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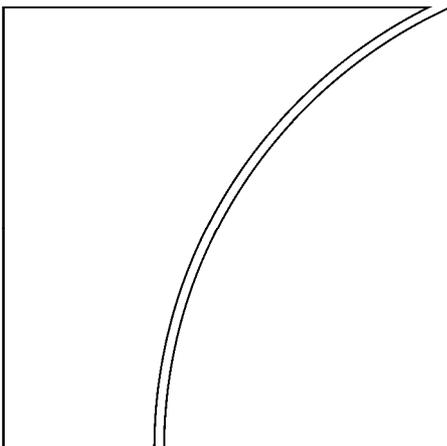
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Macroprudential instruments and frameworks: a stocktaking of issues and experiences

Report submitted by the Committee on the Global Financial System

Preparation of the Report was overseen by a Coordinating Group chaired by Lex Hoogduin of The Netherlands Bank

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BANK FOR INTERNATIONAL SETTLEMENTS

Preface

In November 2009, the Committee on the Global Financial System (CGFS) launched a project to examine issues that central banks will face as macroprudential policy frameworks are developed and applied. Central banks have a stake in macroprudential policy due to their various roles in financial stability, and because successful macroprudential policy can help stabilise the economy. But questions surround how macroprudential policy should be defined and how its instruments should be operated.

This report summarises the CGFS's preliminary "stocktaking" of issues and experience related to the design and implementation of macroprudential policy. The project was overseen by a Coordinating Group led by Lex Hoogduin of the Dutch central bank. It has benefited from input by many CGFS members.

As part of this work, in late 2009 the CGFS surveyed central banks on their conceptions of macroprudential policy and their use of macroprudential instruments. The CGFS also held a workshop for central banks in February 2010 on the use of macroprudential instruments relating to property lending markets, many of which have been applied in emerging economies.

Following discussion of initial findings in March 2010, the revised report was presented to central bank Governors at the Global Economy Meeting in May 2010, where it received endorsement for publication. We hope that this report will be a relevant and timely input to the national and international discussions about strengthening the financial system.

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1. Introduction

The global financial crisis has prompted a careful review of a wide range of policy areas. In many cases, microprudential supervision failed to ensure that financial institutions had sufficient capital and liquidity to cope with the shock. The efficacy of monetary policy in responding to system-wide financial risk in an environment of stable inflation was, and still is, under debate.

The issue of how to define and develop the macroprudential element of financial stability policy has attracted particular attention.[1] Policymakers broadly agree that the purpose of macroprudential policy is to reduce systemic risk, strengthening the financial system against shocks and helping it to continue functioning stably without emergency support on the scale that was extended in the crisis. Preventative in its orientation, macroprudential policy is distinct from financial crisis management policy.[2]

Views vary on how macroprudential policy should be defined and implemented. Questions also surround the choice of available instruments and the ways in which they might operate.

Central banks have a stake in macroprudential policy. First, they are seen as bearing important responsibilities for financial stability, if sometimes only implicitly so. Second, the objectives, instruments and conduct of macroprudential policy are part of an overall economic and financial stabilisation function that includes monetary policy. Successful macroprudential policy and monetary policy can reinforce each other to stabilise the economy.

This report discusses summarises preliminary discussions of the Committee on the Global Financial System (CGFS) on issues that central banks will face as macroprudential policy frameworks are developed and applied. It proceeds as follows. Section 2 discusses the objectives of macroprudential policy. Section 3 looks at different types of macroprudential instruments. Section 4 examines issues relating to the operation of macroprudential instruments. Section 5 discusses practical experience with macroprudential instruments in a number of economies, drawing from the results of a CGFS survey of central banks on their conceptions of macroprudential policy and their use of macroprudential instruments, and from a CGFS workshop for central banks on the use of macroprudential instruments relating to property lending markets. Section 6 concludes by noting some preliminary findings and open issues.

The report does not discuss in detail the broader issues of how macroprudential policy should fit into a wider stabilisation policy framework, including the governance issues that arise in that context. As these complex and important topics are under discussion elsewhere, we consider them outside the scope of this paper, which will focus on macroprudential policy itself.

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[1] The definition of financial stability is not settled. Alternatives have been proposed in the literature. Some focus on the robustness of the financial system to external shocks and to shocks originating within the financial system, others on the system's vulnerability to normal-sized shocks (see Annex 1 for a review of the literature on these topics and on macroprudential policy more broadly).

[2] Although safety nets and crisis resolution tools contribute to macroprudential objectives (for instance, by lowering the probability of runs), they are arguably most relevant in the event of a crisis, and are not treated as macroprudential instruments here.

2.   Elements of a macroprudential policy framework

2.1   Macroprudential policy objectives

To mitigate systemic risk, it is first necessary to define it. A proposed definition arising from work by the IMF, FSB and BIS for the G20[3] defines systemic risk as "a risk of disruption to financial services that is caused by an impairment of all or parts of the financial system and has the potential to have serious negative consequences for the real economy". (For these purposes, "financial services" include credit intermediation, risk management and payment services.)

Macroprudential policy focuses on the interactions between financial institutions, markets, infrastructure and the wider economy. It complements the microprudential focus on the risk position of individual institutions, which largely takes the rest of the financial system and the economy as given. Clearly, neither type of policy is a substitute for sound risk management in the private sector, which should as far as possible internalise the risk of potential losses.

The vagueness of the definition of systemic risk reflects its dependence on time- and economy-specific circumstances, as well as the current lack of knowledge about the behaviour of the financial system, its interactions with the economy, and their sensitivity to policy interventions.

In articulating the practical objectives of macroprudential policy, two aims might be distinguished. The first is to *strengthen the financial system's resilience* to economic downturns and other adverse aggregate shocks. The second is to actively limit the build-up of financial risks. Such *leaning against the financial cycle* seeks to reduce the probability or magnitude of a financial bust.[4]

These aims are not mutually exclusive. They both go beyond the purpose of microprudential policy, which is to ensure that individual firms have sufficient capital and liquidity to absorb shocks to their loan portfolios and funding. Macroprudential policy takes into account risk factors that extend further than the circumstances of individual firms. These include shock correlations and the interactions that arise when individual firms respond to shocks. Such factors determine the likelihood and consequences of the systemically important shocks that macroprudential policy seeks to mitigate.

2.2   Instruments and interventions

A key part of developing macroprudential instruments is to adapt existing microprudential tools, such as strong prudential standards (for example, requirements to hold high capital and liquidity buffers) and limits on activities that increase systemic vulnerabilities and risks. These standards and limits might be occasionally varied, or adjusted in a countercyclical manner, especially with a view to leaning against the financial cycle. When that is the aim, the instruments would be adjusted dynamically in response to changing assessments of financial risks. Adjustments would need to occur both on the upswing, when vulnerabilities are building, and on the downswing, when risks of a destabilising credit contraction are rising.

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[3]   See "Guidance to assess the systemic importance of financial institutions, markets and instruments: initial considerations", October 2009.

[4]   The sharpness of the distinction here is mostly for expository purposes; in practice there will be nuances and shades of grey between the two aims.

