November 2009

The role of macroprudential policy

A Discussion Paper

BANK OF ENGLAND

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The Bank of England would welcome comments on, and criticisms of, the ideas expressed in this paper. Comments should be sent to:

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A discussion paper by the Bank of England.

Executive summary

The global financial crisis has demonstrated the need for fundamental reform of the financial system. The underlying structure of the international financial and monetary system is being re-evaluated. Whatever its structure, the prudential regulatory framework will need to be re-oriented to have a system-wide focus. And improvements need to be made to allow financial institutions to fail without imposing unacceptable costs on the rest of society.

Working with UK Tripartite and international colleagues, the Bank of England aims to contribute to each dimension of this debate. A series of recent speeches by the Bank have highlighted the importance of re-evaluating the structure of the financial system, improving the framework for financial crisis management and resolution, and revisiting the regulatory framework — in particular, the potential role for macroprudential instruments.

In the run-up to the current crisis, there was a big build-up of leverage and liquidity mismatches across the global financial system. That left the system vulnerable to adverse changes in the macroeconomic and market environment, and so sowed the seeds of the present problems. One of the key challenges is to re-orient prudential regulation towards risk across the system as a whole — so-called systemic risk. This is the role of *macroprudential* policy. In this discussion paper, the Bank of England aims to contribute further to emerging ideas on how macroprudential instruments might be designed and deployed.

Macroprudential policy is a missing ingredient from the current policy framework. In the past few decades, there has been too great a gap between macroeconomic policy and the regulation of individual financial institutions. If macroprudential policy had been able to increase the resilience of the system and to moderate exuberance in the supply of credit to the economy, and especially to the financial system, the crisis would have been less costly.

Financial stability is fundamentally concerned with maintaining a stable provision of financial services to the wider economy — payments services, credit supply, and insurance against risk. This is the starting point for any macroprudential policy instrument. It is possible to conceive of more ambitious objectives, such as forestalling asset price bubbles. By moderating exuberant increases in the supply of credit, macroprudential policy might sometimes help to contain asset bubbles. But it would be unrealistic to make the prevention of asset bubbles a specific objective of the regulation of the banking system.

Systemic risk has two principal sources. First, there is a strong collective tendency for financial firms, as well as companies and households, to overexpose themselves to risk in the upswing of a credit cycle, and to become overly risk-averse in a downswing. This has a variety of underlying causes, including a perception that some financial institutions may be too important to fail and herding in markets. Second, individual banks typically fail to take account of the spillover effects of their actions on risk in the rest of the financial network. Macroprudential policy would ideally address both sources of systemic risk.

This discussion paper examines whether it would be practical to dampen cyclical overexuberance through a regime of capital surcharges on top of prevailing microprudential capital ratios. These surcharges could be applied to headline capital requirements or at a more disaggregated level (through so-called 'risk weights' on particular types of exposure). The sectoral approach might allow policy to be better targeted at pockets of emerging exuberance, but would also entail greater complexity. The appropriate level of disaggregation for setting capital surcharges would need to be considered carefully.

Increasing capital requirements in a credit boom would generate greater systemic self-insurance for the system as a whole and, at the margin, act as a restraint on overly exuberant lending. Crucially, this mechanism could also operate in reverse: lowering capital requirements in a bust might provide an incentive for banks to lend and reduce the

likelihood of a collective contraction of credit exacerbating the downturn and increasing banks' losses.

Separately from seeking to address changes in risks through the credit cycle, capital surcharges could also be set across firms so as broadly to reflect their individual contribution to systemic risk. For example, as the FSA have discussed, surcharges could be levied based on factors such as banks' size, connectivity and complexity. This would lower the probability of those institutions failing and so provide some extra systemic insurance. It would also provide incentives for those firms to alter their balance sheet structure to lower the systemic impact of their failure.

