland

E-mail: publications@bis.org

Fax: +41 61 280 9100 and +41 61 280 8100

This publication is available on the BIS website (www.bis.org).



ISSN 1020-0959 (print)

ISSN 1682-7678 (online)

# Abstract

In the economic environment that has been emerging over the last couple of decades, it is more likely that the occasional build-up of financial imbalances, typically in the form of unsustainable credit and asset price booms, will occur against the background of low and stable inflation, posing a potential threat to financial and macroeconomic stability. This means that the scope for monetary policy to lean against the build-up may be more constrained than in the past, when those imbalances would normally develop alongside rising inflation. This puts a premium on a strengthening of the macroprudential orientation of prudential frameworks, designed to restrain the build up of the imbalances and to make the financial system better able to withstand their unwinding. In this paper, we review the progress made in this direction in recent years. We conclude that there is now a much keener awareness of the importance of a macroprudential orientation but that progress in making it operational, while considerable, has been slower. The main obstacles are of an analytical and, above all, institutional/political economy nature. We suggest ways in which these obstacles could be addressed and underline the potential complementary role that adjustments in monetary policy frameworks could play.

JEL Classification: E30, E44, E52, G20, G28

Keywords: financial stability, price stability, financial imbalances, macroprudential, financial regulation and supervision, monetary policy

# Table of contents

## Introduction[1]

It has long been recognised that that there is a strong complementarity between monetary and prudential policies. A sound financial system is a prerequisite for an effective monetary policy; just as a sound monetary environment is a prerequisite for an effective prudential policy. A weak financial system undermines the efficacy of monetary policy measures and can overburden the monetary authorities; a disorderly monetary environment can easily trigger financial instability and render void the efforts of prudential authorities. Economic history attests to this, as illustrated by the anatomy and consequences of the financial crises that have affected the industrialised and developing world, going back to previous centuries.

So much is agreed. What is more contentious is the view that some fundamental changes in the economic environment over the last quarter of a century may actually have tightened the interdependence between monetary and prudential policies, potentially calling for significant refinements in policy frameworks. In some research at the BIS in recent years we have been exploring this possibility in some detail.

More specifically, the basic hypothesis we have been investigating is that changes in the monetary, financial and real economy regimes may have been subtly changing the dynamics of the economy and the challenges faced by central banks. We have argued that the joint effect of financial liberalisation, the establishment of credible anti-inflation regimes and the globalisation of the real-side of the economy may have been to make it more likely that, occasionally, financial imbalances build up against the background of low and stable inflation. These imbalances can have potentially serious implications for the macro-economy and financial stability to the extent that they unwind in a disruptive way. By financial imbalances we mean overextensions in private sector balance sheets, characterised by joint credit and asset price booms that "go too far", sowing the seeds of the subsequent bust. In other words, changes in the economic environment may have increased the "elasticity" of the economy or, put differently, its potential "procyclicality".[2]

As extensively argued elsewhere, if accepted, this hypothesis has implications for both monetary and prudential policy. It would be helpful for monetary policy frameworks to allow sufficient room for manoeuvre for policy to be tightened even if near-term inflation pressures appear at bay, thereby leaning against the build-up of the imbalances. It would be helpful for prudential policy frameworks to strengthen their *macroprudential* orientation, thereby addressing the build-up and unwinding of the imbalances more effectively.

In this paper, following the invitation of the organisers, we will not develop the arguments for a pre-emptive monetary policy response. Rather, we will focus on what prudential policy can do to support monetary policy. Moreover, we will discuss these issues from the narrow perspective of the ebbing and flowing of financial imbalances. That is, we take as *given* that the basic prudential infrastructure is in place and fully functioning, including a sound legal and institutional environment and proper enforcement mechanisms. In other words, the question we address is what prudential policy can do *over and above* fulfilling the commonly agreed criteria for an effective prudential framework, as codified in the body of international codes and standards. This has the merit of highlighting the specific strengths, but also the limitations, of prudential tools in this context.

We reach the conclusion that prudential policy has an important role to play, has been moving in the right direction but that there is room for further adjustments (BIS (2005a), Knight (2006)).[3] Moreover,

---

[1] This is a revised version of the paper that was originally prepared for the Workshop on "Inflation targeting in emerging market countries" organised by the Bank of Thailand on 13-14 November 2006 and published in the corresponding volume of conference proceedings. The main addition is the econometric annex. The paper has not been updated to include the turmoil in financial markets which started in August 2007. We would like to thank Kostas Tsatsaronis, William White and BIS seminar participants for their helpful comments and Marjorie Santos for excellent statistical assistance. The views expressed are our own and do not necessarily reflect those of the Bank for International Settlements.

[2] Throughout the paper, and in order to avoid confusion, a variable is said to be procyclical if it moves in such a way as to *amplify* the business cycle. In other words, the definition refers to the *impact* of the variable on economic activity, not to the direction of its *co-movement* with activity.

[3] The literature on the issues covered in this paper is vast. The references here are mainly confined to BIS work. For a more complete set of references, the reader is referred to the individual papers mentioned.

prudential policy alone is not sufficient to address the challenges that policymakers face in this area. Monetary policy can play a supportive role. And, while not discussed in detail, other policies would need to take a share of the burden, not least fiscal policy.

The structure of the paper is the following. In the first section we explain why we believe that it has become more important to strengthen the macroprudential orientation of prudential policy in support of monetary policy. This involves summarising briefly the arguments about the implications of changes in financial, monetary and real economy regimes for the dynamics of the world economy. In the second section we assess the pros and cons of various prudential policy options in addressing financial imbalances and review briefly the experience with their implementation. In the third section we assess the obstacles to a more effective use of prudential tools and suggest ways to address them. The conclusions summarise the key points and draw out the implications of the analysis for other policies.

## I. Why has prudential support become more important?

The world we live in is remarkably different from the one of a quarter of a century ago. Financial markets have been liberalised around the globe. Heavily controlled and segmented domestic financial systems have given way to the emergence of a lightly regulated, open and competitive global financial environment. The changes in the real side of the economy have been equally spectacular. The markets for goods, services and factor inputs have become much more integrated. While this process of globalisation of the real side of the economy has been proceeding throughout the post-war period, it has no doubt accelerated since the early 1990s. This is the period that has seen the integration into the market system of previous command economies such as China and the former Soviet Union and a greater acceptance of market principles across many developing countries, not least India. And alongside these developments monetary policies have made major strides in their battle against inflation. Since the 1990s we have entered a phase of low and stable inflation across most of the world. This has gone hand-in-hand with institutional changes designed to hard-wire this success. They have taken the form of monetary policy regimes focused on inflation control and underpinned by a greater degree of central bank independence.

The success against inflation has been extraordinary and has yielded tremendous benefits. Not least, it has resulted in an environment in which global growth has been higher and the macroeconomy, *on average*, much more stable than during the inflationary years.

At the same time, contrary to widespread expectations, lower inflation and a more stable macroeconomy have not been sufficient to secure financial stability. While episodes of financial instability had already been present during the inflationary years, they did not go away once inflation was conquered. Especially since financial liberalisation in the early 1980s, the longer economic expansions have seen larger booms in credit and asset prices in both the industrialised and developing world, often followed by shorter but quite disruptive busts. These busts have sometimes contributed to serious financial strains with material consequences for the real economy and, on occasions, to more costly outright financial crises. Consequently, financial instability concerns have gradually made their way to the top of the international policy agenda.

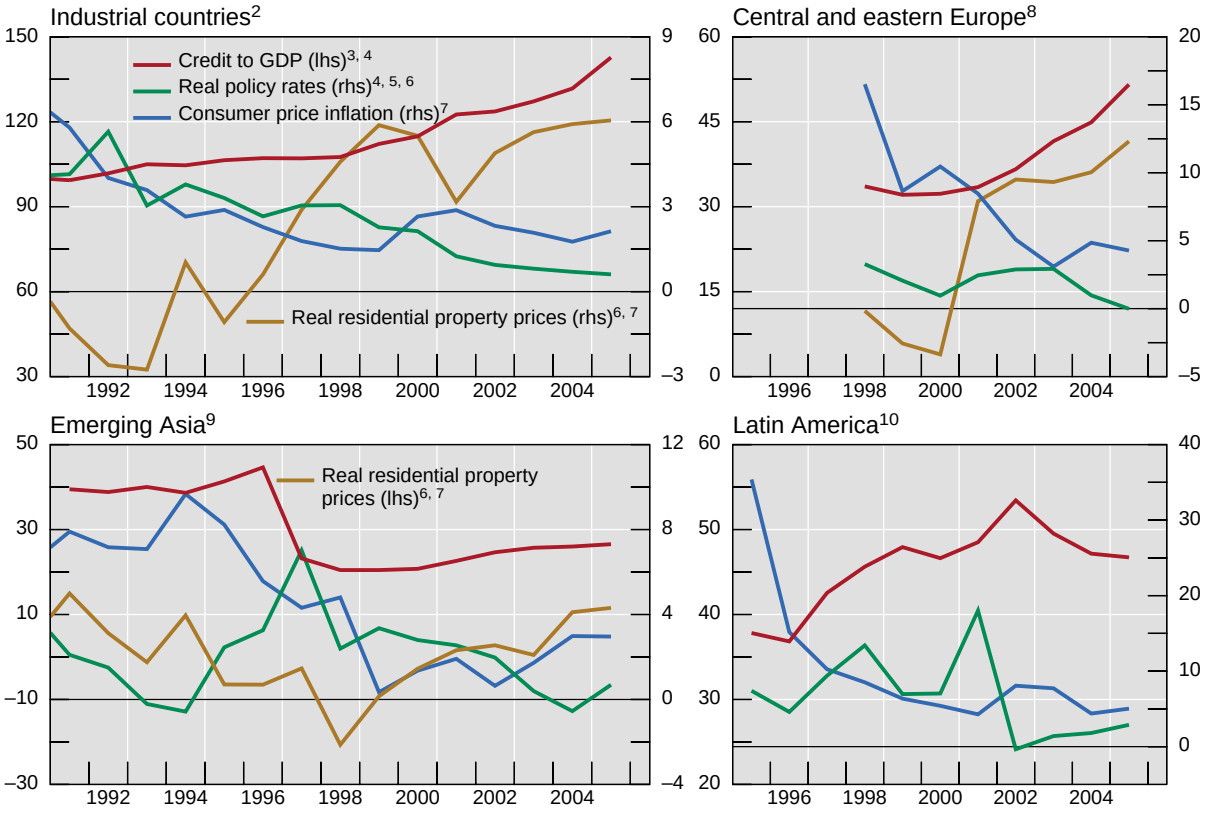
Thus, the macroeconomic background to the episodes of financial distress has evolved alongside inflation performance. During the inflationary phase, they tended to coincide with efforts by central banks to fight inflation through higher interest rates. This was the case, for instance, for the secondary banking crisis in the United Kingdom as far back as the early 1970s or for the Savings and Loan crisis in the Untied States in the 1980s. The more recent ones, however, have occurred even against the backdrop of comparatively quiescent prices. This was most notably the case in Japan in the late 1980s-early 1990s and in a number of Asian countries a few years later, as the financial crises broke out. Ostensibly, price stability has not been sufficient to secure financial stability.

These developments have gone hand in hand with apparent changes in the dynamics of business fluctuations. With inflation quiescent, a sharp monetary tightening to see off strongly rising inflationary pressures has become a less common trigger for global economic slowdowns. For example, the one in 2001 was driven by a largely spontaneous unwinding in an investment-driven boom in the United States. Concomitantly, asset prices generally appear to have come to play a more salient role in the ups and downs of the economy. Equity prices were instrumental in the upswing and downswing of the late 1990s-early 2000s. Similarly, an unusually widespread boom in residential property prices has

been underpinning the global expansion since then, supported by rapid credit expansion and an accommodating monetary policy (Graph 1). Given comparatively weak business fixed investment, except in China, the boom has helped to support consumer expenditure and residential investment, which have accounted for an overwhelming share of world growth. Asia has not escaped these trends (CGFS (2006), BIS (2006a), IMF (2006a)).

Graph 1

**Credit, asset prices and monetary policy[1]**




[1] Simple average of the economies listed. [2] G10 plus Australia, Finland, Greece, Iceland, Ireland, New Zealand, Norway, Portugal, and Spain. [3] Total credit to GDP, for Asia, household credit to GDP. [4] In per cent. [5] Central bank target rates or money market rates. [6] Deflated by annual changes in consumer prices. [7] Annual changes, in per cent. [8] Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland and Romania. For property prices, only Bulgaria, Croatia, the Czech Republic, Estonia, Hungary and Poland. [9] China, Hong Kong SAR, India, Korea, Malaysia and Thailand. [10] Argentina, Brazil, Chile, Colombia, Mexico and Peru.

Sources: IMF; Bloomberg; Datastream; national data.

We have argued elsewhere that it may be possible to trace these novel characteristics of the dynamics of the world economy back to the triad of forces mentioned at the outset, viz. financial liberalisation, the establishment of credible anti-inflation regimes and the globalisation of the real-side of the economy (Borio and Crockett (2000), Borio and Lowe (2002a), Borio and White (2004), Borio (2007)). While each of them is undoubtedly enormously beneficial, their interaction may have been producing some subtle effects that deserve attention.

Financial liberalisation may have made it more likely that financial factors in general, and booms and busts in credit and asset prices in particular, act as drivers of economic fluctuations. In particular, financial liberalisation has greatly facilitated the access to credit. It has therefore also increased the scope for perceptions of wealth and risk to drive the economy, more easily supported by external funding. More than just metaphorically, we have shifted from a cash-flow constrained to an asset-backed global economy.[4] Such perceptions are highly procyclical, reinforcing expansions and

[4] To our knowledge, the term asset-backed economy was first used in this context by Calverley (2004).

contractions as they move in sync with the real economy. While these forces are essentially part of the "physiology" of the economic system – the oil that lubricates it – occasionally, they may go too far, and hence become part of its "pathology". Limitations in risk perceptions and incentive mechanisms play a key role here (see below). In these instances, financial imbalances develop during the upswing, raising the risk of macroeconomic damage at some point in the future, as they eventually unwind.

At the same time, the establishment of a regime yielding low and stable inflation, underpinned by central bank credibility, may have made it less likely that signs of unsustainable economic expansion show up first in rising inflation and more likely that they emerge first as excessive increases in credit and asset prices (the "paradox of credibility"). The credibility of policymakers' commitment to price stability, by anchoring expectations and hence inducing greater stickiness in prices and wages, can delay the inflationary pressures normally associated with the unsustainable expansion of aggregate demand. And low inflation, by obviating the need to tighten monetary policy, can also remove a key constraint on the development of the imbalances. There is a risk of unwittingly accommodating their build-up.