Existing microprudential instruments could be used for promoting financial system resilience. They can be recalibrated to limit the financial system's exposure or vulnerability to shocks. Instruments in this category include capital and liquidity requirements with a "buffer" character, limits on leverage in particular types of lending contract, constraints on currency mismatches, or measures that strengthen financial infrastructure. Table 1 shows some examples of macroprudential instruments, categorised by the main risk factors they influence or constrain, and by the component of the financial system they work in.

Leaning against the financial cycle requires instruments that can be varied actively and calibrated quantitatively. They might apply narrowly to sectors where systemically relevant imbalances are developing, or more broadly to intermediaries and markets across the financial system when financial excesses are more generalised. Ideally, the instruments should be effective in leaning against both the upswing and the downswing. In the latter phase, their task would be to avert a generalised fall-off in risk appetite and credit.

Few potential instruments appear to exist with these characteristics, but work is under way in international forums to develop them. The Basel Committee on Banking Supervision is considering the introduction of measures to promote the build-up in good times of capital buffers that can be drawn down in periods of stress.[5] And in a recent report on how haircuts and margining practices can exacerbate procyclicality, the CGFS discussed the possible use of countercyclical add-ons to supervisory haircuts that could be used to vary capital requirements on secured lending.[6]

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[5]   See "Consultative proposals to strengthen the resilience of the banking sector announced by the Basel Committee", Basel Committee on Banking Supervision press release, 17 December 2009.

[6]   See Section 4.2 in CGFS (2010).

Table 1

Macroprudential instruments by vulnerability and financial system component

		Financial system component				
		Bank or deposit-taker		Non-bank investor	Securities market	Financial infrastructure
		Balance sheet*	Lending contract			
Vulnerability	**Leverage**	• capital ratio • risk weights • provisioning • profit distribution restrictions • credit growth cap	• LTV cap • debt service / income cap • maturity cap		• margin/haircut limit	
	Liquidity or market risk	• liquidity / reserve requirements • FX lending restriction • currency mismatch limit • open FX position limit	• valuation rules (eg. MMMFs)	• local currency or FX reserve requirements	• central bank balance sheet operations	• exchange trading
	Interconnectedness	• concentration limits • systemic capital surcharge • subsidiarisation				• central counterparties (CCP)

* Capital and other balance sheet requirements also apply to insurers and pension funds, but we restrict our attention here to the types of institutions most relevant for credit intermediation.

Table 2 shows some broad differences in the style of macroprudential policy that might correspond to the two aims outlined above. In practice, shades of grey will exist, of course. Some instruments and styles could be applied towards both aims. For example, LTV ratio caps could be set at a certain level or norm (for instance, 80%) and left there. They would in this case contribute mostly to the aim of enhancing financial system resilience, but they might also act as automatic stabilisers, thus helping to moderate the financial cycle. If policymakers wanted to enhance the latter effect, such caps could be adjusted around their norm in a countercyclical manner.

Table 2

**Macroprudential aims within the overall objective, and instruments:
a stylised comparison**

	Aim	
	To enhance financial system resilience to shocks	**To moderate the financial cycle**
General approach to achieving aim	Recalibrate micro tools taking into account systemic risk	Use tools dynamically in response to the financial cycle
Key features of instruments	May be macro- or micro-style (ie institution-specific elements in application and calibration)	Tend to be macro-style: broad application, eg across all banks or markets
Frequency of adjustment	Generally less frequent or might be one-off (eg in response to structural changes in the financial system), but frequent review and adjustment also possible	Tend to be periodically reviewed and more frequently adjusted, in response to fluctuations in the financial cycle

3. Issues involved in operating macroprudential instruments

3.1 Assessing the transmission of macroprudential interventions through the financial system

Our understanding of how the financial system behaves and interacts with the macroeconomy remains very incomplete. The same is true for the potential role of macroprudential policy in influencing that behaviour and interaction. Close substitutability and competition between institution- and market-based credit complicate the task of predicting the systemic impact of measures taken in any specific market.

The plenitude of instruments is helpful in that policy measures could potentially be tailored to conditions in particular sectors. However, measures targeting specific markets might increase imbalances in other areas. For example, generalised restrictions on bank leverage might reduce bank lending, but increase securities issuance. Restrictions on lending to particular sectors (for instance, through lower LTV ratio caps) might cause credit conditions to loosen in other sectors, as lenders could seek to deploy their capital elsewhere. And these dynamics within the financial system might well have macroeconomic implications, which are not yet well understood.

Moreover, the transmission mechanism is likely to change over time with changes in financial intermediation practices and the structure of the financial system. Financial innovation,

consolidation and a shifting balance between institution- and market-based credit can change risk distributions in unpredictable ways.

3.2 Signal extraction

By definition, macroprudential risks can be diagnosed only by reference to measures of systemic vulnerability, even though sectoral developments may also form an important part of the information set. The measures might comprise system-wide counterparts of familiar financial risk measures such as leverage, maturity or currency mismatches, and the correlation of exposures across institutions and other measures of interconnectedness. Also important are measures of system-wide financing conditions, such as aggregate or sectoral credit growth, the credit/GDP ratio and inflation in asset prices. For all such measures, the *imbalances* or *excesses* need to be identified, as distinct from fundamentals-driven cyclical fluctuations and longer-term trends.

Policymakers will be unable to lean against the cycle effectively unless they can first identify the build-up of financial risks. Even when excesses are evident, it might be difficult to assess the consequences for the real economy and weigh them against the effects of tighter macroprudential policy. Moreover, the need to take timely policy action increases the risk of diagnostic error.

Evidence of financial imbalances and vulnerabilities will need to be sought at both the aggregate and disaggregated levels. Such evidence might be more apparent at the sectoral level, given that imbalances and exposures do not typically develop evenly across the financial system or sectors of the real economy. The difficulty of aggregating sector-specific measures into credible evidence of an overall *macroprudential* problem might lead policymakers to take action mainly at a disaggregated level, even though the actions might be motivated primarily by macroprudential concerns. The danger here is that the intent of macroprudential policy might not be clear. A further risk is that policy measures will not be applied uniformly and proportionately across sectors. Specific measures that might be taken to reduce these risks include supervisory guidance statements and other public communication devices, as well as "horizontal" reviews and stress tests.

3.3 Rules vs. discretion in operating macroprudential policy

Experience with monetary policy suggests that policymaking works best when it is fairly predictable and transparent. At the very least, such policy behaviour reduces uncertainty for market participants. The same is likely to hold true for macroprudential policy. When leaning against the financial cycle, where timely policy action is particularly important, explicit guidelines or well-articulated principles for macroprudential policy actions should help to counter political and institutional resistance.

In a further analogy with monetary policy, macroprudential policymakers who tighten in a boom can expect their case for doing so to be criticised as uncertain. Persuasive evidence needs to be marshalled in time for successful policy action to be taken. Yet, even ex post, policymakers will always struggle to demonstrate the rationale for their actions or their effectiveness.

If it is to be predictable and transparent, policy needs to be set according to easily observable and reliable indicators. That said, each new financial cycle has unique as well as generic characteristics. Thus, policymakers will need to exercise judgment and give due weight to qualitative factors when using financial measures to assess systemic risks. The timing and intensity of policy interventions will also probably need to be varied with some discretion.

A crisis that is successfully averted by macroprudential policy leaves no traces. This makes it difficult to judge how well policymakers might have strengthened the resilience of the

financial system. The uncertainties surrounding macroprudential assessment mean that policy will inevitably have to be conducted with a considerable degree of judgment and discretion.