A big practical question is whether a macroprudential regime with aims of the kind described above could be made operational. Capital surcharges would need to be calibrated. That would ultimately require judgement, drawing on analysis, market intelligence and modelling. This discussion paper summarises, by way of illustration, a few of the indicators, quantitative and qualitative, that with further work could become useful inputs. They would largely be about the macroeconomy, and the financial system as a whole and the interaction between them.

It seems unlikely that macroprudential instruments could be set wholly according to fixed rules. Judgement may be needed to make robust policy choices. That would call for assessments of the resilience of the system, credit conditions, sectoral indebtedness and systemic spillovers — all of which vary over time and according to circumstances. All available evidence would need to be weighed, and policymakers would themselves need to adapt as they learn about the effects of their instruments on behaviour.

But it would be important that constraints were placed on a macroprudential regime to ensure transparency, accountability and some predictability. That would call for clarity around the objectives of macroprudential policy, the framework for decision-making, and the policy decisions themselves. It also suggests the need for robust accountability mechanisms. Such a macroprudential regime of 'constrained discretion' would share some similarities with macroeconomic policy frameworks.

Another important issue would be the degree of international co-operation. To be wholly effective, a macroprudential regime might require significant international co-ordination. But, even in its absence, appropriate macroprudential instruments might still be able to strengthen the resilience of the domestic banking sector.

Drawing on existing work by regulators and central banks, this discussion paper summarises some possible ways in which a macroprudential policy regime might be made operational. It does *not* reach conclusions on implementation, nor does it advocate a particular operational regime. A lot of further work would be required before policies such as these could be ready to be put into practice. Instead, it is intended to contribute to the domestic and international macroprudential policy debate in the period ahead. The Bank of England would welcome comments and criticisms of the ideas and analysis set out in this paper.

1 Introduction

Since the early 1970s, the probability of systemic crises appears to have been rising.(1) The costs of systemic crises have risen in parallel. The incidence and scale of systemic crises have risen to levels never previously seen in financial history. The crisis of the past two years is the most visible manifestation of that trend. It has meant that reducing risks to the financial system as a whole — systemic risk — has emerged as a top public policy priority.

All aspects of the 'rules of the game' for our financial system need to be examined. The underlying structure of the financial system needs to be re-evaluated. Whatever its structure, the prudential regulatory framework will need to be re-oriented to have a system-wide focus. And improvements need to be made to allow financial institutions to fail without imposing unacceptable costs on the rest of society. Extensive discussions have been taking place in both domestic and international fora as to the appropriate regulatory frameworks and instruments.(2) But, at least until recently, there has been less debate on structural change to the financial system or on the high-level objectives of the supervisory regime.(3)

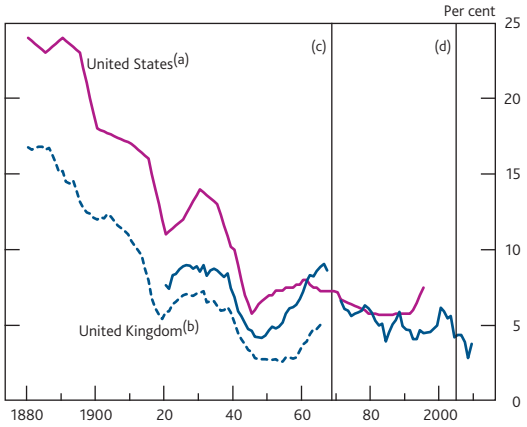
Working with UK Tripartite and international colleagues, the Bank of England aims to contribute to each dimension of this debate. For example, in a recent speech the Governor highlighted the importance of revisiting the structure of the financial system.(4) In this discussion paper, the Bank of England aims to contribute to emerging ideas on how macroprudential instruments might be designed and deployed.(5)

The existing framework has shown itself ill-equipped to deal with a severe crisis. This is for two distinct reasons. First, there have been difficulties in calibrating and implementing existing microprudential policy instruments, in particular capital requirements, to the degree of stress that bank balance sheets need to withstand. Some prudential instruments were significantly underemphasised, such as liquidity requirements. In fact, capital and liquidity ratios have declined materially in the United Kingdom and the United States over the past century (**Charts 1.1** and **1.2**).