Finally, the globalisation of the real economy may have played a dual role. On the one hand, it may have represented a sequence of pervasive positive supply-side "shocks". Such shocks would tend to raise world growth potential and help to keep inflation down while at the same time encouraging the asset price booms on the back of liquidity expansion. On the other hand, it may have interacted with monetary policy so as to reinforce these mechanisms. As a positive force, it may have helped to underpin central bank credibility. The tailwinds of globalisation have arguably supported the disinflation process and made it easier, at least so far, to keep inflation low (BIS (2005a and 2006b)). As a less welcome force, it may at times have induced central banks to lean too heavily against the prospect of negative inflation rates. As history indicates, such supply-side-driven deflations are quite benign compared with their demand-driven counterparts. The risk is that, paradoxically, excessive resistance to "good deflations" can, over time, lead to "bad deflations", if it supports the build-up of financial imbalances that eventually unwind (Borio and Filardo (2004), White (2006a)).

The bottom line is that the current environment may be more vulnerable to the *occasional* build up of financial imbalances, ie overextensions in (private sector) balance sheets. These imbalances herald economic weakness and *unwelcome disinflation* down the road, as they unwind. The unwinding may occur either because inflation eventually *does emerge* and the central bank is forced to tighten, or because the boom falters *under its own weight*.

While the above lens is not the only one through which developments over the last quarter of a century can be viewed, it is arguably consistent with a number of stylised facts. Seen from this perspective, it may not be a coincidence that business fluctuations appear to be becoming more similar to those that had been common under the Gold Standard. It was then that a financially liberalised environment had already coincided with a monetary policy regime which, by design or implication, yielded a reasonable degree of price stability. Moreover, more formal empirical work carried out at the BIS has supported some of the implications of this view. In particular, real-time measures of financial imbalances, based on simple indicators of the coexistence of unusually strong credit and asset price increases, have proved to have fairly good leading indicator properties for economic weakness, disinflation and banking crises, over horizons of between two to five years ahead (see below). In addition, there is also evidence that monetary policy has tended to lean more heavily against the unwinding of financial imbalances than against their build-up (Borio and Lowe (2004)). And, consistent with the role of globalisation in the disinflation process, we have found that global measures of excess capacity appear to have gained ground in the inflation determination process, sometimes at the expense of purely domestic measures (Borio and Filardo (2007)).

All this clearly puts a premium on the support that prudential policy can provide for monetary policy. This is obvious for monetary regimes with strong exchange rate commitments. In this case, the hands of monetary authorities are effectively tied, except in the presence of tight exchange and capital controls. But it is also true for those regimes that allow for more flexible exchange rates and that focus on inflation objectives. For, the analysis would suggest that it is important for monetary policy to retain the option of leaning against the build-up of financial imbalances *even if near term inflation pressures remain subdued,* so as to limit the risk of a subsequent disruptive unwinding. This course of action remains very controversial and difficult to implement. There are doubts about its effectiveness on purely technical grounds. These include issues of timing, calibration, and potential collateral damage, not least an undesired appreciation of the exchange rate in small open economies. More importantly, though, it is politically very hard to justify increases in policy rates if the inflation outlook is benign. The obstacles are particularly daunting in those inflation targeting regimes which, operationally, target

inflation over short horizons, of between one to two years. Admittedly, in recent years the intellectual climate among central banks has become more supportive of such a pre-emptive tightening. A number of central banks have adjusted their frameworks to envision this possibility and appear to have taken decisions that are broadly consistent with this notion (Borio (2007)). Even so, the room for manoeuvre has remained quite limited so far.

What is true of individual countries applies with even greater force at the global level. The international transmission mechanism of monetary conditions is crucial here. The forces of financial globalisation have arguably constrained the room for manoeuvre of individual countries. They have made it harder to maintain policy rates at levels that deviate markedly from those prevailing in global markets by increasing the sensitivity of capital flows to interest rate differentials. This has exacerbated policy choices. Asia is a clear case in point. In particular, against the backdrop of policy rates that have been unusually low for unusually long in the key currency areas of the world, of unwelcome upward pressure on exchange rates and of subdued domestic inflation, policy rates in Asia have been close to zero in inflation-adjusted terms for a prolonged period.[5] All this has contributed to a global expansion in liquidity, as reflected in the rapid growth of global monetary and credit aggregates, whose ultimate effects are still quite uncertain (BIS (2004), Borio (2007)).

## II. The prudential policy response: options and progress made

### General orientation: the importance of the macroprudential dimension

What, then, can prudential policy do?

The first thing it can do is to strengthen the foundations of the prudential apparatus. Since the Asian financial crisis in particular, the international community has made major efforts to strengthen the so-called international financial architecture (eg, Working Party on Financial Stability in Emerging Market Economies (1997), G22 (1998)). The development of agreed codes and standards for the sound functioning of financial systems has been a key element of the strategy. Within that set, prudential standards have been prominent (BCBS (1997 and 2006a)). True, effective implementation has proved difficult. But the process in place has provided a useful framework to guide countries' efforts to develop the required financial infrastructure.

Beyond this, a question arises about the precise contours of the prudential framework itself. Are there any special characteristics which might help to address more directly the occasional build-up of financial imbalances? As argued extensively elsewhere, a key step would be to strengthen the *macroprudential* orientation of the framework (Crockett (2000), BIS (2002), Borio (2003), White (2006b)). Doing so has two main elements, one more general and the other more specific.

The more *general* element is to take further the shift in focus away from individual institutions towards the *system as a whole*. The episodes of financial distress have shown that major crises do not result so much from idiosyncratic problems at individual institutions which then contagiously spread throughout the system. Rather, they result from the shared, sometimes less apparent, exposures to the build-up of macroeconomic financial imbalances. A holistic view of the financial system, and of its multifaceted linkages with the macro-economy, is clearly needed.

The more *specific* element is to address the risk of excessive *procyclicality* in the financial system (Borio et al (2001))[6]. This implies offsetting those mechanisms that can potentially lead to generalised overextension and subsequent excessive retrenchment. The basic principle is to encourage the build-up of cushions in good times, when imbalances typically emerge, so that they can be run down, up to a point, in bad times, as the imbalances unwind.

---

[5] For a detailed analysis of the role of the exchange rate in policy frameworks in emerging market countries, see Ho and McCauley (2003).

[6] For some specific evidence on the degree of procyclicality in Asian financial systems, see Craig et al (2006).

Implementing the principle would have three merits. First, it would help to track risk more closely. While it has been common to think of risk as falling in booms and rising in recessions, it is better to think of it as rising in booms, if and when imbalances develop, and as materialising in the bust, as the disruptions unfold. Second, it would allow cushions to act as such. Unless they are run down, the buffers cannot perform their function. And in order to do so, the buffers need to be sufficiently high to start with; otherwise, forbearance would be inevitable. Finally, by leaning against the procyclical forces of the economy, it could limit the size of financial imbalances in the first place and hence the risk of subsequent financial instability and macro-stress. Through all these mechanisms, implementing the principle would strengthen *both* individual institutions *and* the system as a whole.

How much progress has been made in this direction (Borio (2007), Knight (2006))? There is no doubt that awareness of the importance of the macroprudential dimension of financial stability has greatly increased in recent years. The Asian crisis, which highlighted the macroeconomy-financial sector nexus, and the debate surrounding the possible procyclicality of Basel II have played a major role in this context. The progress made in implementation has also been considerable. At the same time, legitimate questions remain.

In order better to understand the progress made and the open questions, it is useful to consider separately the measurement of risk and the calibration of the policy tools. Not only is the measurement of risk a precondition for calibration, promoting a better understanding of risk can also avoid the need for other, more intrusive, policy measures. We explore the pros and cons of the various options available and the experience with them so far.[7]

**The macroprudential dimension: the measurement of risk**

The measurement of risk by policymakers has become much more focused on the financial system as a whole, consistent with a strengthening of the macroprudential orientation. The essence of the approach has been to seek to identify vulnerabilities with system-wide implications, paying special attention to the link between the macroeconomy and the financial sector. Some of this work has been of a general nature; some has highlighted more specifically the financial imbalances discussed above. Naturally, the approach has combined quantitative and qualitative elements.

Formal quantitative work has essentially proceeded along three lines.

The first is the development of ***better data and simple descriptive statistics*** of the health of financial systems (eg, sectoral balance sheet information, measures of capitalisation and asset quality, etc.). The so-called macroprudential indicators identified by the IMF are a case in point. These data are essential, but only a starting point. The main drawback is that, in and of themselves, the descriptive statistics of financial system strength are often *lagging* or, at best, *contemporaneous* indicators of distress. Bank profits, capital and loan quality measures are obvious examples. More forward-looking assessments require a "theory", however primitive, of the dynamics of distress.

The second is the development of ***macro-stress tests*** (eg, Sorge (2004) and BIS (2005b)). By analogy with their firm-level counterparts, these seek to establish the resilience of the financial system as a whole, or sub-sectors thereof, to plausible but severe adverse developments. These developments range from shocks to individual risk factors, such as exchange rates, interest rates and asset prices, to more complete scenarios, which combine both macroeconomic and financial factors. A distinguishing characteristic of such stress tests is that they generally do not assess the probability of a given adverse development materialising, but only the costs of its materialisation. Sometimes these exercises are done only at the aggregate level; sometimes they combine both macro and individual firm (bank) data. Sometimes they are carried out by the authorities on their own; sometimes they are done iteratively with the direct involvement of the relevant financial institutions. Macro-stress tests have become a standard element of Financial Sector Assessment Programs (FSAPs), implemented jointly by the IMF and the World Bank (IMF (2005)).

The third is the development of so-called ***early warning indicators***. Their objective is to form a quantitative assessment of the risk that a crisis may occur. While, initially, much of the work had been

[7] For an analysis of the range of possible instruments, see also McCauley et al (1999).

on currency or sovereign debt crises, over time an increasing amount of effort has gone into the analysis of banking crises and their relationship to the other types of distress.

Formal research in this area carried out at the BIS has mainly focused on banking crises with systemic consequences and has been inspired by the view that the build-up of financial imbalances is the most common source of distress (Borio and Lowe (2002a, 2002b and 2004)).[8] In particular, and in contrast to the rest of the available literature, that work has been fairly successful in identifying the occurrence of banking crises *with a two-to-four year lead* based on the characteristics of the preceding boom, as opposed to those closer to the emergence of the disruption. The corresponding indicators rely exclusively on information available at the time the predictions are made. They seek to capture *joint* excessive asset price increases and credit growth. The proxies are intended to measure the co-existence of asset price misalignments with a limited capacity of the system to absorb the asset price reversal. Misalignments are simply captured by deviations of equity[9] and possibly exchange rates from trend; the absorption capacity of the system by the ratio of private sector debt to GDP. In its rating assessments of banking systems and countries, Fitch Ratings has implemented a combination of micro- and macro-prudential indicators, with the macroprudential component based on this methodology (Fitch Ratings (2005)).

While promising, quantitative work on macro-stress tests and early warning indicators is still in its infancy. Macro-stress tests are very rudimentary compared to their micro counterparts, which address the risks in the portfolio of individual institutions. First, linking macroeconomic developments formally to the performance of the financial system has proved difficult. Above all, it has proved exceedingly hard to model in a meaningful way the feedback effects of distress on asset prices and the real economy. Consequently the degree of financial stress arising from the response of the financial system to the original "shock"– the critical "endogenous" dimension of risk – has remained largely unmodelled. Second, and relatedly, the horizons over which these "shocks" are assumed to play themselves out are generally too short and hence the results not sufficiently convincing. Finally, the performance of early warning indicators is too heterogeneous and uneven. With a few exceptions, such as some of those noted above, they are not forward-looking enough, acting more like coincident than leading indicators of distress. This may be fine for investors, but is not so for policymakers, who need sufficient lead time to take measures. Moreover, we simply do not know how well they might perform in future. Even if successful in retrospect in capturing signs of impending distress, their performance may not prove robust to the passage of time, as financial systems evolve further.

Such quantitative work can of course only be an element in a broader, more ***qualitative assessment of potential vulnerabilities***. In recent years, national and international fora have been routinely carrying out macroprudential monitoring exercises, blending quantitative and qualitative elements. Nationally, central banks have taken the lead, as witnessed by the proliferation of Financial Stability Reports. In some countries, the assessments are carried out in close cooperation with supervisory authorities. Internationally, the Financial Stability Forum has been very active and has encouraged the dialogue between different types of authority, by bringing together senior representatives of national and international prudential authorities, central banks, ministries of finance and international financial institutions. Similar monitoring exercises are also performed at the BIS by the Committee on the Global Financial System – a central bank body – and by international financial institutions, such as the IMF.

On balance, how successful have these quantitative and qualitative efforts been? This depends very much on the benchmark for the judgement. They have no doubt established a basis for a more structured assessment of vulnerabilities. And by raising the awareness of specific characteristics of the

---

[8] A more granular framework, based on a wider array of disaggregated indicators, is also used in the context of monitoring exercises; see Hawkins and Klau (2000).

[9] Equity, as opposed to real estate, prices were used simply because of restrictions on data availability. Conceptually, real estate prices should be expected to perform better, as they have played a key role behind the macroeconomic costs associated with financial distress (BIS (1993), IMF (2003)). If anything, it is surprising how much mileage one can get by simply relying on equity prices. In part, this may result from the historically close correlation between the two asset classes, with booms and busts being temporally close and with peaks in equity prices tending to lead those in real estate prices by about a couple of years (Borio and McGuire (2004)). This tight correlation, however, has been far less in evidence in the cycle currently under way. This would suggest that an assessment of potential threats to financial stability ahead would have to be based on real estate prices directly.

build-up of distress, they have provided clues for refinements of policy frameworks and, in some cases, discretionary policy measures (see below). At the same time, compared with what is the case for monetary policy, they have so far fallen short of yielding an agreed and tight overall framework. For instance, the preliminary nature of the quantitative work has meant that it has not as yet imposed sufficient discipline on the assessment of vulnerabilities. The result has been twofold. On the one hand, there has been an excessive tendency to "look at everything" without a good sense of "how" to look at everything. On the other hand, there is still too much room for quasi-philosophical priors concerning the strength of the stabilising or destabilising nature of market forces to influence the final judgements. Rather sterile debates can result.