Another reason why discretion will continue to be indispensable in macroprudential policy is that financial behaviour responds to settings in other policy areas, such as the tax regime and industry-specific regulation. It would be misguided to reach for a macroprudential tool to correct a financial imbalance, for example, if that imbalance arose from a distortion arising elsewhere in the real economy. For instance, rising leverage could be a behavioural response to property price inflation, but that inflation may in turn reflect tight limits on building permits or a tax regime that favours debt financing. In this case, the problem would be best addressed at source, either by tax reform or by microeconomic regulatory measures in the property sector.

Macroprudential policy is not an exact science. Some fuzziness will probably be inevitable for the actual operation of policy. For the aim of ensuring resilience, the fundamental question is how much disruption is "low enough". For leaning against the wind, the issue is first to identify the financial cycle and then to ask what amplitude would be "small enough". In both cases, it is uncertain what level of confidence is actually achievable. Experience over time will help in the clarification of objectives and operating paradigms, as it has in the case of monetary policy.[7]

3.4 Regulatory arbitrage and cross-border coordination

Policymakers need to manage regulatory instruments in ways that counter avoidance and regulatory arbitrage, and they also have to keep up with innovation and structural change. These issues are especially pronounced for instruments that will be used in highly integrated and substitutable financial markets.

Macroprudential policy will raise questions of fairness both at home and abroad. Within a single jurisdiction, the playing field can be kept level by applying macroprudential interventions broadly across the financial system. This approach works less well across borders, however, given that financial cycles are not often synchronised between jurisdictions.

Furthermore, cross-border financial activity can undermine the effectiveness of national macroprudential policy. Problematic financial activity in one jurisdiction might be caused by institutions domiciled in a different jurisdiction, where there is no concurrent macroprudential problem and where the macroprudential authority has no motive or legal capacity for taking action. Indeed, restrictions on local activity imposed by the local macroprudential authority might have contributed to the offshore problem. Local incorporation and other "subsidiarisation" measures might enhance the ability of local authorities to directly influence local financial conditions for macroprudential purposes, thus simplifying the international coordination problem. However, this might raise the question of how globally active financial institutions would respond to such interventions.

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[7] An increasingly common definition of price stability for the purpose of setting objectives is now a low single-digit rate of annual CPI inflation, usually within a range that is very narrow compared to the historical experience of inflation variability, and over a horizon of around two to three years. Close variations on such a formulation have been adopted by more and more central banks over a number of years, as accumulated evidence showed that monetary policy can, in fact, succeed in delivering inflation outcomes consistent with the formulation.

There are limits to how far macroprudential policy can be coordinated internationally. Close international cooperation to enhance domestic resilience is likely to prove more practicable than a coordinated approach to leaning against the cycle.

3.5   Relationship with monetary policy

Successful monetary policy and macroprudential policy are likely generally to reinforce each other. Measures to strengthen the resilience of the financial system reinforce monetary policy by shielding the economy from sharp financial disruptions. Conversely, macroeconomic stability reduces the financial system's vulnerability to procyclical tendencies. Overall, official interest rates probably need not move as much as would be required in the absence of policy coordination.

The conduct of one policy will need to take account of developments and settings in the other. Interventions in either area will affect economic and financial conditions. Macroprudential settings will influence credit supply conditions, and hence monetary policy transmission. Meanwhile, measures that strengthen the resilience of the financial system may also help monetary policy to influence credit conditions more precisely in the wider economy, by reducing the impact of financial frictions on credit supply. The significance of these effects would probably depend on the macroeconomic environment, financial conditions, the share of bank-based intermediation in the financial system, and the level and distribution of capital and liquid assets within the banking system.

Of course, it is unrealistic to expect the combination of monetary and macroprudential policies to completely eliminate the economic cycle. The objective would be to moderate the cycle and increase the resilience of the system.

4.   Experience with macroprudential instruments

In most economies, macroprudential policy frameworks are at an early stage of development. They have been implemented using existing microprudential monetary policy and liquidity management mandates and institutions. And, macroprudential interventions have taken the form of adjustments or add-ons to instruments already used for microprudential or liquidity management purposes.

To date, most experience with macroprudential policy has focused on judgmental, rather than rules-based, use of instruments. The aims have mostly been to enhance financial system resilience rather than to moderate aggregate financial cycles, though there are examples where instruments have been used with a flavour of both aims.

The evidence for effectiveness is tentative. The independent effect of macroprudential instruments is hard to isolate, given that they have come into use only recently in most cases, and often in conjunction with other stabilisation measures such as monetary policy responses. Authorities that have used them generally report that they helped to protect the financial system from downturns, but made a lesser contribution to moderating the financial cycle.

To date, macroprudential instruments have been used mainly to limit the amount of credit supplied to specific sectors seen as prone to excessive credit growth, especially property investment and development. In addition, some emerging market economies have used reserve requirements to prevent the build-up of domestic imbalances arising from volatile cross-border capital flows. Measures targeting the size and structure of financial institution balance sheets for macroprudential purposes have been less common, with the exception of Spain's dynamic provisioning system, which has now been in place for a number of years.

This section summarises the main findings of a CGFS survey conducted in November 2009 on macroprudential instruments and policy. We also set out the main points of discussion at a CGFS workshop for central banks held in February 2010 on the use of macroprudential instruments relating to property lending markets. We discuss measures responding to capital flows or their consequences for domestic credit conditions, where a number of economies also have experience. Finally, we outline Spain's experience with statistical or dynamic provisioning, which has received some attention as a macroprudential instrument.

4.1 A CGFS survey of central banks on macroprudential instruments

At the end of 2009, the CGFS surveyed central banks on the use of macroprudential instruments in their economies. The survey covered the definition of macroprudential instruments, their categorisation, and objectives for their use. 33 central banks responded.

The CGFS survey showed that macroprudential instruments or interventions had been widely applied. They had targeted a variety of problems arising from the financial system and financial behaviour, at both aggregated and highly sector-specific levels.

Most respondents had a broad concept of what constitutes a macroprudential instrument. Many defined as macroprudential any instrument that could be used to affect system-wide financial risk, including measures that target specific groups of institutions or individual financial institutions with systemic importance. In particular, many respondents viewed microprudential measures that aim at reducing systemic risk as macroprudential. Measures that were mentioned as helping to contain system-wide risks by influencing the behaviour of market participants included communication of monitoring and systemic risk assessments (either to the general public or to financial institutions), and supervisory or regulatory letters indicating to supervised institutions a change in the stringency of the supervisory approach.

Survey responses indicated that conceptions of macroprudential policy aims and objectives are fuzzy. Respondents generally agreed that the objectives include strengthening the financial system's resilience and containing the build-up of risk within it. However, there was no common, or widely shared, formal definition of macroprudential policy objectives. One central bank deliberately avoids the term "macroprudential policy measures", on the grounds that the tools required to deal with financial instability constantly evolve and vary for each episode of financial instability. Rather, this respondent preferred to emphasise the importance of taking a "macroprudential perspective" when assessing financial sector conditions.