But, second, even with these trends reversed, there are limits to what prudential regulation can reasonably be expected to achieve if it is calibrated to institution-specific balance sheet characteristics. With an institution-specific focus, the build-up of *aggregate* leverage and maturity mismatch are at risk of being overlooked in the setting of regulatory requirements. A *macroprudential* orientation would be calibrated to risks across the financial system as a whole.

A key issue is whether the build-up of excessive leverage and maturity mismatch prior to the financial crisis could have been reduced by deploying macroprudential instruments. In the run-up to crisis, in the United Kingdom and internationally, monetary policy was aimed at balancing nominal demand in line with the supply capacity of the economy, while prudential regulation focused on the state and conduct of individual financial institutions. For much of the past decade, this approach appeared to work well. Demand and inflation were

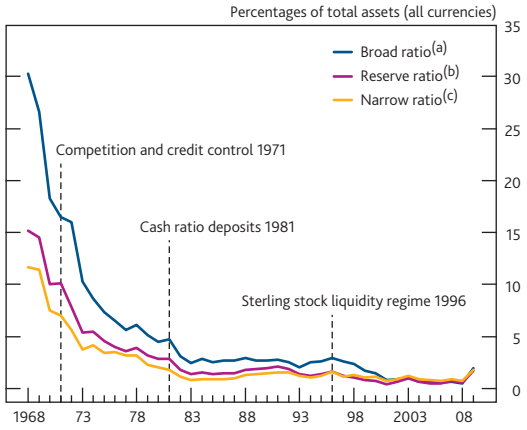
Chart 1.1 Long-run capital ratios for UK and US banks



Sources: United States: Berger, A, Herring, R and Szegö, G (1995), 'The role of capital in financial institutions', *Journal of Banking and Finance*. United Kingdom: Sheppard, D (1971), *The growth and role of UK financial institutions 1880–1962*, Methuen, London; Billings, M and Capie, F (2007), 'Capital in British Banking', 1920–70, *Business History*, Vol. 49, No. 2; BBA, published accounts and Bank calculations.

(a) US data show equity as a percentage of assets (ratio of aggregate dollar value of bank book equity to aggregate dollar value of bank book assets).
(b) UK data on the capital ratio show equity and reserves over total assets on a time-varying sample of banks, representing the majority of the UK banking system, in terms of assets. Prior to 1970 published accounts understated the true level of banks' capital because they did not include hidden reserves. The solid line adjusts for this. 2009 observation is from H1.
(c) Change in UK accounting standards.
(d) International Financial Reporting Standards (IFRS) were adopted for the end-2005 accounts. The end-2004 accounts were also restated on an IFRS basis. The switch from UK GAAP to IFRS reduced the capital ratio of the UK banks in the sample by approximately 1 percentage point in 2004.

Chart 1.2 Sterling liquid assets relative to total asset holdings of UK banking sector



Sources: Bank of England and Bank calculations.

(a) Cash + Bank of England balances + money at call + eligible bills + UK gilts.
(b) Proxied by: Bank of England balances + money at call + eligible bills.
(c) Cash + Bank of England balances + eligible bills.

(1) For example, Bordo *et al* (2001).
(2) For example, the Geneva Report by Brunnermeier *et al* (2009) and the NYU Stern Report by Acharya and Richardson (2009).
(3) See G30 (2009), Kay (2009), King (2009b), Haldane (2009a, 2009b).
(4) See King (2009b).
(5) Also see Tucker (2009).

stable and there were very few failures of individual financial institutions. But over that period global banks' balance sheets doubled, while UK banks' balance sheets rose threefold. Latent financial vulnerabilities emerged and financial exuberance took hold. Leverage and connectivity within the financial system increased rapidly and parts of the real economy borrowed too much. With no set of instruments or institution charged with tempering this exuberance, the party grew more raucous. The credit crisis of the past two years has exposed those vulnerabilities.