## The macroprudential dimension: the calibration of policy tools

### *General considerations*

From the perspective of the build-up of financial imbalances, the key question is how best to calibrate tools to address the potential excessive procyclicality of the financial system. There is, in principle, a wide range of such tools. What follows will consider only a sub-set of those most typically regarded as being of a prudential nature. Besides efforts to promote a better risk management culture, these include loan provisioning rules, capital standards, loan-to-value ratios, measures to address currency mismatches and, more generally, the intensity of the supervisory review process. It should be noted, though, that a range of instruments considered of a monetary nature, such as reserve requirements and restraints on lending, can in fact perform a very similar function. Indeed, they have often been operated alongside, or as an alternative to, prudential tools.

A first issue that arises is whether calibration should take the form of built-in stabilisers or discretionary measures. The advantage of discretionary measures is that, in principle, they can be better fine tuned to the characteristics of financial imbalances. By their very nature, imbalances arise infrequently and they vary in terms of intensity and specific features, such as the sectors affected. If temporary, the measures may also be less subject to avoidance. The main advantage of built-in stabilisers is that, *provided* they are related to robust aspects of the imbalances, they leave less room for policy error. Moreover, once in place, they do not require continuous justification, and hence can act as an effective pre-commitment device. As such, they can relieve pressure on the supervisors from the regulated and the body politic not to take action during the boom, as a tightening of prudential standards would inevitably be seen as going against the manifest view of the markets. The inhibiting effect on the authorities, in turn, could easily result in action being taken too late, if at all. In turn, the presence of built-in stabilisers can influence private behaviour ex ante, encouraging more prudent behaviour.

On balance, therefore, we believe that built-in stabilisers are superior[10]. At the same time, the two sets of measures should not necessarily be seen as alternatives. To the extent that built-in stabilisers are too hard to design or not sufficiently effective, complementary discretionary measures may be envisaged in some situations.

An obvious objection to the use of discretionary measures is that prudential authorities do not necessarily have superior information about the build-up of the imbalances compared with market participants. This may well be true. However, the authorities do have a very different set of objectives and hence different incentives. Owing to foregone short-run profit opportunities, it is typically very hard for market participants to go against the tide, even if, at bottom, they are not convinced about the sustainability of the boom. For a number of reasons that have to do with governance arrangements, their effective horizon can be quite short.[11] It is not uncommon to hear participants complain that risk is under-priced, but to blame this on others or on anonymous market forces. The situation is quite different for the prudential authorities. Their task is precisely that of avoiding tail risks in the system.

---

[10] For a similar position, see Goodhart (2004), who suggests relating prudential requirements, including possibly capital and liquidity requirements, to various "risk margins", which move procyclically.

[11] Short horizons can easily result from contractual mechanisms designed to overcome "asymmetric information" obstacles, which may thus have unintended consequences. The routine monitoring of performance based on short-term benchmarks is one such example.

And, by implication, their horizon can be considerably longer. In other words, the distorted incentives which are a key factor behind overextension and over-retrenchment in the financial system also provide a justification for discretionary measures.

We next consider the calibration of the various tools chosen, discussing their operation first as built-in stabilisers and then as discretionary adjustments. We then provide an assessment of their effectiveness and limitations.

### *Built-in stabilisers*

In principle, the best possible built-in stabiliser would be ***risk management practices*** which internalised the risk of the build up of financial imbalances and their unwinding. There is little doubt that major improvements in risk management and credit culture have taken place in recent years. Prudential authorities have played an important role here. Not least, the process of developing and implementing Basel II has been very helpful. Banks have been encouraged to improve their data collection systems: one of the reasons for delays in implementation has been that banks simply threw away vital historical records of loan performance! Banks have also been under great pressure to adopt more disciplined and quantifiable risk practices. More specifically, the debate surrounding the potential procyclicality of Basel II has made banks better aware of the cyclical dimension of risk and is likely to instill greater caution and more forward-looking behaviour in risk management practices (see also below).

At the same time, it is probably unrealistic to expect these improvements to be sufficient by themselves (Borio et al (2001), Lowe (2002)).[12] First, banks' internal rating systems tend to be rather procyclical to start with, typically producing low readings of risk in booming conditions, even when risks are in fact building up.[13] In part, this results from rather short horizons for the assessment of risk, driven by the tyranny of the yearly accounting cycle as well as by incentive structures. The shorter the horizon, the easier it is to expect current conditions to continue. In part, it results from reliance on market prices, themselves highly procyclical. Quite apart from procyclical market assessments of risk, these prices are "contaminated" by the procyclical behaviour of risk tolerance and hence risk premia. Filtering this out is not straightforward.[14] Second, as described earlier, risk measurement technology has not yet advanced sufficiently. There is still no agreement on which information to base risk assessments so as to avoid dangerous extrapolation of booming conditions and encourage more prudent expectations of a reversion to the mean. Finally, even in those cases where risk might be accurately measured, incentive structures may not be conducive to restraint, for the reasons already discussed. Here, too, short horizons play a key role.

***Loan provisions*** tend to be strongly procyclical. The main reason is that for a provision to be taken, it is normally necessary to identify an event which provides concrete evidence of deterioration in repayment prospects. As a result, provisions are generally made rather late, not when risks build up but when they materialise.

One way of limiting this procyclicality is to encourage more forward-looking provisioning. As long as such forward-looking measures are not based on pure extrapolation but contain mean-reverting elements, they can result in an earlier recognition of losses. Variants of dynamic provisioning adopted by some banks in the past did incorporate such elements, linking provisions to average past performance during a business cycle. This mean-reverting tendency can be encouraged by regulation. The Spanish authorities have done precisely that, when in 2000 they introduced a system of prudential provisioning to complement existing specific provisioning arrangements (Fernandez de Lis et al (2001)). Its effect was to set a floor to the fall in provisions during the upswing in the credit cycle and

---

[12] See Allen and Saunders (2004) for a review of the procyclicality features of risk measurement systems. See Tarashev (2005) for evidence that it is possible to improve the forecasts of defaults made by widely used measures by including macroeconomic variables, including the indicators of financial imbalances mentioned above (Borio and Lowe (2002b)).

[13] Rating agency assessments also exhibit some procyclicality, but this is generally lower than that of banks' internal rating systems, reflecting the distinction between point-in-time and through-the-cycle perspectives; see Borio et al (2001), Lowe (2002) and Amato and Furfine (2003).

[14] There is considerable evidence that time-varying risk premia play an important role in asset price fluctuations, especially for certain asset classes. For credit instruments in particular, see eg Bernt et al (2005) and Amato (2005). Hördahl and Packer (2006) review the work done by central banks seeking to measure risk premia and effective risk aversion.

hence to constrain reported earnings. By the same token, this created a prudential cushion that could be drawn upon as the cycle turned. The authorities have been quite pleased with the way the arrangements have worked in practice.

How far the Spanish experience can be generalised, however, is unclear. Such statistical provisions can easily come under heavy criticism by other authorities. They are disliked by tax authorities, who typically regard them as a tax avoidance scheme. They are disliked by securities regulators, who see them as an artificial profit-smoothing device. Above all, for much the same reasons, they tend to be disliked by accounting standard setters. In particular, a debate has taken place between the International Accounting Standards Board (IASB) and the Basel Committee over how forward-looking provisions can be. The current version of IAS 39, while less constraining than the original, still limits significantly the ability to implement statistical provisioning schemes (Caruana (2005)). It clearly helps if, as in Spain, the prudential regulator (the Bank of Spain) is also responsible for setting accounting standards for banks. This, however, is more the exception than the rule.

An alternative to implementing such adjustments to provisions is to take them as additional "reserves" and add them to minimum capital requirements (Borio and Lowe (2001) and Borio and Tsatsaronis (2004)). Admittedly, this would not be fully equivalent, as it would leave reported earnings unaffected. As a result, it would limit any disciplining effect that might be associated with a lower profit number *per se*. At the same time, if the capital requirement was binding, it would still restrain the distribution of dividends. Moreover, it would have the advantage of decoupling prudential from accounting standards. To our knowledge, such a system has not yet been tried out in practice.

***Minimum capital requirements*** also tend to be procyclical (Borio et al (2001), Danielsson et al (2001), ECB (2001)). A common reason is that, regardless of the specific features of the arrangements, provisions and write offs eat into capital during recessions, making the requirements more binding. A specific concern with Basel II has been that, by making the capital standard a function of the perceived riskiness of the portfolio, it could also make capital ratios more procyclical than under Basel I, which was only a function of the asset split between loans and securities. Since risk is normally measured as falling in expansions and rising in recessions, this additional factor could induce a further decline in capital ratios in good times and a further rise in bad times. Indeed, preliminary estimates *on given (fixed) portfolios* pointed to an additional procyclicality of the order of up to 30% of the minimum requirement, especially in the case of the use of internal ratings (eg, Segoviano and Lowe (2002), Catarineu-Rabell et al (2003), Kashyap and Stein (2004), Gordy and Howells (2004)).

A sign of the increased awareness of the macroprudential dimension is that the authorities have made a number of adjustments to the original proposals in order to address procyclicality concerns (BCBS (2001 and 2006b), Caruana (2005)). In particular, through a number of technical changes, they have flattened the risk curve. These include separate calibration with respect to expected and unexpected losses, a reduction in the charge for high-default-risk but more easily diversifiable retail credits, and encouraging the use of downturn, as opposed to point-in time, loss-given-default estimates. In addition, the authorities have strengthened the supervisory review pillar, making it possible for higher capital standards to be applied in the light of the results of stress tests of macroeconomic conditions (see below).

The end result is that, *as a package*, Basel II could be less procyclical than Basel I. Admittedly, and trivially, given current risk management technologies, the minimum requirements *on a given portfolio* are bound to vary more procyclically over the business cycle: this is an inevitable outcome of greater risk sensitivity. But portfolios will *not* be invariant to the introduction of Basel II. And changes in the behaviour of the firms, markets and supervisors would tend to reduce the procyclicality of the overall capital cushion and of risk management practices more generally.[15] Specifically, the improvements in risk management culture induced by Basel II and other supervisory initiatives, such as the Core Principles, should result in higher precautionary cushions and in earlier recognition of deterioration in the underlying quality and riskiness of the portfolio. Likewise, rating agencies and markets should be expected to become more suspicious of firms whose capital varies widely over the cycle. Moreover, supervisors can rely on a strengthened supervisory review pillar to reinforce these mechanisms. They could also make any adjustments to the basic formulae in light of experience.

[15] For a preliminary attempt to model such endogenous changes in behaviour, see Zhu (2007).

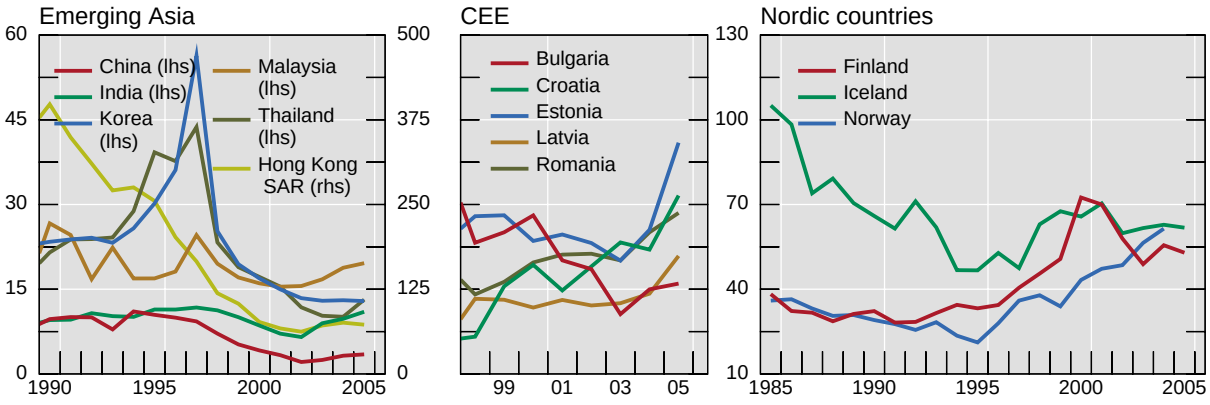
***Loan-to-value ratios***, too, tend to be procyclical. Part of this effect is automatic: since asset values move procyclically, for any given ratio, the ability to grant credit moves in the same direction. Part of the effect is behavioural: experience suggests that market participants may sometimes relax loan-to-value ratios in good times, as competitive pressures mount and perceptions of risk decline, and tighten them in adverse conditions.

The built-in stabiliser properties of any restrictions on loan-to-value ratios depend on two features. The first is the level of the ratio: the lower the ratio, the smaller the change in the amount of credit that can be granted for a given change in the asset price. The second is the valuation method for the collateral: the lower its sensitivity to the asset price, the smaller the procyclicality.

Systematic evidence on loan-to-value ratio practices and regulations, or indeed on their impact on lending dynamics, is very limited (Borio et al (2001), G10 (2003)). Three generalisations, however, seem particularly pertinent. First, open market valuations, more sensitive to market prices, are much more prevalent than alternatives, which seek to arrive at longer-term, sustainable and typically more conservative estimates of value (eg, "mortgage lending values"). These seem to be still used in some continental European countries. The predominance of open market valuations is consistent with the increasing role of market prices in business practices. Second, supervisors typically do not set the parameters used in valuation methods and, even when they have the authority, do not generally set maximum loan-to-value ratios. However, it has not been uncommon in the past to relate risk weights to such ratios. This would be institutionalised by variants of Basel II, since loan-to-value ratios would normally affect estimates of probability of default and loss given default. Finally, to our knowledge, procyclicality considerations per se have not entered the choice of specific arrangements, as opposed to discretionary adjustments (see below). Even when prudential grounds have been dominant, the issue has been couched in terms of narrower microprudential concerns.

Prudential measures to address ***currency mismatches*** can play a supportive role in dealing with financial imbalances. On the one hand, the build-up of the imbalances has often gone hand in hand with a growing share of (net) foreign-currency financing (Graph 2).[16] Booming domestic conditions, a typically positive interest rate differential alongside expectations of a currency appreciation and foreign capital eagerly searching for high returns have often provided a very receptive environment for such funding. On the other hand, once in place, the currency mismatches have naturally exacerbated the macroeconomic costs of the subsequent crises, generally accompanied by sharp currency depreciations. This is in fact one reason why, at least for emerging market countries, the conjunction of rapid credit growth with a marked real exchange rate appreciation is so helpful in predicting banking distress over medium-term horizons, as noted earlier (Borio and Lowe (2002b)).