Comments on the relationship with other policy areas emphasised the complementarity with monetary policy. Macroprudential instruments should complement monetary policy by mitigating systemic risks to the financial system and thus providing a foundation for the effective transmission of monetary policy. Macroprudential instruments were viewed as more effective than monetary policy in addressing specific imbalances. Many emerging market economies viewed capital controls also as a means of gaining monetary policy flexibility in the context of an exchange rate band.

Macroprudential instruments were categorised in several ways. Apart from the basic distinction between those that affect credit prices and those that affect quantities, respondents often distinguished measures that mitigate the build-up of aggregate financial risk over time from those aimed at reducing the risk of financial contagion.

A broad range of instruments has been used to address system-wide financial risks, including many tools normally used for other purposes. These include microprudential instruments that have been applied to the system as a whole, fiscal measures such as financial transaction taxes, and central bank tools used for system liquidity management. Distinctions were drawn between instruments that directly or indirectly influence the supply or demand for credit in particular markets or sectors, those that directly target the size or

composition of bank balance sheets or those of other financial institutions, and those intended to limit the effects of cross-border capital flows.

The most widely used instruments have been measures to limit credit supply to specific sectors that are seen as prone to excessive credit growth. These include various restrictions on mortgage lending (caps on LTV ratios or debt/income ratios) and credit card lending limits. Some emerging market economies have used reserve requirements to prevent the build-up of domestic imbalances arising from cross-border capital flows. Although measures targeting the size or composition of bank balance sheets (such as loan-to-deposit ceilings, institution-specific capital add-ons or time-varying capital charges) seem to have been less frequently used, a range of such instruments have been introduced in response to the financial crisis, or are under consideration.

Table 3 shows examples of macroprudential instruments drawn from the survey responses. The table includes only instruments where the main or usual purpose is macroprudential. This excludes instruments such as official interest rates, emergency liquidity provision and foreign exchange market intervention, since these are mainly used for other policy purposes, even though their usage might often have macroprudential benefits. Also, consistent with the definition of macroprudential policy used in this note, our focus is on *preventative* instruments, rather than those used under crisis conditions.

Table 3

Macroprudential instruments cited by CGFS survey respondents

Type of instrument	Examples	Economies that have used the instrument	
		Advanced	**EME**
Measures targeting credit growth			
Limits calibrated to borrower risk characteristics	LTV caps, DTI limits, foreign currency lending limits	2	9
Absolute limits	Aggregate or sectoral credit growth ceilings, limits on exposures by instrument		4
Measures targeting size and composition of bank balance sheets			
Measures to limit interconnectedness			
Limits on leverage	Size-dependent leverage limits or asset risk weights, capital surcharges for systemically important institutions	2	2
Financial system concentration limits	Limits on interbank exposures	1	2
Measures to limit procyclicality			
Capital	Time-varying capital requirements, restrictions on profit distribution	1	1
Provisioning	Countercyclical/dynamic provisioning	1	5
Measures to address specific financial risks			
Liquidity risk	Loan-to-deposit limits, core funding ratios, reserve requirements	1	8
Currency risk	Limits on open currency positions or on derivatives transactions		8

The survey suggested that there are grey areas in regard to what counts as a macroprudential instrument. This should not be surprising, given that all instruments contemplated to date are derived from other policy areas with their own distinct objectives. The intent of the policymaker appears to have strongly influenced whether an instrument is considered macroprudential. For example, some survey respondents cited as having potential macroprudential applications instruments that are traditionally used in monetary policy (either the official interest rate or settings in liquidity management facilities such as acceptable collateral and other terms of central bank credit provision) and foreign exchange market intervention. Clarity about why a particular instrument is being used would help reduce the potential for conflict with other policy areas or for misappropriation of instruments.

Most of the instruments in use or under consideration apply to banks or deposit-takers. This probably reflects a pragmatic focus by the authorities on institutions that sit at the core of the financial system and are already subject to both microprudential regulation and supervision, and liquidity management interventions by central banks.

All the instruments shown in Table 3 directly address vulnerabilities and hence could potentially play a role in promoting financial system resilience. Some might also be of use in leaning against the financial cycle, depending on how broadly they could affect developments across the financial system. Direct constraints might be a more focused influence on overall lending, if they could be coordinated so as to avoid substitution by other credit products. It might also be necessary to use instruments in multiple sectors simultaneously to prevent imbalances that are tamped down in one sector from spilling over into other sectors.

4.2   Measures relating to property lending markets

Reflecting the relatively broad experience with measures relating to property lending, the CGFS hosted a workshop in February 2010 to discuss the practical experience with property-related measures across a number of economies.[8] The workshop focused on the use of loan-to-value (LTV) caps, debt servicing/income ratios, capital requirements and other measures related to property lending. Such measures are an important part of the macroprudential toolkit in a number of economies, particularly in Asia.

Most measures were taken during phases of rapid credit expansion, but some were also imposed in the aftermath of the crisis. Instruments were generally calibrated from starting from existing microprudential settings with adjustments for particular macro circumstances that were seen as relevant. For example, an 80% LTV maximum is widely seen by these countries as a norm or benchmark for residential real estate loans from a microprudential point of view, and a number of economies have caps at this level. Tightenings of this instrument typically took the form of 10 or 20 percentage point reductions, some of which were reversed when conditions in the targeted markets were seen to have normalised.

Discussions underscored that macroprudential policy and instrument choices depend on financial system structure, as well as on law and market practices regarding property lending. A heavy exposure of the financial system and economy to property market cycles and a marked tendency for property markets to respond to liquidity fluctuations were common features among economies that have used these measures. Most, but not all, were emerging market economies in which property lending is dominated by banks that retain the loans on their balance sheets rather than securitising them. Macroprudential policy seems to be

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[8]   Representatives of 22 central banks participated in the workshop. See Annex 3 for a list of participants.

especially important for economies that are constrained by fixed or managed exchange rate regimes from using monetary policy for stabilisation purposes.

Authorities were open to using a variety of instruments, and often combined them with standard measures that enforce prudent underwriting standards. For example, one authority used limits on loan concentration and debt servicing/income ratios as complements to an LTV ratio cap.

The aims of enhancing financial system resilience (formulated in one case as the maintenance of a stable credit supply) and leaning against build-ups of risk were given roughly equal weight in the operation of policy. A key challenge was to align goals and instruments in the design of institutional arrangements. One authority suggested that consistency of microprudential and macroprudential actions was important for the effectiveness of macroprudentially motivated measures.

LTV caps were thought attractive by those that employ them because they directly influence credit growth, and allow macroprudential authorities to articulate and precisely signal their concerns to institutions and the public. However, it was noted that a single quantitative "bright line" measure might not reflect all the relevant dimensions of risk on the credit product. Supervisory guidance that reflected the variation across products in several dimensions could address this issue. Probably in response to this complexity, authorities typically used LTV caps in conjunction with other measures. Macroprudential regulation was also generally supplemented by close supervision.

The calibration of quantitative instruments such as LTV caps was often based on information about the volatility of the underlying asset, as well as on existing LTVs and LTVs that apply to new lending. In one case, the tolerable level of loss given default and an estimate of how much assets were overvalued provided a sense of how large the cushion implied by the LTV cap should be. Judgments needed to be made about how stringently to constrain new lending, especially because it is politically difficult to impose low LTV caps. On the other hand, if the LTV cap was too high, it might not bind or it might even have the perverse effect of raising LTVs on new lending if an LTV at the level of the cap was seen as "normal" or sanctioned by the authorities.