As Box 1 outlines, various international bodies are currently discussing ways of reforming the prudential framework to improve the resilience of the financial system. These have focused so far on the appropriate definition of the prudential minimum for risk-based capital, leverage and liquidity requirements; on how to reduce procyclicality in minimum regulatory requirements; and on policies that encourage earlier provisioning for losses. Recently, there have been a number of initiatives aimed explicitly at developing macroprudential instruments.

This paper extends the debate to macroprudential policy more generally, including whether discretionary policy could usefully complement a set of rules. The paper is organised as follows. Section 2 discusses the potential objectives of macroprudential policy and considers how macroprudential policy might sit alongside microprudential and macroeconomic policy.

In exploring possible macroprudential instruments, a natural starting point is the set of market failures and channels through which systemic risk arises in the first place (Section 3). These provide not only the rationale for macroprudential policy, but also help identify the kind of instruments that may be best suited to tackling the different underlying sources of systemic risk.

Section 4 considers possible instruments for enhancing systemic resilience of the banking system and moderating shifts in the supply of credit over the credit cycle, while Section 5 considers instruments for reducing variations in systemic risk across institutions. Credit cycles and financial network spillovers have long existed. And the possible instruments for addressing these problems are also not entirely new — for example, countercyclical or systemically oriented regulatory ratios. The key is to try to embed those instruments within a coherent, practical regime.

Section 6 considers some of the possible building blocks for making such a macroprudential regime operational. It outlines specific measures to increase its transparency and predictability. Transparency enhances accountability. Making decision-makers accountable externally for their actions might also sharpen significantly their incentives to act. Accountability also provides legitimacy for policies that would affect the quantity and allocation of credit supplied to the economy and so could be challenged, especially at peaks and troughs in the credit cycle.

Finally, Section 7 discusses some operational challenges in implementing a macroprudential regime of the kind described, in particular the potential scope of such a regime in terms of institutional coverage and international application and co-operation. To be wholly effective, a macroprudential regime might need to complement strong national accountability with a significant degree of international regulatory co-operation and information sharing.

Too much should not be expected of regulation. It would be unrealistic and probably undesirable for regulation to seek to eliminate financial failures. This paper is not intended to advocate a particular macroprudential framework, nor to provide all of the operational detail that would be necessary to implement one. Rather the aim is to contribute to the debate on how the authorities might further re-orient their regulatory efforts to lower the incidence and cost of future systemic crises.

Box 1
The policy debate internationally

This box summarises briefly international initiatives aimed at improving the prudential regulation of banks.

The Basel Committee on Banking Supervision (BCBS) has embarked on an ambitious work programme to improve minimum prudential standards. In particular, the Committee is developing proposals that will improve the risk-capture of capital requirements across banks' trading and commercial banking activities; improve the quality of capital; introduce a leverage ratio as a backstop; and develop, for the first time, an international liquidity standard.

One key dimension of the policy debate is the appropriate level of equity capital in the financial system. It is commonly believed that raising additional equity capital is costly for the banking system and would reduce levels of intermediation. But a higher equity share in the capital structure of a firm need not necessarily imply a higher cost of funding for the banking system because of the reduced risk and hence cost of debt finance arising from lower levels of leverage.(1)

Moreover, some of the reasons given for why higher equity capital could conceivably raise the average cost of capital — such as expectations of government support to protect bank debt holders — are themselves distortions. Removing them would potentially increase the attraction of raising equity. At the same time, there may be some frictions in financial markets that are not so easily removed and which may raise the costs of issuing equity. Against this background, it is clear that further evidence is needed on the costs and benefits of a material increase in required equity capital for the banking system. A recent discussion paper published by the Financial Services Authority (FSA) provides a useful starting point.(2)

A second key dimension of the international debate is mitigating any procyclicality in regulatory requirements. Undesired cyclicality in regulatory ratios can be caused by the use of static ('point-in-time') estimates of probability of default, which tend to fall in an upturn and rise in a recession. The BCBS has developed methodology to track the extent of this cyclicality, which it has begun to apply. Any excessive procyclicality could be reduced by using longer-run averages of default probabilities ('through-the-cycle'). For example, in its implementation of the Basel II framework during the crisis, the FSA has introduced measures which attempt to mimic this smoothing effect.