Graph 2
**Foreign currency borrowing[1]**




[1] External positions of BIS reporting banks vis-à-vis all sectors in the individual countries, as a percentage of domestic credit.

Sources: IMF; BIS.

[16] There is a vast literature on currency mismatches and their link to financial crises; see, in particular, Goldstein and Turner (2004) and Eichengreen et al (2003) on key aspects of the policy debate; see Borio and Packer (2004) for an encompassing test of the various hypotheses, and Lowe and Stevens (2006) for an explicit link with procyclicality.

Built-in prudential stabilisers in this area take the form of those structural forms of regulation that contain currency mismatches in the regulated institutions and which may also help to restrain such mismatches in the balance-sheets of those obtaining the foreign exchange funding. Even if not expressly calibrated to become more severe during the build-up phase, they naturally become more binding then, as the incentive to take on currency mismatches increases.

Since the Asian crisis in particular, much greater attention has been paid to currency mismatches generally.[17] This has also encouraged the adoption of tighter regulations on foreign exchange positions of financial intermediaries, supported in many countries at the macroeconomic level by greater flexibility in exchange rate arrangements. The regulations can take many forms, including through capital requirements, limits on FX positions, restrictions on liquidity mismatches specifically in foreign currency, and on the terms on foreign currency funding to customers.

At the same time, the limitations of this set of measures should be recognised. In particular, even when they successfully insulate the financial institutions from the direct effect of exchange rate changes, they are far less effective in insulating them from the indirect effects of broader currency mismatches among borrowers. In some cases specific measures to influence indirectly mismatches in their balance-sheets may be possible (eg, limits on what can be lent based on specific features of the foreign exchange exposures of borrowers). More generally though, this is an area in which permanent built-in stabilisers would seem to be best articulated in the form of the development of better risk management practices.

### *Discretionary measures*

The difficulties in designing built-in stabilisers increase the scope for the use of discretionary measures. The possibility to target the specific characteristics of the imbalances makes them a potentially valuable addition to the arsenal of tools. At the same time, because the imbalances do not build up in each cycle, resort to such instruments should be expected to be rare.

The first option is to issue ***warnings*** about the build-up of risk in the system. Resort to such "open-mouth" policy is not uncommon. Communication vehicles range from occasional speeches to, increasingly, the various publications addressing financial stability, such as the Financial Stability Reports. These can be particularly effective in helping to reinforce other forms of action. How effective such warnings can be by themselves is less clear. Unless the authorities have built a reputation for being prepared to follow through with specific actions, words without deeds may not have much of an effect. If repeated to no avail, they could even undermine the credibility of the policymakers. And as the potential financial distress nears, the authorities may be reluctant to raise their voice, out of concerns that they might help precipitate the very event they are trying to avoid.

A second option is to tighten the overall ***supervisory review*** pressure, while still refraining from specific adjustments in quantitative instruments. The measures will very much depend on supervisory practices. For instance, the authorities could make tougher assessments of the quality of the loan book. Or they could encourage tougher underwriting standards for new loans. Recently, in light of the rapid expansion in mortgage credit in many countries, a number of supervisory authorities have taken action along these lines, including in the United States. Empirical evidence tends to suggest that, at the margin, these responses can be effective. Unfortunately, that same evidence also indicates that it is common for the supervisory review process to become easier in expansions and tougher in contractions.[18] While understandable, this clearly is not helpful from the perspective of procyclicality.

A third option is to make ***quantitative adjustments to the various tools*** at the disposal of the authorities. Since the mid-1990s at least, there has been a growing utilisation of such tools, confirming the increased awareness of the importance of a macroprudential orientation. The measures have been

---

[17] For evidence of a reduction in currency mismatches since the late 1990s, see BIS (2005a and 2006a). At an aggregate level, of course, the sharp increase in foreign exchange reserves in many countries has played a key role.

[18] On the effectiveness, see Peek and Rosengren (1995); on the cyclical pattern, see Berger et al (2000). Unfortunately, this evidence draws only on the US experience. Even so, it is likely to reflect a more general pattern, although country-specific factors are bound to play a significant role too.

used in an increasing number of countries, especially in Asia, Central and Eastern Europe and some other EU economies. While by no means exhaustive, Tables 1 and 2, and a more detailed Table 3 at the back of the document, provide a summary of the experience in a selected group of countries. Several points stand out.

First, while the precise motives have varied, concerns with rapid credit growth have been a common factor. In some cases, the motive has been credit expansion generally; in others, it has focused more on credit to certain sectors, especially households, either in the form of consumer credit or, much more often, property-related financing.

Second, in general, the monetary regime and/or monetary conditions put a premium on a prudential response (Table 1 and Graph 3). A majority of the countries adopting the measures have had their monetary policy autonomy constrained by the exchange rate regime in place, ranging from being part of a larger monetary area to paying close attention, de facto, to exchange rate considerations in policy decisions. Moreover, in the period leading up to the measures, in most countries inflation was benign and in a number of them the exchange rate appeared to be under some upward pressure, thereby constraining the potential room for manoeuvre for monetary policy. In fact, in the bulk of the episodes policy rates were actually declining over the same period, although they were adjusted upwards thereafter in some instances.

Third, most of the adjustments have involved a tightening of standards as imbalances have been perceived to develop in particular sectors. From the information we have gathered so far, the prudential measures have been reversed only in some of the countries, including Hong Kong, Malaysia and Norway. In several cases the failure to reverse the changes simply reflects the fact that perceived imbalances are still present. In others, especially the less recent ones, the reasons are unclear. They could suggest that the authorities took advantage of conditions to bring standards to a level deemed more comfortable on a structural basis. Alternatively, they could point to an inherent conservatism of the authorities or to difficulties in reversing previous decisions. As argued earlier, some of the once-for-all adjustments would still be consistent with the use of instruments as built-in stabilisers (eg, a lowering of the loan-to-value ratio). But otherwise the experience would be less consistent with an effective countercyclical use of the instruments.

Fourth, policymakers have used a variety of tools (Table 2). The most common ones have been adjustments to loan-to-value ratios and to capital standards, notably to the risk weights linked to such ratios. By contrast, adjustments to loan provisioning arrangements have been far less frequent. This may reflect not so much their perceived relative efficacy, as the actual degree of control exercised over the tools: as noted earlier, adjustments to provisions are harder to effect for prudential authorities. And in a number of cases, the tools have been activated alongside controls of a more purely monetary nature, such as increases in reserve requirements and other types of restrictions on lending. This confirms that the two sets of tools can help to reinforce each other, by in effect restraining the expansion of credit.

Finally, with few exceptions, including Ireland, Korea and Norway, the adjustments have been implemented by central banks, as opposed to separate supervisory agencies (Table 3). As the sample is small, the reasons for this are unclear. On the one hand, it may simply reflect a random coincidence of factors. It may be that the countries facing economic conditions conducive to such measures happened to be those where central banks had supervisory responsibilities. On the other hand, it may also partly indicate that, by virtue of their perspective and expertise, central banks are more favourably predisposed towards such a macroprudential use of the tools. We return to the implications of this point later.

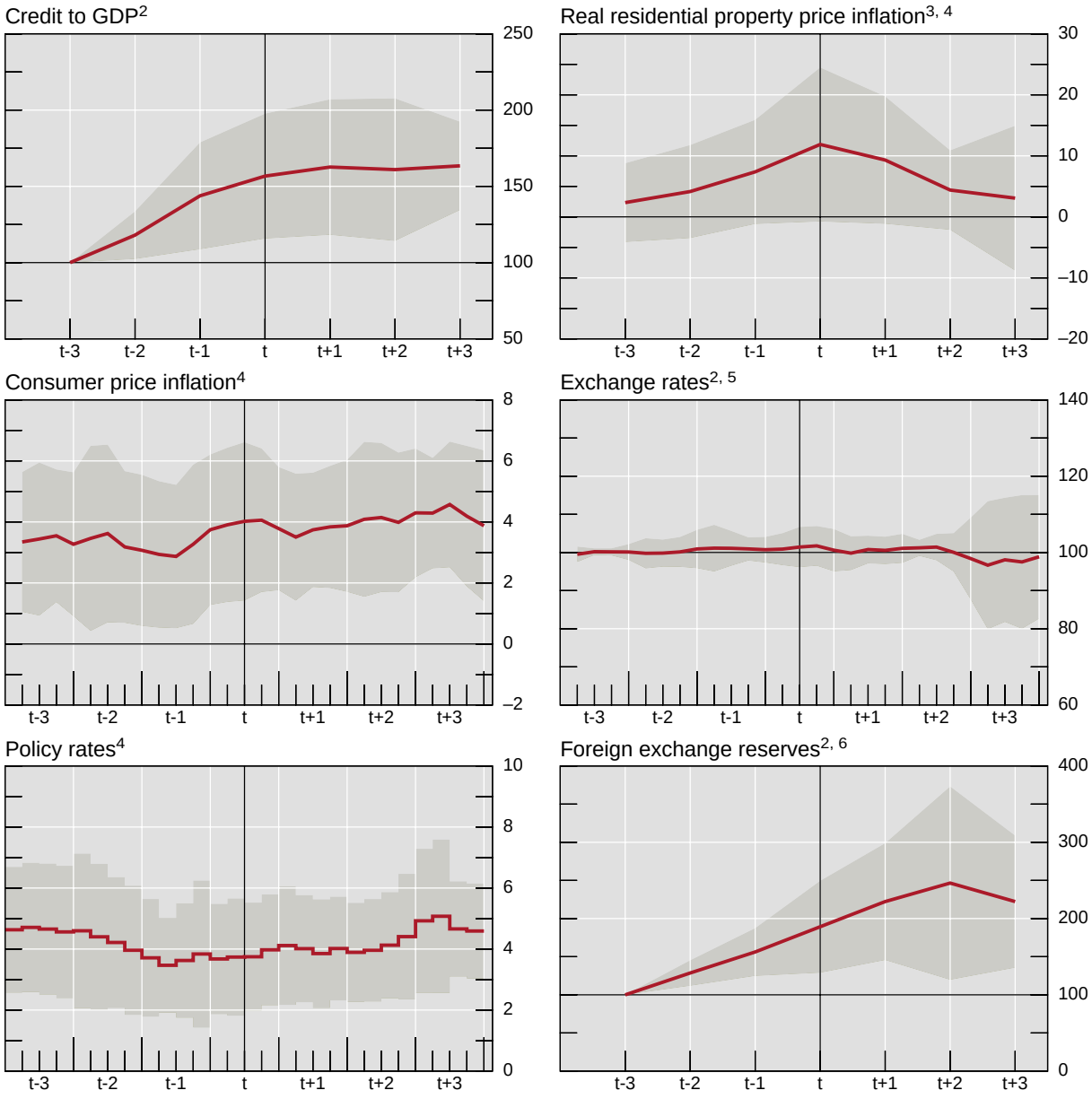
Have these measures been effective? Based on the authorities' own assessments as well as on those of some outside observers it would appear that, on balance, these measures have been regarded as useful (Table 3).[19] In some cases, they have been reported to have slowed down credit expansion somewhat, at least temporarily, and to have acted as a restraint on imprudent practices. In others, even when the impact on overall credit and asset price growth has been regarded as insignificant, they appear to have helped the banking sector to withstand the subsequent unwinding of the imbalances (eg, in the case of Hong Kong). Indeed, simple bivariate relationships do suggest, on average, some

[19] For an overview of the recent experience in Central and Eastern Europe, see Hilbers et al (2005) and Mihaljek (2006).

restraining effect on both credit expansion and asset prices. And a very preliminary, more formal statistical assessment, based on simple regression analysis that seeks to control for background economic conditions, is broadly supportive of this conclusion, especially with regard to credit expansion (see the Annex). Nevertheless, there are also a number of cases in which, based on the same criteria, the impact of the measures has been judged by the authorities and observes to have been ambiguous; and in the more recent cases it is still too early to tell what the overall effects might be. Moreover, the authorities' own assessments may be tainted with some excessive optimism.

Graph 3

**Assessing the impact of prudential measures[1]**




[1] Simple averages. It includes 15 cases, of which 7 cases cover only prudential measures and 8 cover both prudential and monetary measures. The number of observations is not uniform across graphs and points in time within a graph. The shaded area refers to ±1 standard deviation around the average. [2] t-3 = 100. [3] Deflated by consumer prices. [4] In per cent. [5] An increase indicates an appreciation. [6] Excludes euro area countries. The picture would not be qualitatively different if they were included.

Sources: IMF; national data; BIS.

**Table 1: Monetary background***

| | Monetary regime | Exchange rate regime | Capital controls | Inflation[1] | Exchange rate[1] | Policy rate[1] | Monetary controls |
|---|---|---|---|---|---|---|---|
| **Euro area** | | | | | | | |
| Finland (1988) | IO | Reference to basket | | →, ↑ | ↓, ↑ | ↓, ↑ | ✓ |
| Greece (1999) | IO | ERM / EMU | | ↓, → | ERM / EMU | →, ↓ | ✓ |
| Greece (2005) | IO | EMU | | ↓, → | EMU | ↓, → | |
| Ireland (2006) | IO | EMU | | →, n/a | EMU | →, n/a | |
| Portugal (1999) | IO | ERM / EMU | | →, ↑ | ERM / EMU | ↓, ↑ | |
| Spain (2000) | IO | ERM / EMU | | ↑, ↑ | ERM / EMU | ↓, ↑ | |
| **Other Europe** | | | | | | | |
| Bulgaria (2004) | Euro currency board | | ✓ | ↓↑, → | →, → | ↓, → | ✓ |
| Croatia (2003) | Multiple indicators | Managed float | ✓ | ↓, ↑ | ↑, ↑ | ↓, → | ✓ |
| Estonia (2006) | Euro currency board | | | ↑, → | →, → | →, ↑ | ✓ |
| Iceland (1999) | IT | Float | | →, ↑ | ↑, ↑ | ↑, ↑ | ✓ |
| Latvia (2004) | Peg to the Euro | | | ↑, → | ↓, → | →, ↑ | ✓ |
| Norway (1998) | IT | Float | | ↑↓, → | ↑, ↓ | ↓, ↑ | |
| Romania (2004) | IT[2] | Crawling band | ✓ | ↓, ↓ | ↓, ↑ | ↓, ↓ | ✓ |
| **Asia** | | | | | | | |
| China (2004) | Multiple indicators[3] | Quasi-dollar peg | ✓ | ↑, ↓ | →, →↑ | →, ↑ | ✓ |
| Hong Kong(1991) | Dollar currency board | | | ↑, ↓ | →, → | ↓, ↑ | ✓ |
| India (2005) | Multiple indicators | Managed float | ✓ | ↑, ↓ | ↑, ↓ | ↓, ↑ | ✓ |
| Korea (2003) | IT | Managed float | ✓ | →, → | ↓, ↑ | ↓, ↓ | ✓ |
| Malaysia (1995) | Interest rate focus | Quasi-dollar peg | ✓ | ↓, ↓ | →, →↓ | ↓, ↑ | ✓ |
| Malaysia (2005) | Quasi-dollar peg[4] | | ✓ | ↑, ↑ | →, ↑ | ↓, → | |
| Thailand (2003) | IT | Managed float | ✓ | →, ↑ | →, ↓ | ↓, → | |

* IO = inflation objective; IT = inflation target; ✓ = yes; empty space = no; n/a = not applicable.