Authorities that have used macroprudential instruments relied almost entirely on judgment when imposing and calibrating instruments. One authority roughly matched its instrument setting to the trends in quantitative aggregate indicators (in this case, growth in house sales, real estate investment and house prices). Otherwise, formulaic quantitative relationships were scanty. Many participants emphasised that any models or rule-like operations would need to be supplemented with considerable scope for judgment.

A wide range of macro and micro information was needed to inform macroprudential assessments. Micro data, such as surveys that measure household debt holder characteristics, provided information on the tails of distributions that the macro data miss. Macro data provided information needed to address issues of timing and the balance of intervention across different policy areas. One important caveat was that available data might not effectively capture riskier products and new distribution channels. Quantitative measures such as LTV caps could be used as shorthand for risk, but softer, qualitative information was also important.

Macroprudential supervision tended to be forward-looking. Some participants argued that its policy horizon should be longer than for monetary policy, on the grounds that it takes time for systemic financial risks to build up. It was also suggested that the right mix of instruments is likely to depend on the stage of the financial cycle. Once strong credit demand has taken hold, it might be very difficult for macroprudential policy to restrain credit growth, as loopholes would always be found.

The tendency for credit origination to move to less regulated sectors was observed in several cases. A fundamental problem with measures that sought to restrain the generation of risky

products (such as high-LTV loans) was that the measures could easily be circumvented by financial engineering (as was shown in the recent crisis). This was another reason to be cautious about interventions that might bind too firmly.

Participants saw a range of issues concerning the measurement of the success of macroprudential policy. If the objective was to lean against the financial cycle, success could be measured by tracking changes in credit growth rates. If the objective was to ensure financial system resilience, and if measures such as LTV caps were intended to promote that resilience by raising the level of household equity in a crisis, then relevant measures could be total equity in the household sector and capital adequacy of the banking system.

Some of the central banks from economies where these measures have been applied reported that they have been effective in moderating excesses in the targeted credit markets and limiting the financial system's exposure to those sectors. Others reported mixed results. One analytical difficulty was distinguishing the effect of the macroprudential measures from wider macroeconomic factors, such as the broadening of the Asian crisis soon after some of the measures in Asia were taken. Also, in some cases where the underlying conditions (such as interest rates) remained favourable for credit demand, credit growth tended to resume shortly after macroprudential measures were imposed.

Another challenge was to estimate the real cost of the financial instability that regulation seeks to avoid, as well as that of the side effects of regulation on efficiency and economic growth. To calibrate the overall intensity of macroprudential regulation with the aim of constraining rapidly growing market segments required judgments on efficiency (more complete markets are a good thing) and on systemic risk (complexity is not). In small open economies, the possible distortions were more challenging because of the ease with which cross-border funding can replace domestic funding.

4.3 Reserve requirements

Changes in (domestic currency) reserve requirements have commonly been seen as part of the toolkit for the implementation of monetary policy or exchange rate policy. Especially in emerging market economies in response to large ebbs and flows in foreign capital, more attention is being focused on the use of reserve requirements to moderate the financial cycle. Such a measure can supplement or substitute for the use of the official interest rate to manage the cost of credit to the economy, which is the more common practice among developed economies.

A number of economies have also imposed reserve requirements on foreign currency funding of financial institutions. Here, the macroprudential concern is more directly related to currency mismatch and foreign currency liquidity vulnerabilities that may be generated in the banking system through such funding.

Variations in reserve ratios have been applied with judgmental discretion. Generally, the economies using them for macroprudential purposes have fairly fragmented credit markets that are dominated by regulated credit intermediaries. Although a roughly equivalent effect on domestic credit conditions might well have been achievable through the use of the official interest rate instrument, the dominance of regulated credit intermediaries, and relatively undeveloped money markets through which interest rates work, perhaps meant that reserve requirements were seen as a more direct way to influence their funding costs and capacity for generating financial imbalances.

4.4 Statistical or dynamic provisioning

As an example of a macroprudential instrument, statistical or dynamic provisioning has been applied in Spain since mid-2000. The authorities consider this instrument to have both a microprudential purpose, as it is applied to individual institutions, and also a macroprudential

role, due to its countercyclical impact, which damps excess procyclicality within the financial system. Banks are required to set aside provisions during phases of rapid credit expansion according to a formula. The measure anticipates the impairments that will arise when the economy turns down and credit retrenchment appears.

The experience with this instrument is well documented.[9] In brief, the instrument is seen as having successfully protected banks from the risk of underprovisioning during the boom phase. It was less effective, however, in moderating the financial cycle.

5. Some preliminary findings and open issues

Three main issues arise from this stocktaking on the choice and use of macroprudential instruments. First, what are the respective roles of measures aimed at ensuring financial system resilience, and those aimed at leaning against the financial cycle? Second, what does experience tell us about what has worked, and why? And third, how can workable approaches to leaning against the financial cycle be developed?

5.1 The respective roles of ensuring resilience and leaning against the cycle

The two aims of ensuring resilience and leaning against the cycle are not mutually exclusive. Indeed, one can substitute for the other to some extent, given that successful leaning means that measures designed to protect institutions against the financial cycle can be less stringent. In practice, therefore, macroprudential policy frameworks are likely to include elements directed towards both aims. These will be combined in ways that are seen as the most efficient for the circumstances.

The emphasis on each aim potentially affects the types of instrument that might be brought to bear (for example, whether they apply broadly or narrowly), the way they might be used (for example, how frequently they might be adjusted) and policy governance. It also has implications for monetary policy to the extent that, if macroprudential policy can successfully moderate the financial cycle, it would probably ease the burden on monetary policy to stabilise the economy. In addition, there would be less need to use monetary policy to lean against the financial cycle.

For practical implementations of leaning against the cycle, the complexity of the task and the limited state of knowledge suggest a degree of caution. However, the efficiency benefits of successful leaning should not be forgotten. In a pragmatic approach, one might proceed by building up a macroprudential regime from microprudential and other existing instruments that are refocused for greater emphasis on reducing systemic vulnerabilities, while taking into account the effect of those instruments on credit conditions and continuing to seek more effective tools to lean against the cycle.

5.2 Tentative lessons from practical experience

As macroprudential policy frameworks are much less developed and tested than monetary policy frameworks, they should not promise more than they can deliver.

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[9] See Saurina (2009a,b).

To date, approaches have been pragmatic, based on judgmental and discretionary use of existing instruments that are already used for other, usually microprudential, purposes. These include existing microprudential and system liquidity management tools such as LTV ratio caps, capital requirements, reserve requirements and dynamic provisioning systems. Such instruments have been deployed from within their current institutional settings, and with close supervisory involvement. Macroprudential interventions have generally taken place in response to specific sectoral developments rather than at a system-wide level.

Authorities who use macroprudential instruments express some confidence that they have been successful in enhancing the resilience of their financial systems. There is some evidence that such measures have led to some, at least temporary, cooling of excesses in the particular markets to which they have been applied. It is too early to say whether the small number of explicit macroprudential loosening measures undertaken so far will be effective in promoting credit expansion during a period of widespread retrenchment in lending.