Another means of mitigating procyclicality in the microprudential regime might be to allow firms to make general provisions against expected future losses as well as incurred losses. The accounting profession is moving in this direction with the recent publication by the International Accounting Standards Board (IASB) of its proposals for replacing the current incurred loss impairment methodology with an expected loss (or cash-flow) approach.(3) The BCBS is working closely with accounting standard setters to help improve banks' incentives to set aside provisions against expected losses. Broadly speaking, a similar principle underpins the so-called 'dynamic provisioning' policy which has operated in Spain for some time, although there are also some important differences (Box 2).

All of these initiatives aim to increase the resilience and reduce the procyclical tendencies of individual institutions. None of them, however, aim to lean against credit exuberance by acting in a forward-looking countercyclical fashion, or to offset risks arising from complex interconnections within the financial system.

More recently, the Basel Committee has developed a work programme to design capital buffers above regulatory minimum requirements that will be built up during credit cycle upswings to be drawn down during downswings. The Financial Stability Board and the BCBS are also developing proposals to address the 'too-big-to-fail' problem, which include assessing the merits of capital surcharges applied to these institutions. These efforts are consistent with calls from the G20 for stronger regulation and oversight of such firms.(4) The UK authorities support these initiatives, which are due to report next year.

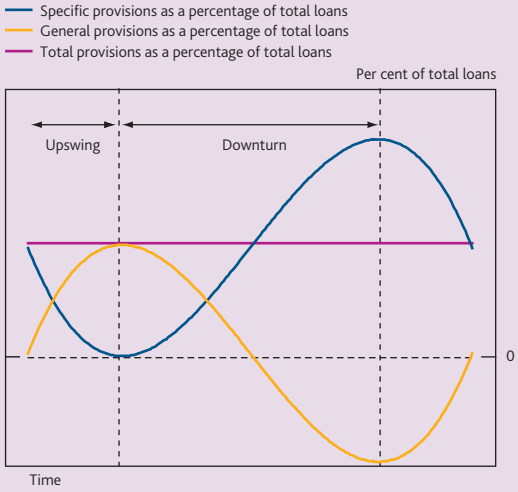
(1) In an economy with no frictions and with no distortionary taxation, it can be shown that the weighted average cost of capital is invariant to the choice of capital structures (Modigliani and Miller (1958)).
(2) FSA (2009b).
(3) See International Accounting Standards Board (2009).
(4) See www.g20.org.

Box 2
Is dynamic provisioning sufficient to meet macroprudential objectives?

There has been considerable recent interest in the regulatory regime of 'dynamic provisioning' introduced by the Spanish authorities in 2000. This is a rule-based scheme that requires banks to build up buffers of general provisions (also referred to as 'dynamic' or 'statistical' provisions) against performing loans in an upturn, which can then be drawn down in a recession. Under the Spanish system, general provisions are intended to complement specific provisions made against loans which already show signs of impairment.

To see how the system works, consider the following stylised example. When a bank in Spain extends a mortgage, it must set aside a provision consistent with the historical loss experience of that type of lending, even though the particular mortgage itself may show no current sign of impairment. By using long-run historical losses, general provisions are intended to counter the natural procyclicality of specific provisions, ensuring smoother total provisions over the cycle (**Chart A**). In this way, dynamic provisions can contribute towards making the banking sector more resilient to expected losses and as a result less cyclical. By contrast, the role of macroprudential instruments would be to increase the resilience of the financial system to unexpected losses and be countercyclical by design.