[1] The first arrow tells movement during period of two or three years before first measure taken; the second arrow shows movement during period over which the measure(s) were taken. The reference exchange rate varies according to the regime (bilateral or effective). ↓ for exchange rate denotes depreciation of the domestic currency.

[2] Since August 2005. [3] Close attention to quantitative aggregates. [4] Effective exchange rate orientation announced in July 2005.

**Table 2: Prudential measures and monetary controls***

| | Prudential instruments | | | | | | FX policy measures[1] | Monetary instruments | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LTV | Capital + LTV[2] | Capital | Provisions | Exposure limit | Lending criteria | | Credit limit | Credit limit + marg RR | Average RR | Marginal RR | Liquidity |
| **Euro area** | | | | | | | | | | | | |
| Finland | | | | | | | | | 89-90 | 88,89 | | |
| Greece | | | | 05 | | 05 | | | 99-00 | | | |
| Ireland | | 06 | | | | | | | | | | |
| Portugal | | 99 | | 99 | | | | | | | | |
| Spain | | | | 00[3] | | | | | | | | |
| **Other Europe** | | | | | | | | | | | | |
| Bulgaria | 04 | 04 | 04, 05 | 04, 05 | | | | | 05 | 04 | | |
| Croatia | 06 | | | 03, 06 | | 06 | 03, 05, 04, 05, 06 | | 03-03[4], 07 | | 04, 05, 06 | 03, 05 |
| Estonia | | | 06 | | | | | | | 06 | | |
| Iceland | | | | | | | | | | | | 99 |
| Latvia | | | | | | | | | | 04, 05, 06 | | |
| Norway | | 98-01 | | | | | | | | | | |
| Romania | 04 | | | 02, 05 | 04, 05 | 04, 05 | 04, 05, 06 | | | 04, 05, 06 | | |
| **Asia** | | | | | | | | | | | | |
| China | 01,05,06 | | | | | 04 | | | | 03, 04, 06, 07 | | |
| Hong Kong | 91,97 | | | | 94-98 | | | 94 | | | | |
| India | | | 05, 07 | 05, 06, 07 | | | | | | 04, 06, 07 | | |
| Korea | 03, 06 | | | | | 06 | 06 | | | 06 | | |
| Malaysia | 95-98 | | 05 | | 97-98 | 95 | | | | 94-98 | | |
| Thailand | 03 | | | | | 04, 05 | | | | | | |

* LTV: loan-to-value ratio, Capital: capital requirements, Provisions: loan provisioning rules, RR: reserve requirements, Credit Limit: Limit on credit growth, Liquidity: liquidity requirement, Lending criteria: Limits on debt-repayment-to-income ratio or debt-repayment-to-debt ratio or credit-line-to-income ratio, Exposure Limit: credit exposure to a sector. The years indicated refer to the timing of the introduction of the measure. A year coming after a hyphen refers to the timing of the lifting of the measure.

[1] Specific controls other than general restrictions on net FX positions aimed at limiting credit expansion. [2] Capital requirement weights linked to loan-to-value ratios.

[3] Statistical provisioning. [4] Introduced in January 2003 and discontinued in December 2003. Requirement to purchase central bank bills at a penalty rate instead of maintaining reserves.

Clearly, a more definite answer would need to be based on a more systematic analysis of the various episodes, which is beyond the scope of this paper.

While judging the overall effectiveness of the measures is hard, it is easier to identify the conditions which affect it. As always, the ease with which the controls can be avoided is key. The measures are bound to be less effective in economies that have highly developed capital markets, or institutions outside the scope of regulation, and that are very open to cross-border capital flows. It may not be a coincidence that in some countries with more developed securities markets, such as Australia, the measures have not been used even though the growth in credit and residential property prices has given rise to concerns.[20] In addition, the effectiveness of the controls is further diminished where banks headquartered abroad account for a large fraction of credit to residents. Not only would this tend to relax the funding constraint, particularly when the domestic operations are small relative to those elsewhere. But there may also be some tension between the perspective of home regulatory authorities, who focus on the soundness of the bank as a whole, and that of the host supervisor, more sensitive to local conditions. Indeed, wherever the funding is provided through branches rather than subsidiaries, the host supervisors have very limited options at their disposal. And host authorities may also be discouraged from taking measures by concerns about introducing competitive distortions between domestic and foreign banks.

## III. A way forward?

As the above analysis makes clear, despite the progress made in strengthening the macroprudential orientation of prudential frameworks, there is still considerable room for a further shift. In our view, such a shift would call for additional efforts along three dimensions.

The first dimension is ***analytical***. While our understanding of financial distress has much improved in recent years, work in this area is still in its infancy. The conceptual and empirical tools need to be developed further, until they become a familiar weapon in the authorities' arsenal. This is especially the case for the more quantitative diagnostics. These analytical efforts could provide a basis for the calibration of a policy response as well as for improvements in risk measurement systems of market participants themselves.

It is possible to suggest some priorities and promising lines of inquiry. For macro-stress tests, we see as a priority the extension of the horizon of the "shocks", to well over one year. This calls for advances in modelling the interactions between the macro-economy and the financial sector and hence the two-way feed-back effects involved. For early warning indicators, while their specifics are bound to vary, we would conjecture that two ingredients will remain critical. The first is some measure of asset price misalignment, the second is some measure of the shock absorption capacity of the system. It is the comparison of these two dimensions that matters. In addition, to increase their usefulness for policy purposes, it is also important that the indicators be based on real-time information, transparent and sufficiently forward-looking, so that they can identify risks as they build-up, not just close to their materialisation. We expect that further progress in our understanding of risk premia and leverage, in its multifaceted forms, will be essential.

The second dimension is ***institutional***. In many cases the institutional setup is not particularly conducive to an effective implementation of the macroprudential orientation. Mandates may not be fully supportive. In particular, the presence of strong depositor/investor protection elements in the statutes of some supervisory authorities is not easily reconcilable with a systemic perspective (Borio (2003)). Control over instruments may be imperfect or limited. As discussed, this can be the case both nationally and across borders, particularly when other types of authorities are involved, such as those responsible for accounting and taxation. And even when the instruments are available, the embedded culture and expertise may not be quite sufficient. This may be less of an issue where central banks are

[20] A recent joint report by the Reserve Bank of New Zeland and the Treasury on supplementary stabilisation instruments reaches a similar conclusion. In particular, while acknowledging the merits of a uniform maximum loan-to-value ratio on housing loans in restraining excessive credit and asset price increases, it argues that it would be hard to enforce it and that it would encourage disintermediation. The report also includes a discussion of other prudential and tax instruments. See Reserve Bank of New Zeland and the Treasury (2006).

in charge of supervision, given their natural comparative advantage in macroeconomic issues. But it could be a more relevant consideration elsewhere, where legal and accounting backgrounds are the rule.

Addressing these issues is not straightforward. Redesigning institutions so as to better align objectives with instruments and expertise is a difficult and controversial task. And since the various objectives are worth pursuing, it often simply implies a change in the nature of conflict-resolution mechanisms, from intra- to inter-agency. Appropriate solutions are bound to be country-specific.

At a minimum, however, there is no alternative to an intensified dialogue and to greater cooperation among the various parties involved. The dialogue can help to better understand and overcome differences in perspective, thereby providing a basis for a common framework. In turn, this should contribute to a more supportive allocation of responsibilities across the various authorities and to a more effective deployment of the available tools. The process can also help to leverage the comparative advantage of the various parties. This is especially important for monetary and prudential authorities: the former have an edge in understanding the nexus between the macro-economy and the financial system, while the latter have an edge in understanding the risk management practices of the regulated institutions.[21]

The third dimension is the ***political economy*** of implementation. One distinguishing characteristic of the macroprudential orientation is the focus on the events that cause costs to the economy as a whole, in the form of lost output. Retaining this focus is not straightforward wherever the failure of individual institutions is seen as synonymous with the failure of supervisors to do their job. Another distinguishing feature is the need to take restraining actions in good times. We know from other policy areas just how hard it is to moderate exuberance during booms; the failure to consolidate fiscal policy in good years is the most obvious example. The possible inadequacy of mandates is just part of the story. More fundamentally, limitations in incentive mechanisms and perceptions are at play. At a minimum, educational efforts aimed at fostering the necessary support are important. From this perspective, the analytical work and intensified cooperation can be very helpful too.

Useful as action along these three dimensions might be, it is important not to lose sight of the inherent limits to the effectiveness of prudential measures. In particular, the reach of the instruments may be quite limited. Even in those cases in which they may be able to insulate the regulated institutions, they may not be able to prevent the build-up of the imbalances, especially in highly deregulated and open financial systems. And full insulation is in any case hard to imagine in many circumstances. For example, the institutions may survive largely unscathed defaults in the household sector linked to a bust in residential property prices and high debt. But would they survive equally unscathed in light of the indirect effects of the induced sharp contraction in household spending on overall economic activity?

More generally, the raw material on which prudential instruments operate is based on perceptions of risk and value that may be less than fully adequate. In turn, these perceptions are intimately linked to the availability of liquidity, which allows them to be translated into purchasing power and hard funding. But prudential authorities have only limited influence on the liquidity generated in an economy. This is, in fact, largely the realm of monetary policy.

Against this backdrop, the mutually reinforcing roles of prudential and monetary policy stand out. Cooperation, quite apart from helping to develop a common intellectual framework and the necessary tools, it could also aim at making implementation more effective, allowing the authorities to lean jointly against the build-up of imbalances even if near term inflation pressures remain benign.

One could imagine a gradual sequence of policy responses. Once a problem is identified, and the diagnosis shared, the initial response could be coordinated warnings about the sign of overextension. The next step would depend on the precise nature of the problem. Targeted tools would be preferable if the problem was largely limited to a particular segment, such as commercial real estate. Examples include, for instance, requiring specific stress tests, tightening lending and underwriting standards,

[21] Another area where such cooperation is essential, and has indeed deepened, is accounting standards. The shift under way towards greater use of marked-to-market accounting can have first order implications for the behaviour of financial institutions and financial stability more generally. On these issues, see Borio and Tsatsaronis (2004 and 2006), Knight (2004), Enria et al (2004), Goodhart (2004), Taylor and Goodhart (2006) and Shin (2006).

lowering loan-to-value ratios or raising minimum capital through the supervisory review process. However, if the problem was more generalised or was building through market, as opposed to bank, finance, the interest rate tool might be more effective. And joint action could add bite to the policy response.

At the same time, as discussed before, monetary authorities face similar hurdles to those faced by prudential authorities. They may not feel they know enough to identify the imbalances in good time and to calibrate an effective response. They may feel that such a policy is not entirely consistent with their mandates. And, even when this is not the case, they may face first-order communication problems in justifying their actions. Thus, agreement on the diagnosis among authorities need not trigger a commensurate policy response. While in recent years several central banks have expressed views and implemented policies more consistent with a preventive use of monetary policy in this context (Borio (2007)), this type of response does remain controversial.

## Conclusion

There is a broad consensus that a financial infrastructure consistent with the codes and standards agreed by the international community provides a sound framework to promote financial stability. Those codes and standards also include guidelines for a sound prudential framework. By the same token, they set out the broad contours of arrangements that can support macroeconomic policies generally, and monetary policy in particular.

But beyond this, is it possible to identify characteristics of the prudential framework that can further support monetary policy? In particular, which features would be most helpful in an environment in which financial imbalances might build up to threaten macroeconomic stability even if inflation is comparatively stable and low?

In this paper, we have argued that a strengthened macroprudential orientation of the framework is part of the answer. The orientation puts a premium on a holistic view of the financial system, paying particular attention to the tight nexus between the macroeconomy and the financial system. And it highlights the importance for prudential arrangements to offset the procyclical forces at the root of the occasional development and subsequent unwinding of financial imbalances.

In recent years, considerable progress has been made in this direction. Policymakers have become much more keenly aware of the importance of the macroprudential orientation, have made major efforts to upgrade the monitoring of potential vulnerabilities in ways consistent with it and have begun to use it more as a guide for calibrating prudential instruments. Looking ahead, a continuation of this process would be helpful and is indeed likely to take place. In all probability, however, it will proceed at a slow pace, as obstacles of an analytical, institutional and political economy nature hinder it. We have suggested ways in which these obstacles could be addressed. They all put a premium on closer cooperation between prudential authorities and other policymakers.

More generally, it would be unwise to rely entirely on prudential policy to contain the build-up of financial imbalances. This is not just because of the slow pace at which a further strengthening of the macroprudential orientation of financial regulatory and supervisory frameworks is likely to proceed. It is also because of the inherent limits on the effectiveness of prudential instruments in addressing financial imbalances in the first place. In particular, a key role can also be played by monetary policy, which ultimately influences the expansion of liquidity that can accommodate their development.