5.3   Open issues

Many open issues remain in the development of a fully fledged macroprudential framework that delivers the promise of more effective stabilisation policy. Some of the issues are empirical, while others relate to operationalisation. And, at this early stage in our experience with macroprudential policy, it is quite possible that effective instruments beyond the current toolkit might be developed. Several initiatives at the national and international level are exploring new instruments.

Institutionalisation of the aim of leaning against the financial cycle is still some way off, as is the related task of operationalising instrument usage resolutely to that end. Some of the more difficult open issues relate to this aim in particular.

The empirical issues include the effectiveness of the instruments through the cycle. As noted, most experience is with adjustments during the boom phase. There are a few examples where macroprudential instruments have been loosened in response to the crisis, but it is too early to tell how effective they have been in promoting, rather than constraining, lending and risk-taking.

It is uncertain whether a more activist approach to operating the instruments would actually be effective in moderating the financial cycle. The micro-based instruments and measures adopted to date have mostly not been used in a way that could seriously limit aggregate credit growth or dampen asset prices. Most interventions have so far focused on specific sectors, motivated largely by a desire to ensure the resilience of the financial system. If macroprudential instruments were used more actively and ambitiously to moderate the financial cycle, questions would naturally arise whether and how far they were also stifling innovation and growth.

Another open question is how frequently instruments would need to be adjusted in an activist approach. Authorities have tended to vary macroprudential instruments at intervals of a few years, but there appears to be a spectrum of activism in this respect.

Annex 1:
Macroprudential policy – a literature review

1.   Introduction

This Annex provides an overview of research on macroprudential policy, defined as a set of tools geared towards limiting the risk of episodes of system-wide distress that have significant macroeconomic costs.[10] The crisis has highlighted the need for a macroprudential approach to financial regulation and supervision. The policy debate is currently focusing on macroprudential tools and their usage, their relationship with monetary policy, their implementation and their effectiveness. Important insights can be gained from the research literature on macroprudential policy, although this line of research is still relatively recent. This is in contrast to the rich research literature on monetary policy, which over past decades has informed the evolution of monetary policy frameworks and strategies. Even so, the crisis has highlighted important shortcomings of this literature, and in particular big gaps in modelling the nexus between the real economy, the financial system, and monetary policy.

The literature review is divided into two main parts. The first reviews research on the concept of financial (in)stability and systemic risk, distinguishing work along the "time series" and the "cross-sectional" dimensions. The second part summarises research on individual macroprudential tools and on the interaction of macroprudential tools with other central bank functions, especially monetary policy. Throughout the review, parallels are drawn with the literature on monetary policy.

2.   Financial (in)stability and systemic risk

Over the past two or three decades, the literature on monetary policy provided a common conceptual framework. In particular – at least until recently – there was a broad consensus on how to define price stability, how to measure inflation, and about the advantages and limitations of commonly used economic models. Theoretical work within this framework generally assumes forward looking, homogeneous, rational agents, and analyses dynamics near the steady state. These models typically incorporate frictions that result from rigidities in product and labour markets and asymmetric information that affect financing conditions. A long tradition of empirical research has investigated monetary authorities' reaction functions and the monetary transmission mechanism in this context. The main challenge for research on monetary policy highlighted by the crisis is to build macro models that incorporate the behaviour of the financial system and feedback effects to the macroeconomy in a meaningful way.[11]

In contrast to the monetary policy literature, research on macroprudential policy is still in its infancy and appears far from being able to provide a sound analytical underpinning for policy frameworks. This may be due to two main reasons. First, the macroprudential approach has come to play a visible role in policy discussions only very recently.[12] Second, it reflects the

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[10] See eg Borio and Drehmann (2009a).

[11] Recent work by Brunnermeier and Sannikov (2009) – who model heterogeneous agents and derive full equilibrium dynamics, not just near the steady state – points to a potentially useful approach to filling this gap.

[12] See eg Tucker (2009) and Borio (2009).

lack of established models of the interaction between the financial system and the macroeconomy.[13]

Defining financial (in)stability

To start with, there is no commonly shared definition of financial stability, towards which macroprudential policies would be geared. Alternative definitions include robustness of the financial system to external shocks (Allen and Wood (2006), Padoa-Schioppa (2003)) or to shocks originating within the financial system (Schinasi (2004)), and the vulnerability to financial distress in response to normal-sized shocks (Borio and Drehmann (2009a)). The notion of financial stability is often discussed in terms of the concept of systemic risk and its sources (eg Goodhart (2009)), for which again there is no consensus definition.[14]

In terms of analytical paradigms, one can follow Borio and Drehmann (2009a) and distinguish three types of models. The first comprises models of self-fulfilling equilibria generated by exogenous shocks, in the sense of Diamond and Dybvig (1983). The second refers to models with negative shocks – which can be idiosyncratic or systematic (Allen and Gale (2004)) – and an amplification mechanism (eg contagion shaped by informational and balance sheet linkages as in Rochet and Tirole (1996)). The third consists of representations of the "endogenous cycle view of financial instability" in the spirit of Minsky (1982) and Kindleberger (1996).

The time series dimension

One important distinction in the debate on financial (in)stability is between the time series dimension (ie the evolution of risk over time) and procyclicality on the one hand (BIS (2001), Borio et al (2001), Danielsson et al (2001), Borio and Zhu (2008), Brunnermeier et al (2009), Brunnermeier and Pedersen (2009), Shin (2009)), and the cross-section dimension (ie risk at a point in time) on the other. Saurina and Trucharte (2007) and Repullo et al (2009), for example, examined the procyclicality of capital requirements. Note that the distinction between time series and cross-sectional dimensions is straightforward when thinking about the nature of policy responses but less obvious in the context of the research literature. A number of the papers are included in the procyclicality area (eg Danielsson et al (2001)) even though they do not incorporate the macroeconomy directly.

In this field of research, the contrast with research on monetary policy is striking. In the latter, there exists a large body of literature that models the link between policy instruments and goals. These models are routinely employed both to produce forecasts of target variables and to conduct policy simulations.[15] By contrast, both theoretical and empirical work linking the financial sector to the macroeconomy is far from a stage where it can be operationalised and used for risk analysis and policy simulations. Instead, a variety of tools have been proposed that have more limited value in informing policy decisions. These tools can be broadly classified into three categories: indicators of financial distress based on balance sheet and market indicators, early warning indicators, and what has been called single- and multiple module measures of financial distress.[16]

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[13]   See eg Brunnermeier (2009).

[14]   For an overview of systemic risk, see eg de Bandt and Hartmann (2009).

[15]   Nelson (2008) surveys the use of such models in central banks.

[16]   See Borio and Drehmann (2009a).

Over the past decade, a growing literature has identified indicators of financial distress based on balance sheet indicators (Carson and Ingves (2003), Bordo et al (2000)) – most notably the Financial Soundness Indicators whose development was coordinated by the IMF (Moorhouse (2004), IMF (2008)) – and market indicators, typically based on equity and credit default swap (CDS) or other derivative instruments (Illing and Liu (2006), Tarashev and Zhu (2006, 2008)). While these indicators are increasingly used, there are important limitations (eg Fell (2007)). Most balance sheet indicators – such as loan loss provisions or non-performing loans – are typically backward-looking or at most contemporaneous indicators of financial distress (Bongini et al (2002)). Ratings of individual institutions are in principle forward-looking but in practice tend to incorporate new information only with a lag. Moreover, they are micro in nature and thus fail to highlight vulnerabilities at the level of the whole financial system. And market indicators of risk can themselves be affected by exuberance.