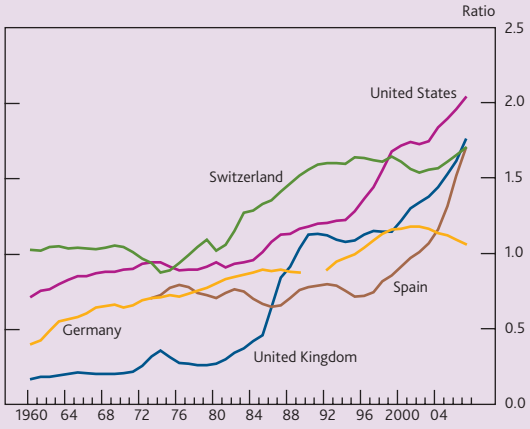
Chart A Dynamic provisioning: a stylised illustration



Dynamic provisioning is essentially a rule for setting aside reserves based on stocks and flows of credit. The parameters of the Spanish rule have been fixed since 2004 and were calibrated to capture average historical incurred losses (a proxy for long-run expected loss) in different lending sectors. As a fixed, backward-looking rule based on historical losses, the scheme is not designed to respond to financial shocks in a flexible way. For example, a backward-looking regime, by definition, cannot distinguish between credit demand and supply shocks.

Experience in Spain has shown that dynamic provisioning does little to smooth the supply of credit. As **Chart B** illustrates, since the introduction of dynamic provisioning in 2000 the ratio of private credit to GDP in Spain has more than doubled, growing at a faster rate than in the United Kingdom, United States, Switzerland and Germany. But Spanish dynamic provisions may have contributed towards increasing the resilience of the Spanish banking sector, forcing banks to build up buffers against particular types of lending.

Chart B Ratio of private credit to GDP in selected countries(a)



Source: World Bank.

(a) Private credit defined as claims on the private sector by deposit money banks and other financial institutions. It excludes credit issued to governments and public enterprises. The ratio is designed to measure the activity of financial intermediaries in channelling savings to investors. Measured on a real (deflated) basis.

Dynamic provisioning as currently implemented in Spain applies only to exposures held in the banking book. It does not capture exuberance in other parts of the balance sheet, such as trading book holdings of securitised products.

2 Possible objectives of macroprudential policy

What could macroprudential policies reasonably expect to achieve and, as importantly, not achieve? And how would those goals relate to microprudential and macroeconomic policy?

2.1 What are the appropriate goals of macroprudential policy?

In general terms, the goal of financial stability policies should be the stable provision of financial intermediation services to the wider economy — payment services, credit intermediation and insurance against risk. They should seek to avoid the type of boom and bust cycle in the supply of credit and liquidity that has marked the recent financial crisis. Tighter regulatory standards raise the cost of financial intermediation, so reducing the availability of credit to at least some households and companies. The benefits of a less volatile supply and cost of credit thus need to be weighed against these potential losses.(1)

There has been recent debate about whether the objectives of macroprudential policy are better cast in terms of ensuring the resilience of the financial system over time — 'protecting banks from the cycle' — or ensuring stability in the supply of credit to the wider economy — 'protecting the real economy from the banks'. This may be too stark a distinction, as the resilience of the banking system affects the supply of credit, which in turn affects the economic conditions influencing loan delinquencies and defaults.

During upswings, the objective of dampening the credit cycle is typically well aligned with ensuring the financial system is robust and resilient. Tightening capital and/or liquidity requirements in an upswing would tend to encourage financial institutions to check growth in their balance sheets, so increasing the future resilience of the banking system. In these situations, resilience of the financial system is likely to reinforce the macroeconomic objective of stabilising the supply of credit and its cost.

At times of collapse in credit and asset prices, such as during the current crisis, however, the goal of maintaining the provision of credit might appear to jar with narrowly prudential objectives over a short horizon. A prudential policymaker concerned only with the safety and soundness of individual financial institutions might tend to push for conservative lending policies. But a macroprudential perspective would give weight to the prospect that, for the system as a whole, excessively conservative lending policies could prove counterproductive by weakening economic activity, raising loan defaults and impairing the capital of banks. In these circumstances, the primary role of macroprudential policy would be maintaining a continuing flow of lending by allowing buffers of regulatory capital built up during the upswing to be drawn down. In this capacity, macroprudential policy would be helping to temper the credit cycle.