**Table 3: Measures, objectives and assessment of effectiveness**[†]

| Country | Authority | Year | Category | Specific measures | Objective | Authorities' assessment |
|---|---|---|---|---|---|---|
| **Bulgaria** | CB | 2004<br>2005 | Capital | More stringent rules for classifying claims and determining banks' capital adequacy (exclude current profit from capital base). | Limit the build-up of risk for the banking sector associated with rapid bank lending growth (49% in 2004).<br>Measures taken to cut lending growth and minimise banking system risk. | Growth in bank claims on the non-governmental sector slowed to 32% as of the end of 2005, in line with that of total of assets, borrowings and especially with capital. By the end of 2005, capital adequacy stabilised at a level seen consistent with banks' risk profile (above regulatory minima).<br>While credit risk stabilised in the corporate segment, it accelerated in the consumer and mortgage segments (CB Annual Reports 2004, 2005) |
| | | 2004<br>2005 | Provisions | Tighter loan provisioning requirements. | | |
| | | 2004 | LTV, LTV + Capital | Introduction of a 70% LTV ratio for mortgages risk-weighted at 50%; when violated, exposures assigned a 100% risk weight. | | |
| | | 2004 | Reserves | Tighter reserve requirements (including a higher deposit base and minimum ratio and more restricted recognition of cash for reserve, etc). | | |
| | | 2005 | Credit + Reserves | Introduction of a marginal reserve requirement (reserves equal to double the excess of all loans over the average growth rate). | | |
| **China** | CB | 2001 | LTV | Reduction in maximum LTV ratio for mortgages to 80%. | Address excessive expansion in housing finance, regulate housing finance transactions and prevent the associate build-up of risk.<br>Limit loan growth and prevent a resurgence in domestic investment. | Introduction of these policies seen as having timely and effectively restrained the growth of the real estate industry and preventing financial risks. (CB China Real Estate Finance Report, 2004). |
| | | 2005 | LTV | Recommended reduction in maximum LTV ratio from 80% to 70% for properties in cities or regions with excessively fast housing price increase (decision up to banks). | | |

[†] CB: central bank, MoF: Ministry of Finance, FSA: financial supervisory authority, ISC: Insurance Supervisory Commission, LTV: loan-to-value ratio, Capital: capital adequacy ratio, Provisions: loan provisioning rules, Reserves: reserve requirements, Credit: credit growth control, Liquidity: liquidity requirements, Lending criteria: cash flow requirement, Exposure: credit exposure to a sector, Interest: mortgage rate.

**Table 3: Measures, objectives and assessment of effectiveness†**

| Country | Authority | Year | Category | Specific measures | Objective | Authorities' assessment |
|---|---|---|---|---|---|---|
| | | 2005 | Interest | Increase in mortgage rate by 0.2% to 5.51%. | | The deceleration of credit growth in 2004 was seen as bolstering official confidence that corrective measures had brought the economy back from the brink of overheating. (Institute of International Finance, 2005).<br>Signs of slowdown in credit growth in June 2006. |
| | State Council | 2006 | LTV | Reduction in maximum LTV ratio from 80% to 70% for housing larger than 90m$^2$ excluding purchases for own use by individuals. | | |
| | CB | 2003, 04,06, 07 | Reserves | Gradual increase in reserve requirements from 6% to 14.5%, in either 0.5% or 1% point steps. | | |
| | | 2004 | Lending criteria | Limit on monthly repayment of loans equal to 50% of homeowner's income | | |
| **Croatia** | CB | 2006 | LTV | Introduction of maximum LTV ratio for housing loans at 75% | Limit credit expansion, reduce procyclicality, slowdown foreign borrowing and encourage prudent business policies of banks in their foreign borrowing. | Introduction and subsequent increase in the marginal reserve requirement did not stem foreign borrowing. The minimum foreign currency liquidity requirement was more effective. (CB Bulletin, Mar 2005). |
| | | 2006 | Lending criteria | No approval of new loans by banks when a debtor's average monthly income does not cover the total repayment obligations of the debtor | | |
| | | 2003<br><br><br>2006 | Credit + provisions | Introduction of additional reserves for a bank's exposure growth over 20% per annum, with reserve rates increasing in the growth rate.<br>Tightening of the requirement by lowering the thresholds (20%→15%) and increasing the reserve rates. | | |
| | | 2005 | Capital | Increase in risk weights by 25% on loan to debtor with currency mismatch | | |
| | | 2003 -03 | Credit + liq requirement | Required investment in central bank bills against excessive credit growth (200%) (introduced in January and discontinued in December). | | |

**Table 3: Measures, objectives and assessment of effectiveness†**

| Country | Authority | Year | Category | Specific measures | Objective | Authorities' assessment |
|---|---|---|---|---|---|---|
| | | 2007 | | Re-introduction of the compulsory purchase of central bank bills against excessive credit growth (50%). | | |
| | | 2003 | Liquidity | Maintenance of at least 35% of FX liabilities in liquid foreign exchange assets (lowered to 32% in Feb. 2005) | | |
| | | 2004<br>2005<br>2006 | Reserves | 24% reserve requirement on increased foreign borrowing. Later raised 3 times up to 55%. | | |
| | | 2006 | Reserves | 55% special reserve requirement on the increase in liabilities arising from the issuance of securities. | | |
| **Estonia** | CB | 2006 | Capital | Increase in risk weight for housing loans to residents from 50% to 100%. | Curb the risks to Estonia's economy caused by the rapid growth of domestic demand and loans.<br>Take decisive action to prevent the risk of overheating. | Banks did not react to the increase in risk weights by slowing down the growth of housing loans, but increased own funds instead by attracting more capital from parent banks (CB Financial Stability Review, May 2006). |
| | | 2006 | Reserves | Inclusion in the reserve requirement base of (1) half the amount of housing loans to residents with a risk weighting below 100%, and (2) banks' liabilities to foreign banks on a gross basis.<br>Increase in the reserve requirement from 13% to 15%. | | |
| **Finland** | CB | 1988, 1989 –90 | Reserves | Increase in the cash reserve requirements 8 times from 5.3% to 8% (lowered from 8% to 7% in Dec 1990). | Reduce the growth of bank lending. | Supplementary reserve agreement was more effective than the ordinary cash reserve requirement in restricting the |

**Table 3: Measures, objectives and assessment of effectiveness†**

| Country | Authority | Year | Category | Specific measures | Objective | Authorities' assessment |
|---|---|---|---|---|---|---|
| | | 1989 –90 | Credit + Reserves | Increase in the cash reserve requirement from 8% to 12% against increases in lending to individuals in excess of more than 20% between February and December 1989 ("supplementary reserve agreement") (discontinued in early 1990). | | volume of new lending and raising the interest rates applied on it (CB Bulletin, Nov 1990).<br>Seen as effective given that the real increase in Finnish loans stayed below 10% while that in Sweden was about 20% (Berg, 1993). |
| **Greece** | CB | 1999 –00 | Credit + Reserves | Introduction of required non-remunerated deposits in line with excess credit growth (discontinued in 2000). | Contain credit expansion and mitigate endogenous inflation pressure. | A high degree of price stability has been achieved (CB Economic Bulletin, July 2000). |
| | | 2005 | Provisions | Increase in regulatory provisioning ratios for doubtful consumer loans from 84% to 100%. | Address the risks associated with a boom in consumer lending. | Taking action at an early stage of development for consumer lending appears sensible (Fitch, 2006a) |
| | | 2005 | Lending criteria | Imposition of indicative limit on household debt servicing-to-income ratio of 40%. | | |
| **Hong Kong** | CB | 1991 | LTV | Reduction in LTV ratio from 80-90% to 70%. | Ensure the safety and soundness of the banking system in light of the property boom. | Prudential measures not seen as successful in preventing the bubble, but as effective in limiting bank losses and avoiding bank failures during the crash. |
| | | 1997 | LTV | Reduction in LTV ratio from 70% to 60% for luxury residences. | | |
| | | 1994 –98 | Exposure limits | Limit on banks' exposure to the property market to 40% (discontinued in 1998). | | |
| | | 1994 | Lending ceiling | Ceiling on the growth of mortgage lending of 15% per annum. | | |
| **Iceland** | CB | 1999 | Liquidity requirement | Introduction of a liquid asset requirement (liquid assets in any coming three-month period to be at least equal to liabilities that could | Restrain an unsustainable credit boom 1998-9 financed to a significant degree by short-term capital flows. | Seen as stemming the erosion of the liquidity position of credit institutions and the increase in the use of foreign short-term |

**Table 3: Measures, objectives and assessment of effectiveness†**

| Country | Authority | Year | Category | Specific measures | Objective | Authorities' assessment |
|---|---|---|---|---|---|---|
| | | | | come due in the same period). | | loans, and, at least for a while, as slowing credit expansion.(CB Annual Report 1999). |
| **India** | CB | 2005<br><br><br><br><br>2007 | Capital | Increase in risk weights for housing loans from 50% to 75% and for consumer credit from 100% to 125% and for commercial real estate from 100% to 150%.<br>Increase in risk weights of banks' exposure to systemically important non-deposit taking non-banking financial companies from 100% to 125%. | Strengthen banking system given central bank's concern that housing and consumer credit may not be appropriately priced by banks (Fitch, 2006b).<br>Engineer a calibrated deceleration in the overall growth of credit to the commercial sector (Mohan, 2006). | Risk sensitive approach seen as useful in containing to some extent aggregate demand pressures and second round effects (Mohan, 2006).<br>Measures seen as helpful better to prepare banks for any downturn in the credit cycle (Fitch, 2006b). |
| | | 2005<br><br>2006<br><br><br><br>2007 | Provisions | Increase in general provisions for standard assets from 0.25% to 0.4%,<br>Increase in general provisions for personal loans, capital market exposures, commercial real estate loans as well as residential lending above INR2 million from 0.4% to 1%.<br>Increase in general provisions for personal loans, capital market exposures, and commercial real estate loans from 1% to 2%;<br>Increase in the provisioning requirement for banks' exposure to systemically important non-deposit taking non-banking financial companies from 0.4% to 2%. | | |
| | | 2004, 06,07 | Reserves | Increase in cash reserve requirements from 4.5% to 5%, 5.5%, and 6%. | | |

**Table 3: Measures, objectives and assessment of effectiveness†**

| Country | Authority | Year | Category | Specific measures | Objective | Authorities' assessment |
|---|---|---|---|---|---|---|
| **Ireland** | FSA | 2006 | LTV + Capital | Increase in risk weight for mortgages from 50% to 100% of the loan value on the portion of each loan exceeding 80% of the value of the property as of May 2006 (announced in March 2006). | Strengthen banks against the backdrop of rapid mortgage growth over previous 6 years and a decline in LTV ratios linked to stronger competition (the average LTV ratio rose from 80% in 2000 to 92% in 2004; 100% for most borrowers). | Growth in residential mortgage lending slowed down in April after the announcement, but started to pick up again in June.<br>The annual percentage change in residential mortgage seen as slowing after the announcement. |
| **Korea** | FSA | 2003 | LTV | Reduction in LTV ratios applied to bank loans from 60% to 50% and then to 40% in the geographical areas where property prices surged or were seen as likely to surge, with some exceptions. | Strengthen risk management for housing loans and contain the property bubbles. | Average LTV ratio for housing loans extended by 6 major commercial banks stayed around 54% in 2005 and 53% in 2006. Housing loan growth slowed down since 2003. Measures seen as effective in containing credit risk of housing loans due to negative house price shocks (CB Financial Stability Report, April 2006) |
| | | 2006 | LTV | The exceptions under 2003 measures were abolished for bank loans.<br>Reduction in LTV ratios applied to non-bank loans from 60~70% to 50%. | | |
| | | 2006 | Lending criteria | Introduction of a debt-repayment-to-income ratio ceiling of 40% for purchasing luxury condominiums located in the geographical areas where prices had surged (March) and were seen as likely to surge (November). | | |
| | CB | 2006 | Reserves | Increase in reserve requirements from 5% to 7% for demand deposit, money market deposit account, and other non-savings deposits. Reduction in reserve requirement from 1% to 0% for long-term savings | Slow down the growth of bank lending driven by fierce competition among banks, a surge in demand for housing loans due to the expectation of housing price inflation, and the expansion of foreign-currency lending | |

**Table 3: Measures, objectives and assessment of effectiveness†**

| Country | Authority | Year | Category | Specific measures | Objective | Authorities' assessment |
|---|---|---|---|---|---|---|
| | | | | deposits. The overall reserve requirements increased from 3% to 3.8% as of November 2006.<br>Increase in the reserve requirement on demand deposits in foreign currency from 5% to 7%. | by banks.<br>Also, complement the effectiveness of interest rate policy. | |
| **Latvia** | CB | 2004<br>2005<br>2006 | Reserves | Increase in the reserve requirement from 3% to 4% (July)<br>Inclusion in reserve base of banks' short-term liabilities to foreign banks.<br>Increase in the reserve requirement from 4% to 6% (August) and to 8% (December)<br>Increase in the minimum reserve base for banks to include liabilities with the maturity of over two years (May). | Strengthen macroeconomic stability and subdue the steep acceleration in lending.<br>Dampen the excessively high growth rates of lending. | Overall liquidity ratio of banks slightly increased in 2006 partly due to increases in reserve requirements and expansion of the minimum reserve base. (CB Financial Stability Report 2006).<br>Measures had only short-term dampening effects on the rate of credit growth (IMF Country Report, 2006b) |
| **Malaysia** | CB | 1995 –98 | LTV | Introduction of a maximum LTV ratio of 60% on real estate loans (discontinued in 1998). | Limit banks' exposure to real estate bubbles and contain any deterioration in portfolio quality. | Seen as contributing to slowing down of escalating stock and property price increases and in lending growth to these sectors. |
| | | 1995 | Lending criteria | Increase in minimum monthly repayments for credit cards from 10% of balances to 15%. | | |
| | | 1994 - 98 | Reserves | Increase in the statutory reserve requirement from 8.5% to 11.5% in 1994, and again to 13.5% in 1996. (reversed back to 8% in 1998). | | |
| | | 1997 –98 | Exposure limits | Limit on property lending equal to 20% of a bank's portfolio (discontinued in 1998). | | |
| | | 2005 | Capital | Increase in risk weight for non- | Ensure banks' soundness in light of | Resulting decline in risk- |