There is a rich literature on early warning indicators, which has documented virtues and drawbacks of alternative types of these indicators for banking crises.[17] These studies tend to predict events that happen in the very near future, and moreover do not reflect an underlying model of how the real economy and the financial sector interact. They appear therefore ill-suited to informing macroprudential policy decisions.

A more promising avenue of research on early warning indicators relies on indicators based on credit quantities and asset markets (Borio and Lowe (2002), Borio and Drehmann (2009b), Gerdesmeier et al (2009), Alessi and Detken (2009), Fornari and Lemke (2009), Borgy et al (2009)). These indicators perform relatively well in predicting – even out-of-sample – episodes of financial distress over somewhat longer horizons (1 to 4 years), and reflect a view of financial instability that is based on endogenous cycles (Borio and Drehmann (2009a)). According to this view, excessively strong growth in credit and financial asset prices reflects the build-up of financial imbalances that have the potential to unwind in a disruptive fashion with large negative macroeconomic consequences.

A third set of tools for measuring financial (in)stability and capturing financial distress comprises single and multiple module measures. The former comprise parsimonious data-driven representations of the economy modelled in terms of VARs (Drehmann et al (2006), Misina and Tessier (2008)). These empirical models are flexible tools for forecasting and allow tracing the transmission of shocks through the economy. At the same time, they offer only very stylised descriptions of the dynamics of the financial sector, and of the feedback to the macroeconomy.

The latter consists of macro stress tests, which can be used to trace the response of the financial system to unusually large exogenous shocks.[18] Macro stress tests are by nature forward-looking and highlight the transmission of shocks within the system. They rely explicitly on an underlying view of the forces that can drive financial distress. Similarly to other methodological approaches, however, these models generally fail to capture feedback effects between the financial system and the macroeconomy.[19] They also fail to capture the key aspect of financial distress that small shocks can have very large effects. Existing macro stress tests failed to identify vulnerabilities ahead of the current crisis. Similarly, Alfaro and Drehmann (2009) document that a large fraction of historical banking crises is not preceded

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[17] See eg Hutchinson (1999), Kaminski et al (1999), Bell and Pain (2000), Demirgüç-Kunt and Detriagache (2005), Davis and Karim (2008), Dell'Ariccia et al (2008) and Von Hagen and Ho (2007). The large body of studies on early warning indicators of currency crises (eg Kaminsky and Reinhart (1999)) is beyond the scope of this note.

[18] Surveys of the macro stress testing literature are provided by Sorge (2004) and Drehmann (2008, 2009).

[19] Recent work by Aikman et al (2009) is an important exception.

by weak domestic macroeconomic conditions, showing that current stress testing models are not able to replicate the dynamics of many past crises. He argues that this could be a result of stress tests considering the wrong risk factors and missing those that were the actual drivers of crises.

One important contribution to this line of research is the work by Adrian and Brunnermeier (2009), who use the concept of CoVaR – the value at risk (VaR) of the financial system conditional on institutions being under distress – to capture systemic risk and inform macroprudential regulation. They define an individual financial institution's marginal contribution to systemic risk as the difference between CoVaR and the financial system VaR. This measure crucially depends on leverage, size and maturity mismatch.

The cross-sectional dimension

The second dimension of systemic risk is the cross-sectional dimension, which focuses on the distribution of risk in the financial system at a point in time, and in particular the common exposures that arise owing to balance sheet interlinkages, similar exposures and associated behavioural responses. In the process, macroeconomic dynamics are taken as exogenous. There is a rich literature on this dimension (see eg Hellwig (1995) and Acharya (2001)). Important elements within this perspective include market failures (Rabin (1998), Calomiris (2009)) and propagation channels (eg Jensen (1986), Calomiris and Khan (1991), ECB (2009)).

In the analysis of systemic risk that arises within the financial system, one can draw a distinction between two strands. The first focuses on the systemic impact resulting from the problems of an institution or a market, and highlights the role of size, interconnectness and the availability of substitutes.

One type of research that has recently received increasing attention models the financial system as a complex system and focuses explicitly on interconnection, non-linearity and unpredictability (Haldane (2009), Hommes (2006, 2008), LeBaron and Tesfatsion (2008)). These models are based on heterogeneous agents with bounded rationality, and whose learning process influences the aggregate dynamics of the system. A related line of research analyses the financial system as a complex dynamic network of agents, which are connected directly through mutual exposures in the interbank market and indirectly through holding similar portfolios or sharing the same mass of depositors.[20]

The second strand, which is very recent, starts from a measure of systemic risk and then identifies the contributions of individual institutions to this measure (Tarashev et al (2009a,b). These contributions can inform the design and calibration of policy tools aimed at preventing the systemic stress that can originate in these institutions (Huang et al (2009)).

3.   Macroprudential tools

In the research literature, there is an important distinction between macroprudential tools – defined as prudential tools set up with a macro lens – and other macroeconomic tools that can support financial stability (eg Borio (2009)). The latter include fiscal policy (see eg Blanchard et al (2010)) or capital control instruments (eg Ostry et al (2010)). Caruana (2010)

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[20]   Allen and Babus (2008) provide a careful survey of this literature.

argues that financial regulatory policies are an essential part of the solution but they alone will not suffice to address systemic risk in all its complexity.

Research on individual macroprudential tools

The literature on specific macroprudential instruments is very recent, and can be categorised in various ways.[21] Possible taxonomies include quantity versus price restrictions, rules versus discretionary instruments, preventative versus reactive instruments. Among the instruments, there is a rich literature on capital surcharges for both the cross-section problem – in line with contributions to systemic risk – and procyclicality (Anderson and May (1991), Brunnermeier et al (2009), BIS (2009), Bank of England (2009), Aikman et al (2009) on calibration, Adrian and Brunnermeier (2009), Tarashev et al (2009), Acharya and Richardson (2009), Squam Lake (2009), FSA (2009)). Other literature on countercyclical capital schemes and/or insurance schemes includes Kashyap et al (2008) and Goodhart and Persaud (2008).

A number of papers have also explored the role of loan provisioning and, more generally, accounting (eg Borio and Lowe (2002), Bikker and Metzemakers (2005), Angklomkliew et al (2009), Jiménez and Saurina (2006) and Saurina (2009a,b)). Important work on loan-to-value ratios (LTVs) includes Borio et al (2001). Margin regulation is discussed, inter alia, in Kupiec (1998) and Borio (2009).

In a move away from loading too much on capital requirements, there have also been studies that outline liquidity requirements (Perotti and Suárez (2009), Brunnermeier et al (2009), BIS (2008a), Bank of England (2008)) and funding liquidity standards (Goodhart (2008), BIS (2008b), FSB (2009)).[22] Morris and Shin (2008) for example support the use of liquidity requirements that constrain the composition of assets. They also analyse the use of maximum leverage ratios, which they support as a tool that strengthens the stability of liabilities in an interrelated financial system rather than a simple buffer against losses on assets.