At the same time, there are clear limitations on the extent to which prudential policy can moderate the credit cycle. For example, with free capital mobility and cross-border lending, it is generally not possible to control tightly the overall quantum of domestic credit. At times, regulatory requirements may be a weak instrument for controlling credit — for example, at the peak of the boom (when banks tolerate raising new capital) and in the trough of a recession (when those funding banks may not permit a cut in capital ratios).

These limitations of macroprudential policy would be even more acute if the goal were instead to moderate asset price bubbles or financial imbalances more broadly. To the extent that fluctuations in credit supply contribute to — or indeed finance — bubbles and imbalances, macroprudential policies may help moderate them. Exuberance would, to a degree, be choked off at source. But sometimes bubbles and imbalances are not associated strongly with shifts in (bank) credit supply. Macroprudential tools are likely to be ineffective in these circumstances.

The 'dotcom' bubble in the early part of this decade may provide a good example of this. It was inflated largely by overexuberance among equity investors and entrepreneurs. And it was not financed, in the main, by bank credit. As a result, deflation of the dotcom bubble — while having a significant impact on wealth and aggregate demand growth — occurred without material adverse consequences for the banking system as a whole. By contrast, the wave of defaults that followed the bursting of the telecoms bubble could have affected banking system stability.(2)

Finally, it is clear that there are some economic developments which macroprudential policy should not seek to offset. For example, credit would tend to expand following a fall in global real interest rates. To the extent that such falls in the global cost of capital were sourced in developments in the real economy — for example, greater savings in Asia — the effect on credit should not be offset by macroprudential policy. The same principle applies to other, productivity-related, increases in credit demand. But macroprudential policy may sometimes need to choke off an expansion of indebtedness whose roots were warranted by economic fundamentals, but subsequently overshot.

(1) Recent analysis by the National Institute of Economic and Social Research provides a useful first-pass attempt at calibrating this trade-off — see FSA (2009b).
(2) See Bank of England (2000).

2.2 Microprudential, macroprudential and monetary policy

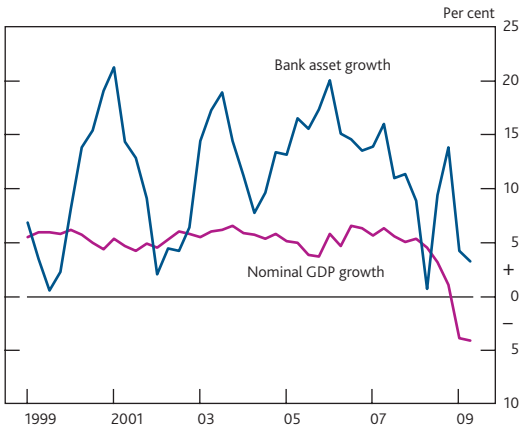
Although there would be overlaps with both microprudential and monetary policy, the role and objectives of macroprudential policy would be distinct. The goal of monetary policy is to stabilise the aggregate price of goods and services in the economy. The macroprudential objective of ensuring the resilience of the financial system as a whole in order to maintain a stable supply of financial intermediation services across the credit cycle is complementary to this objective, but not the same.

Events of the past decade illustrate the difference. Over that period, growth of nominal demand was broadly in line with estimates of the supply capacity of the economy. Goods and services price inflation remained broadly stable. Yet the balance sheets of UK (**Chart 2.1**) and overseas banks increased rapidly. Monetary policy would not have been able to curb these emerging financial imbalances without diluting the commitment to its inflation objective (Box 3). An attempt to curb banks' balance sheet growth through monetary policy may have been seriously destabilising for the real economy over this period.

Nevertheless, the judgements required to set macroprudential policy would, in kind, be not unlike those required to operate monetary policy. They would be based on a quantitative evaluation of broad trends in the macroeconomy, the financial system and, crucially, the interaction between them.