**Table 3: Measures, objectives and assessment of effectiveness†**

| Country | Authority | Year | Category | Specific measures | Objective | Authorities' assessment |
|---|---|---|---|---|---|---|
| | | | | performing housing loans from 50% to 100%. | the rapid expansion in mortgage loans. | weighted capital negligible but measure seen as effective in pre-emptively strengthening risk management practices. |
| **Norway** | MoF FSA | 1998 –01 | LTV + Capital | Increase in risk weight from 50% to 100% for loans with an LTV ratio above 60%, (previously 80%) (discontinued in 2001). | Safeguard bank soundness. | While credit growth decreased from above 10% at the end of 1997 to below 7% in mid-1999, it was not possible to distinguish the effect of the measure from that of the economic downturn following the Asian crisis. |
| **Portugal** | CB | 1999 | LTV + Capital | Tighter capital requirements for housing loans with an LTV ratio exceeding 75%. | Safeguard the soundness of the banking system. | The growth of loans to households decelerated from the second half of 1999, mainly due to the actual and predictable increase in bank interest rates, to the deterioration of consumer expectation on the future economic situation, and to the changes introduced in the regulations governing the subsidised system for house purchasing (CB Economic Bulletin, June 2000; CB Annual Report 1999). |
| | | 1999 | Provisions | Tighter provisioning requirements for consumer loans (Provisions for general consumer credit risks were raised to 1.5%). | | |
| **Romania** | CB | 2004 | Lending criteria | Limit on the ratio of borrowers' payment related to consumer credit to income set equal to 30%. | Containing credit growth (both prudential and monetary policy measures) (CB Financial Stability Report, 2006). | Seen as effective (in 2004, slower growth in loans to individuals, helping to reduce credit risk; in 2005, effective restraint on credit growth to the non-government sector, especially in the foreign exchange component. (CB |
| | | 2005 | Lending criteria | Limit on the ratio of payment related to mortgage loans, real estate loans and consumer loans to the borrowers' net income set equal to 40%. | | |

**Table 3: Measures, objectives and assessment of effectiveness†**

| Country | Authority | Year | Category | Specific measures | Objective | Authorities' assessment |
|---|---|---|---|---|---|---|
| | | | | Limit on the ratio of payment related to mortgage loans and real estate loans to the borrowers' net income set equal to 35%. | | Financial Stability Report, 2006). Between 2004 and 2006, the share of foreign currency-denominated credit in total non-government credit dropped by around 10 percentage points to 50%. |
| | | 2004 | LTV | Introduction of a maximum LTV ratio of 75% for mortgages. | | |
| | | 2002 2005 | Provisions | Stricter loan provisioning and loan classification rules taking into account the currency risk of the borrower. | | |
| | | 2004 2005 2006 | Reserves | Increase in the reserve requirement on deposits in foreign currency from 25-30% to 35-40%, alongside a reduction in that in local currency from 18% to 16%. | | |
| | | 2005 | Exposure limits | Limit on the exposure of a credit institution to 300% of its own funds when granting foreign currency-denominated loans. | | |
| | | 2006 | Regulation of lending activity by non-bank financial institutions | All NFIs should be registered. Small companies are subject to monitoring and large companies are subject to supervision by central bank. | Ensure sound growth of financial intermediation by NFIs and avoid regulatory arbitrage with minimal rules (CB Annual Report 2005). | |
| | ISC | 2004 | Exposure limits | Tighter exposure limits for insurance companies in the underwriting of risks linked to consumer credit and mortgage loans. | Prevent the occurrence of an excessive risk transfer from the banking to the insurance sector. | |
| **Spain** | CB | 2000 | Provisions | Introduction of statistical provisioning rules. | Reduce the volatility of recorded bank profits and build up financial buffers in good times that can be used to | Seen as very effective in fostering sounder risk practices and in building up buffers but as |

**Table 3: Measures, objectives and assessment of effectiveness**[†]

| Country | Authority | Year | Category | Specific measures | Objective | Authorities' assessment |
|---|---|---|---|---|---|---|
| | | | | | weather bad times. Not intended to curtail credit growth directly, but seen as meaning fully penalising it (Caruana, 2005). | having only a small impact on credit growth (Caruana, 2005). |
| **Thailand** | CB | 2003 | LTV | Introduction of a maximum LTV ratio of 70%.<br>Tighter eligibility requirements for housing loans. | Encourage prudent behaviour. | Though moderating somewhat, credit to the household sector continued to expand at a fast rate; The growth of credit card debt slowed and the number of new credit cards issued declined to 416,000 in 2004 Q4 from a peak of 2.4 million in 2002 Q4. |
| | | 2005 | Lending criteria | Limit on the size of credit card credit lines to no more than 5 times monthly income. | | |
| | | 2004 | Lending criteria | Increase in the minimum monthly repayments to 10% of outstanding credit card debt | | |

## Annex: A first pass at assessing the impact of the measures

Did the discretionary prudential measures taken by the countries whose experience is discussed in the text help to contain the potential build-up of financial imbalances? Answering this question is complicated for at least five reasons. First, one needs an operational definition of "financial imbalances". Second, one needs a benchmark, capturing the counterfactual of what would have happened in the absence of the measures. Third, the measures are clearly heterogeneous, comprising a variety of different instruments and used with different degrees of intensity. Fourth, they were often not taken in isolation. Finally, the period available to assess their effect is typically very short, as in many cases they are quite recent. These difficulties mean that a full assessment would require a paper in itself, based on a careful quantitative statistical analysis that paid close attention to country-specific circumstances.

This Annex takes only a first step in this direction. Its aim is only to go one step beyond the visual impression obtained from the graphs in the text and to provide a simple statistical characterisation of the behaviour of key economic variables before and after the measures were introduced. In this way, it can complement the assessment of the effect of the measures provided by the authorities and other observers (Table 3), notably by looking at average patterns across countries.

### The methodology

Given the limited ambition of the exercise, we take a deliberately simple, and in some ways "coarse", approach.

First, we do not define a financial imbalance per se. Rather, we simply explore the extent to which the measures appear to have had an effect on key variables typically associated with financial imbalances as defined in the text, namely credit growth and house price increases. The specific credit variable chosen depends on what type of credit was targeted by the authorities in a specific country and data availability. It ranges from overall domestic credit to mortgage credit to the household sector. Both credit growth and house prices are measured in real (inflation-adjusted) terms. For credit growth, both credit growth per se and the ratio of credit to GDP are used, as alternative variables.[22]

Second, we define three different types of counterfactual, listed here in increasing degree of comprehensiveness. In the simplest case, we simply consider whether the rate of change in the credit variable or in house prices changed following the introduction of the measures. In the second, we allow a less constraining specification of the dynamics of the relevant variables. In the third, we control, in addition, for background conditions, such as the behaviour of other macroeconomic variables. Here, we consider real GDP growth and changes in the stance of monetary policy as captured by changes in policy interest rates (in nominal and real terms, for robustness). The hypothesis tested is that the credit boom or the rate of house price inflation was restrained by the introduction of the measures.

Third, we simply assume away the heterogeneity of prudential measures. All such measures are treated identically, regardless of whether they target minimum capital requirements, loan-to-value ratios, provisions, sectoral exposures and specific lending criteria (Table 2 in the main text). The number of cases is simply not large enough to permit a more granular treatment. In the test, this is implemented by a variable taking the value of 1 if the measure is taken and 0 otherwise.

Fourth, we do make a distinction, however, between prudential measures, on the one hand, and monetary measures, on the other. Aside from changes in the policy interest rate, treated as a control variable, monetary measures include changes in reserve and liquidity requirements as well as credit limits (same Table). We consider two sets of cases, namely those in which prudential measures were taken in isolation and those in which they were taken either in isolation or alongside monetary

[22] Since the credit variables differ significantly across countries and in terms of ratio to GDP, we rebased the ratio of credit to GDP to equal 100 at t minus 3 for each country, where t is the year the first measure was taken.

measures within the relevant window, as defined below. This is partly done to increase the degrees of freedom of the exercise, since there are only 7 cases in which prudential measures were taken in isolation, and as many as 15 in which they were either in isolation or jointly.[23]

Finally, in order to address the fact that the measures may take time to have an effect and that many of them are rather recent, we focus on their impact only in the two years following their introduction. This means that we exclude any effect which may occur within the first year or which may linger beyond that window.[24] Moreover, to simplify the analysis further, in those cases in which more than one measure is taken within the window, we simply take the first one and ignore the rest. The relevant date corresponds to the time of the introduction of the first prudential measure. Overall, we treat each episode separately, and consider the behaviour in all the relevant variables over a 5-year window: the two years preceding the measure, the year the measure is taken, and the two years following that. Thus, the dummy variable is set as $d_{t-1} = d_t = 0$, $d_{t+1} = d_{t+2} = 1$. If the policy measures were effective, we expect negative values for the coefficients of the dummy variable.

Thus, the regressions take the form

Regression 1 (double difference): $\Delta\Delta X_{i,t} = \alpha + \beta d_t$.

Regression 2 (difference with AR1): $\Delta X_{i,t} = \alpha + \beta d_t + \gamma \Delta X_{i,t-1}$.

Regression 3 (difference with AR1 and controls): $\Delta X_{i,t} = \alpha + \beta d_t + \gamma \Delta X_{i,t-1} + \delta Z_t$.

Where

$X_{i,t}$: $X_{1,t}$: $CR_t/GDP_t$, $X_{2,t}$: $\ln(CR_t/P_t)$, $X_{3,t}$: $\ln(RHP_t)$, with CR: credit, P: CPI, and RHP: real house prices;

$\Delta X_{i,t} = X_{i,t} - X_{i,t-1}$, $\Delta\Delta X_{i,t} = \Delta X_{i,t} - \Delta X_{i,t-1} = (X_{i,t} - X_{i,t-1}) - (X_{i,t-1} - X_{i,t-2})$;

$Z_t$: (i) $\Delta RGDP_t = \ln(GDP_t/P_t) - \ln(GDP_{t-1}/P_{t-1})$,

(ii) $\Delta POL_t$ = nominal policy rate at t – nominal policy rate at t-1,

(iii) $\Delta POL_{t-1}$ = nominal policy rate at t-1 – nominal policy rate at t-2,

(iv) $\Delta RPOL_t$ = real policy rate at t – real policy rate at t-1,

(v) $\Delta RPOL_{t-1}$ = real policy rate at t -1– real policy rate at t-2,

(vi) $\Delta RGDP_t$, $\Delta POL_t$,

(vii) $\Delta RGDP_t$, $\Delta POL_{t-1}$,

(viii) $\Delta RGDP_t$, $\Delta RPOL_t$,

(ix) $\Delta RGDP_t$, $\Delta RPOL_{t-1}$.

**The regression results**

At least five findings are worth highlighting.

First, as background, the double difference regressions confirm what was already evident from the graphs in the main text: credit and asset prices were expanding quite fast prior to the introduction of the measures (Annex Table 1). This is indicated by the value of $\alpha$ (the constant) in the regression. Interestingly, the rate of real credit growth was, on average, decelerating, although the coefficient is not statistically different from zero.

[23] We exclude Romania from the regressions because its ratio of household credit to GDP grew more than 10 times in the 4 years to 2005, which is much faster than the 1.5 to 3 times range observed in the other countries in the sample, and because no house price indexes were available.

[24] This is implemented by setting the dummy equal to 1 in the two years following that of the introduction of the measure. We have experimented with different dummy specifications and found out that the lagged effect is stronger than the contemporaneous effect.

Second, the same regressions indicate that all the variables tended to decelerate after the imposition of the measures (same Table). However, a statistically significant effect is apparent only in the larger sample, which includes also the cases where prudential measures were taken alongside monetary measures. This could mean either that they are more effective when taken jointly or that there are simply too few cases of prudential measures in isolation to allow the statistical significance to emerge (few degrees of freedom).

Third, the less constrained regressions, which in most cases also control for background macroeconomic conditions and changes in policy rates, point to a statistically significant restraining effect on credit variables (Annex Table 2). This effect tends to be quite robust to the specification of the regression, as it is apparent across most specifications.

Fourth, the statistical significance of the restraining effect on house prices survives as long as output growth is not included (same Table) Taken at face value, this would suggest that over the relevant window the effect that emerged from the univariate regressions may reflect the influence of output on house prices or that any effect of the measures may be indirect, via their impact on output.

Finally, and encouragingly, regardless of statistical significance, the size of the dummy coefficient does not vary much across specifications, pointing to a certain consistency in the results (same Table). Interpreting them literally, the results would suggest that, on average, prudential measures reduced credit growth by between 4-6 percentage points in the years immediately following their introduction. House prices decelerated in real terms by between 3-5 percentage points.

Given the shortcomings of this preliminary exploration, it is hard to reach any conclusions with any confidence. We interpret the results as suggesting that there is a prima facie case for suggesting that the introduction of prudential measures, sometimes supported by monetary measures, appears to have contributed, on average, to some, at least temporary, containment of the booms. More definite conclusions would require a more systematic and in-depth analysis, ideally based also on the accumulation of more data.

**Annex Table 1**

**Double difference regressions**

| Country group | Dependent Variable (ΔΔXt) | Regression 1 | |
|---|---|---|---|
| | | α | β |
| Countries which took prudential measures (15) | $\Delta\Delta(CR_t/GDP_t)$ | 2.27 | -5.35 |
| | | (2.38) | (3.80) |
| | $\Delta\Delta\ln(CR_t/P_t)$ | -1.41 | -1.79 |
| | | (1.60) | (2.49) |
| | $\Delta\Delta\ln(RHP_t)$ | 4.00** | -6.81*** |
| | | (1.61) | (2.46) |
| Countries which took only prudential measures (7) | $\Delta\Delta(CR_t/GDP_t)$ | 1.29 | -5.76 |
| | | (2.14) | (3.46) |
| | $\Delta\Delta\ln(CR_t/P_t)$ | -1.71 | -0.94 |
| | | (2.06) | (3.20) |
| | $\Delta\Delta\ln(RHP_t)$ | 1.81** | -1.22 |
| | | (0.86) | (1.34) |

*: prob. between 10% and 5%, **: prob. between 5% and 1%, ***: prob. below 1%. The numbers in parentheses are standard errors.