McCauley (2009) argued that emerging market central banks have been regular practitioners of macroprudential policy, without calling it by this name. As an example, he cited the Reserve Bank of India's decision to raise the Basel I weights on mortgages and other household credit in 2005 (RBI (2005)). Some studies have argued that, especially for emerging market economies, the macroprudential toolkit could also include measures to limit system-wide currency mismatches, which aim at stemming the domestic financial consequences of capital inflows. Examples are limits on open foreign exchange positions and constraints on the type of foreign currency assets (Turner (2009)), or market-based regulations designed to reduce the incentives for capital inflows (Mohanty and Scatigna (2005), Ghosh et al (2008), CGFS (2009)).[23] In Ostry et al (2010), however, tools aimed at controlling large capital inflows that may fuel domestic credit booms are not seen as macroprudential tools per se but rather as measures that can buttress prudential regulations.

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[21] See eg Borio and Shim (2007).

[22] Other tools which would fall outside this taxonomy include prudential filters to accounting figures that would mitigate the procyclicality of mark-to-market accounting rules (BIS (2008b)) and organisational measures such as separation in banking organisations (Kay (2009), G30 (2009)) or introducing a central counterparty for credit derivatives and repos (Cecchetti et al (2009)).

[23] Borio and Packer (2004) argue that currency mismatches can be seen as a sort of "stress test", in the sense that they increase the cost of a crisis in the event of a sudden large depreciation of the currency.

How might macroprudential tools interact with monetary policy?

One key issue in the design of a framework for macroprudential policy is how it interacts with monetary policy, since ultimately both types of policy target macroeconomic stability. This interaction depends on whether financial imbalances play a role in the monetary policy framework. Before the crisis erupted, the consensus was that monetary policy should not be geared towards anything but price stability – typically defined over a horizon of no longer than two years – and, if there is a dual mandate as for example in the case of the Federal Reserve, maximum sustainable employment.[24] A minority of researchers instead supported the possibility of using a tightening of monetary policy to lean against the build-up of financial imbalances (eg Borio and White (2004), Gruen et al (2003)).[25] Borio and Drehmann (2009a) not only support the use of monetary policy to address financial imbalances but also stress that relying only on macroprudential policy to address (the time dimension of) financial instability would burden it too much.

It is possible to identify four relevant strands of the literature. The first, recent, strand looks at monetary policy in DSGE models augmented with financial intermediaries (Cúrdia and Woodford (2009), Gertler and Karadi (2009), Cohen-Cole and Martínez-García (2008), Meh and Moran (2008), Christiano et al (2008), Dellas et al (2010)).[26] While the usefulness of these types of model has been challenged forcefully, they are still in their infancy and recent research suggests that they might actually be more flexible than assumed. De Walque et al (2008, 2009) are interesting examples of studies that bridge a macroeconomic model with a model of the interbank market.

A second, new strand that appears to be more promising is provided by Brunnermeier and Sannikov (2009). Within a dynamic equilibrium model, they show that the financial sector does not internalise all the costs associated with excessive risk taking, and hence leverage and maturity mismatch are excessive. Securitisation allows the financial sector to offload some of the risk but exacerbates the excessive risk-taking.

The third strand investigates the role of bank capital in the monetary transmission mechanism. Borio and Zhu (2008) review both the theoretical and empirical contributions. They highlight the role of the "risk taking channel", which they define as the impact of monetary policy decisions on risk perceptions or risk tolerance, which in turn influences the degree of risk in portfolios, the pricing of assets, and the price and conditions of the supply of funding.[27] A different approach is followed by Covas and Fujita (2009), who use a general equilibrium model to quantify business cycle effects of bank capital requirements. They focus on the interaction between entrepreneurs' moral hazard and liquidity provision by banks as analysed by Holmström and Tirole (1998). They find that output volatility is significantly larger (and household welfare smaller) under procyclical regulation.

Other work emphasises the impact of cheap funding liquidity (Brunnermeier and Pedersen (2009)). Adrian and Shin (2008) examine the link between funding conditions and fluctuations of leverage of market-based financial intermediaries. They show that balance sheet quantities of market-based financial intermediaries are important macroeconomic state variables for monetary policy. The link between monetary policy and the interbank market

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[24] The standard references are Bernanke and Gertler (2001), Goodfriend (2003), Cecchetti (2000) and, for an overview of the arguments, Giavazzi and Mishkin (2006).

[25] A somewhat more nuanced view is found in Bean (2003, 2007, 2009) and Detken and Smets (2004).

[26] An early study that follows this approach is found in Chari et al (1995).

[27] Empirical support for this hypothesis is presented in Maddaloni et al (2009), Ioannidou et al (2009), Jiménez et al (2007) and Altunbas et al (2009).

when it is subject to sudden freezes is also examined in Freixas et al (2009), Freixas and Jorge (2008) and Ongena and Popov (2009).

Loisely et al (2009) study the interaction between monetary policy and asset prices using a simple general equilibrium model in which asset-price bubbles may form due to herd behaviour in investment in a new technology whose productivity is uncertain. In this model, monetary policy can influence the cost of resources for entrepreneurs and thereby firms' investment in the new technology if and only if they have received a favourable private signal. In doing so, policymakers reveal this signal and can therefore prevent herding behaviour and the formation of asset bubbles. The paper identifies conditions under which such a monetary policy intervention is socially desirable.

The fourth strand consists of very recent theoretical research that specifically examines the interaction between monetary policy and macroprudential policy. Four contributions in this area are particularly worth mentioning. In a theoretical paper, Agur and Demertzis (2009) model the interaction between optimal monetary policy and endogenous bank risk. The idea is that banks' risky projects are relatively illiquid and raise the probability of default. If a monetary authority puts sufficient weight on preventing defaults, it follows a V-shaped policy: during downturns, rates are cut more deeply but for a shorter period than under a Taylor rule. Rates are raised to limit excess risk-taking during booms.

N'Diaye (2009) finds that binding countercyclical prudential regulations can help reduce output fluctuations and reduce the risk of financial instability. In particular, countercyclical capital adequacy rules can allow monetary authorities to achieve the same output and inflation objectives but with smaller adjustments in interest rates. Moreover, these rules can help reduce swings in asset prices and the magnitude of the financial accelerator process.

Angeloni and Faia (2009) integrate banks into a standard DSGE framework and examine the role of banks in the transmission of shocks, the effects of monetary policy when banks are exposed to runs, and the interplay between monetary policy and Basel-like capital ratios. They find that tighter monetary policy reduces bank leverage and risk, while a productivity or asset price boom increases it. They show that procyclical capital ratios are highly destabilising, regardless of how monetary policy is conducted. In their model the optimal outcome is achieved by a combination of "mildly anticyclical" capital ratios and a monetary policy rule that responds to bank leverage or asset prices.

Kannan et al (2009) present simulations that show how a strong reaction of monetary authorities to accelerator mechanisms that drive credit growth and asset prices can foster macroeconomic stability. In addition, a macroprudential instrument designed specifically to dampen credit market cycles would also be useful. They also find that invariant and rigid policy responses raise the risk of policy errors that could lower, not raise, macroeconomic stability.

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Annex 2:
Members of the CGFS Coordinating Group on Macroprudential Instruments

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José-Manuel González-Páramo	European Central Bank
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Annex 3:
Participants at the CGFS Workshop on macroprudential instruments: Practical experience with loan-to-value ratio caps, risk weights and related measures

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