## Annex Table 2

### The coefficients on the policy dummy for the difference regressions

| Country group | Dependent Variable ($\Delta X_t$) | Regression 2 | Regression 3 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $\Delta X_{t-1}$ | $\Delta X_{t-1}$ $\Delta GDP_t$ | $\Delta X_{t-1}$ $\Delta POL_t$ | $\Delta X_{t-1}$ $\Delta POL_{t-1}$ | $\Delta X_{t-1}$ $\Delta RPOL_t$ | $\Delta X_{t-1}$ $\Delta RPOL_{t-1}$ | $\Delta X_{t-1}$ $\Delta GDP_t$ $\Delta POL_t$ | $\Delta X_{t-1}$ $\Delta GDP_t$ $\Delta POL_{t-1}$ | $\Delta X_{t-1}$ $\Delta GDP_t$ $\Delta RPOL_t$ | $\Delta X_{t-1}$ $\Delta GDP_t$ $\Delta RPOL_{t-1}$ |
| Countries which took prudential measures (15) | $\Delta(CR_t/GDP_t)$ | -7.84** | -6.88* | -7.90** | -8.09** | -8.07** | -8.24** | -6.98* | -7.08* | -7.14* | -7.25* |
| | | (3.69) | (3.74) | (3.70) | (3.69) | (3.70) | (3.74) | (3.76) | (3.72) | (3.76) | (3.83) |
| | $\Delta\ln(CR_t/P_t)$ | -5.50** | -4.58* | -5.53** | -5.61** | -5.67** | -5.77** | -4.62* | -4.68** | -4.72** | -4.69* |
| | | (2.27) | (2.27) | (2.30) | (2.28) | (2.28) | (2.31) | (2.30) | (2.26) | (2.29) | (2.34) |
| | $\Delta\ln(RHP_t)$ | -4.63* | -3.07 | -4.52* | -4.39* | -4.41* | -4.70** | -2.98 | -2.92 | -2.79 | -3.37 |
| | | (2.32) | (2.52) | (2.29) | (2.34) | (2.30) | (2.27) | (2.48) | (2.53) | (2.48) | (2.51) |
| Countries which took only prudential measures (7) | $\Delta(CR_t/GDP_t)$ | -6.51** | -7.11* | -6.41* | -6.57* | -5.86* | -6.35* | -6.93 | -7.12* | -5.66 | -6.90* |
| | | (3.05) | (3.83) | (3.15) | (3.31) | (3.04) | (3.13) | (3.99) | (4.02) | (3.96) | (3.95) |
| | $\Delta\ln(CR_t/P_t)$ | -4.23* | -4.32 | -4.37* | -3.95 | -4.12* | -4.22* | -4.49 | -4.26 | -3.76 | -4.32 |
| | | (2.26) | (2.97) | (2.29) | (2.38) | (2.33) | (2.32) | (3.07) | (3.08) | (3.17) | (3.06) |
| | $\Delta\ln(RHP_t)$ | -0.55 | 0.05 | -0.52 | -0.16 | -0.41 | -0.51 | 0.18 | 0.43 | 0.42 | 0.20 |
| | | (1.49) | (1.99) | (1.58) | (1.59) | (1.58) | (1.53) | (2.16) | (2.08) | (2.18) | (2.05) |

*: prob. between 10% and 5%, **: prob. between 5% and 1%, ***: prob. below 1%. The numbers in parentheses are standard errors. See the text for a definition of the symbols.

## References


Allen, L and A Saunders (2004): "Incorporating systemic influences into risk measurements: a survey of the literature", Journal of Financial Services Research, 26(2), pp.161-91.

Amato, J (2005): "Risk aversion and risk premia in the CDS market", *BIS Quarterly Review*, December.

Amato, J and C H Furfine (2003): "Are credit ratings procyclical?", *BIS Working Papers,* no 129.

Banco de Portugal (2000): *Economic Bulletin*, June.

——— (2000): *Annual Report 1999*.

Bank for International Settlements (1993): *63rd Annual Report*, June.

——— (2002): *72nd Annual Report*, June.

——— (2004): *74th Annual Report*, June.

——— (2005a): *75th Annual Report*, June.

——— (2005b): "Investigating the relationship between the financial and the real economy", *BIS Papers*, no 22, April.

——— (2006a): "The banking system in emerging economies: how much progress has been made?", *BIS Papers*, no 28, August.

——— (2006b): *76th Annual Report*, June.

Bank of Finland (1990): *Bulletin*, November.

Bank of Greece (2000): *Economic Bulletin*, no 15, July.

Bank of Korea (2006): *Financial Stability Report*, April.

Bank of Latvia (2006): *Financial Stability Report 1•2006.*

Basel Committee on Banking Supervision (1997): *Core Principles for Effective Banking Supervision*, Bank for International Settlements, September.

——— (2001): *Basel II: The New Basel Capital Accord - Second Consultative Paper*, January.

——— (2006a): *Core Principles for Effective Banking Supervision*, Bank for International Settlements, April.

——— (2006b): *Basel II: International Convergence of Capital Measurement and Capital Standards: A Revised Framework - Comprehensive Version,* June.

Berg, S A (1993): "The banking crises in the Scandinavian countries", in *FDICIA: An appraisal, Proceedings of the Federal Reserve Bank of Chicago Conference on Bank Structure and Competition*, May 1993, pp 441–49.

Berger, A, M Kyle, and J Scalise (2000): "Did U.S. Bank Supervisors Get Tougher During the Credit Crunch? Did They Get Easier During the Banking Boom? Did it Matter to Bank Lending?", NBER Working Paper 7689.

Berndt, A, R Douglas, D Duffie, M Ferguson and D Schranz (2005): "Measuring default risk premia from default swap rates and EDFs", *BIS Working Papers*, no 173, March.

Borio, C (2003): "Towards a macroprudential framework for financial supervision and regulation?", *CESifo Economic Studies*, vol 49, no 2/2003, pp 181–216. Also available as *BIS Working Papers*, no 128, February.

Borio, C (2007): "Monetary and prudential policies at a crossroads? New challenges in the new century", Moneda y Crédito, 224, pp 63-101. Also available as *BIS Working Papers*, no 216, September 2006.

Borio, C and A Crockett (2000): "In search of anchors for financial and monetary stability", *Greek Economic Review*, vol 20, no 2, autumn, pp 1-14.

Borio, C and A Filardo (2004): "Looking back at the international deflation record", *The North American Journal of Economics and Finance*, 15, pp 287-311. A more extensive version is also available as "Back to the future? Assessing the deflation record", *BIS Working Papers*, no.152, March.

——— (2007): "Globalisation and inflation: new cross-country evidence on the global determinants of domestic inflation", *BIS Working Papers*, no 227, May.

Borio, C, C Furfine and P Lowe (2001): "Procyclicality of the financial system and financial stability: issues and policy options" in *Marrying the macro- and micro-prudential dimensions of financial stability*, *BIS Papers*, no 1, March, pp 1-57.

Borio, C and P Lowe (2001): "To provision or not to provision", *BIS Quarterly Review*, September, pp 36-48.

——— (2002a): "Asset prices, financial and monetary stability: exploring the nexus", paper presented at the BIS Conference on "Changes in risk through time: measurement and policy options", *BIS Working Papers*, no 114, July.

——— (2002b): "Assessing the risk of banking crises", *BIS Quarterly Review*, December, pp 43-54.

——— (2004): "Securing sustainable price stability: should credit come back from the wilderness?", *BIS Working Papers*, no 157, July.

Borio, C and P McGuire (2004): "Twin peaks in equity and housing prices?", *BIS Quarterly Review*, March, pp 79-93.

Borio, C and F Packer (2004): "Assessing new perspectives on country risk", *BIS Quarterly Review*, December, pp 47–65.

Borio, C and K Tsatsaronis (2004): "Accounting and prudential regulation: from uncomfortable bedfellows to perfect partners?", *Journal of Financial Stability*, vol 1, issue 1, September, pp 111–35. A more extensive version is also available as "Accounting, prudential regulation and financial stability: elements of a synthesis", *BIS Working Papers*, no 180, September 2005.

——— (2006): "Risk in financial reporting: status and suggested future directions", *BIS Working Papers*, no 213, August.

Borio, C and W White (2004): "Whither monetary and financial stability? The implications of evolving policy regimes", in *Monetary policy and uncertainty: adapting to a changing economy*, proceedings of symposium sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, 28-30 August, pp 131-211. Also available as *BIS Working Papers*, no 147, February 2004.

Bulgarian National Bank (2005): *2004 Annual Report.*

——— (2006): *2005 Annual Report.*

Calverley, J P (2004): *Bubble$ and how to survive them*, American Express Bank, London.

Caruana, J (2005): "Monetary policy, financial stability and asset prices", *Occasional Papers*, 0507, Bank of Spain.

Catarineu-Rabell, E, P Jackson and D P Tsomocos (2003): "Procyclicality and the new Basel Accord – banks' choice of loan rating system", *Working Papers*, 181, Bank of England.

Central Bank of Iceland (2000): *Annual Report 1999*.

Committee on the Global Financial System (2006): *Housing finance in the global financial market*, Basel, January.

Craig, R S, E P Davis and A Garcia Pascual (2006): "Sources of procyclicality in East Asian financial systems" in S Gerlach and P Gruenwald (eds) *Procyclicality of financial systems in Asia*, IMF and Hong Kong Institute for Monetary Research, Palgrave MacMillan, New York.

Croatian National Bank (2005): *Bulletin,* no 102, Quarterly Report, March.

Crockett, A (2000): "Marrying the micro- and macroprudential dimensions of financial stability", *BIS Speeches*, 21 September.

Danielsson, J, P Embrechts, C Goodhart, C Keating, F Muennich, O Renault and H S Shin (2001): "An academic response to Basel II", *Special Paper*, no 130, London School of Economics Financial Markets Group.

ECB (2001): "The new capital adequacy regime – the ECB perspective", *ECB Monthly Bulletin*, May.

Eesti Pank (2006): *Financial Stability Review*, May.

Eichengreen, B, R Hausmann and U Panizza (2003): "Currency mismatches, debt intolerance and original sin: why they are not the same and why it matters", *NBER Working Papers*, no 10036, October.

Enria, A, L Cappiello, F Dierick, G Sergio, A Haralambous, A Maddaloni, P Molitor, F Pires and P Poloni (2004): "Fair value accounting and financial stability", *ECB Occasional Papers* No 13.

Fernández de Lis, S, J Martínez Pagés and S Saurina (2001): "Credit growth, problem loans and credit risk provisioning in Spain", in *Marrying the macro- and microprudential dimensions of financial stability*, *BIS Papers*, no 1, March.

Fitch Ratings (2005): "Assessing bank systemic risk: a new product", *Criteria Report*, 26 July.

——— (2006a): "Greek consumer lending – trends and risks", *Special Report*, 12 July.

——— (2006b): "Indian banks: prudential regulations", *Banking System and Prudential Regulations Report*, 24 August.

Goldstein, M and P Turner (2004): *Controlling currency mismatches in emerging markets*, Institute for International Economics, Washington.

Goodhart, C A E (2004): *Some New Directions for Financial Stability?*, The Per Jacobsson Lecture, Zürich, Switzerland, 27 June.

Gordy, M and B Howells (2004): "Procyclicality in Basel II: Can we treat the disease without killing the patient?", *Working Paper*, Board of Governors of the Federal Reserve System.

G10 (2003): *Turbulence in Asset Markets: the Role of Micro Policies*, January

G22 (1998*): Reports on the International Financial Architecture by the working groups on 1) Transparency and Accountability; 2) Strengthening Financial Systems; 3) International Financial Crises*, October, (available on the BIS website)

Hawkins, J and M Klau (2000): "Measuring potential vulnerabilities in emerging market economies", *BIS Working Papers*, no 91, October.

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.

Ho, Corrinne and Robert N. McCauley (2003): "Living with Flexible Exchange Rates," *BIS Working Papers*, no 130, February. Featured in Economist's *"Economic focus"* on 13 September 2003.

Hördahl, P and F Packer (2006): "Understanding asset prices: an overview", background paper for the BIS autumn central bank economists meeting, 30-31 October, *BIS Working Papers*, forthcoming.

Institute of International Finance (2005): *Special Briefing: People's Republic of China*, 24 January.

IMF (2003): "When bubbles burst", World Economic Outlook (WEO), Chapter II, April.

——— (2005): *Financial Sector Assessment. A Handbook*, 29 September.

——— (2006a): *Global Financial Stability Report*, September.

——— (2006b): "Republic of Latvia: selected issues", *Country Report*, no 06/354, October.

Kashyap, A K and J C Stein (2004): "Cyclical implications of the Basel II capital standards", *Federal Reserve Bank of Chicago Economic Perspectives*, First Quarter, pp 18-31.

Knight, M D (2004): "Banking and insurance regulation and supervision: Greater convergence, common challenges", speech delivered at the International Conference of Banking Supervisors, Madrid, 22-23 September 2004

——— (2006): "Marrying the micro and macroprudential dimensions of financial stability: six years on", speech delivered at the 14th International Conference of Banking Supervisors, October.

Lowe, P (2002): "Credit risk measurement and procyclicality", *BIS Working Papers*, no 116, September.

Lowe P and G Stevens (2006): "Procyclical financial behaviour: what can be done?", in S Gerlach and P Gruenwald (eds) op.cit.

McCauley, R, J S Ruud and F Iacono (1999): *Dodging Bullets: Changing US Corporate Capital Structures in the 1980s and 1999s*, MIT Press, Cambridge, Massachusetts.

Mihaljek, D (2006): "Eastern Europe's risky credit boom", *Central Banking*.

Mohan, R (2006): "Financial sector reforms and monetary policy: the Indian experience", paper presented at the Conference on Economic Policy in Asia organized by Stanford Center for International Development and Stanford Institute for Economic Policy Research on June 2, 2006.

National Bank of Romania (2006): *Financial Stability Report*.

——— (2006): *Annual Report 2005*.

Peek, J and E S Rosengren (1995): "Bank Regulation and the Credit Crunch", *Journal of Banking and Finance*, 19 (3-4), pp 679-692.

People's Bank of China (2004): *China Real Estate Finance Report*, China Financial Publishing House.

Reserve Bank of New Zealand and the Treasury (2006): *Supplementary stabilisation instruments: An initial report*, February.

Segoviano, M and P Lowe (2002): "Internal ratings, the business cycle and capital requirements: some evidence from an emerging market economy", BIS *Working Papers*, no 117, September.

Shin, H S (2006): "Risk and liquidity in a system context", *BIS Working Papers*, no 212, August.

Sorge, M (2004): "Stress-testing financial systems: an overview of current methodologies", *BIS Working Papers*, no 165, December.

Tarashev, N (2005): "An empirical evaluation of structural credit risk models", *BIS Working Papers*, no 179, July.

Taylor, A and C Goodhart (2006): "Procyclicality and volatility in the financial system: the implementation of Basel II and IAS39", in S Gerlach and P Gruenwald (eds) op.cit.

White, W (2006a): "Is price stability enough?", *BIS Working Papers*, no 205, April.

——— (2006b): "Procyclicality in the financial system: do we need a new macrofinancial stabilisation framework?", *BIS Working Papers*, no 193, January.

Working Party on Financial Stability in Emerging Market Economies (1997): *Financial Stability in Emerging Market Economies*, Bank for International Settlements, Basel, April.

Zhu, H (2007): "Capital regulation and banks' financial decisions", *BIS Working Papers*, no 232, July.