Indeed, macroprudential policy could be thought to lie along a spectrum, with monetary policy at one end and microprudential policy at the other. Its objectives would be closer to those of macroeconomic policy — concerning the stability of the aggregate provision of financial intermediation services to the real economy. But macroprudential instruments would often be based on adapting existing microprudential requirements.

Chart 2.1 Annual growth in UK-resident banks' assets and UK nominal GDP



Sources: Bank of England and OECD.

The x-axis scale has been corrected since initial publication.

Summary

This section has outlined potential objectives of a macroprudential policy regime. It has argued that a goal of ensuring the resilience of the financial system is likely to reinforce that of stabilising the supply and cost of credit during upswings. But in downturns, the primary role of macroprudential policy might be in maintaining the flow of lending by allowing buffers of regulatory capital to be drawn down. Such objectives are distinct from those of monetary policy and microprudential policy, as normally construed. There are clear limitations on the extent to which prudential policy might moderate the credit cycle, given free capital mobility and uncertainties over the transmission mechanism — particularly at peaks and troughs of the cycle.

Box 3
How effective would monetary policy have been in stabilising the credit bubble?

It is sometimes argued that the remit of central banks should be modified to take greater account of movements in asset prices or economic imbalances that threaten attainment of the inflation target, even if those risks may not materialise for several years. The remit given to the Monetary Policy Committee provides latitude for policy to respond to such medium term risks to the extent that they affect inflation and output prospects.(1) In this box, we consider some of the practical difficulties monetary policy might face in reacting to financial imbalances.

Three arguments suggest that short-term interest rates may be ill-suited to such an objective. First, it is unclear what impact a rise in short-term interest rates would have on the risk-taking propensity of the financial system. In normal times, the impact of monetary policy on asset prices is a key component of the transmission mechanism. But the impact of short-term, risk-free interest rates on financial prices and quantities is at best uncertain when risk premia are adjusting rapidly, whether upwards or downwards. In these circumstances, risk-free rates may be an ineffective instrument for influencing risk-taking behaviour and risk premia.(2)

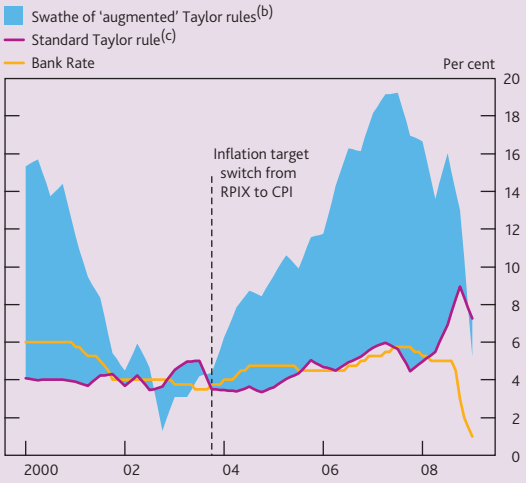
Second, in the run up to the present crisis monetary policy would probably have needed to slow materially money spending in the economy, below that consistent with meeting the inflation target, to quell growth in banks' balance sheets. This would have generated lower output relative to trend and higher unemployment over this period. Those losses could have been large if risk choices were relatively insensitive to movements in short-term interest rates.(3)

To illustrate, **Chart A** shows counterfactual paths for interest rates generated by adding a measure of the 'gap' in asset prices from their trend to a standard Taylor rule.(4) The range of paths is generated by varying the coefficient on this asset price gap within an arbitrary range of 0 to 0.5. This is no more than an illustrative exercise — for example, it makes no attempt to account for the feedback effect of interest changes on asset prices. Nonetheless, the chart illustrates that interest rates may need to have been set at a materially higher level to offset asset price inflation, potentially destabilising the real and nominal economy.

A recent analysis by the IMF (2009) explores the economic costs of assigning monetary policy the task of leaning against credit market disturbances. Simulation results from a structural macroeconomic model suggest that — in the absence of macroprudential instruments — a stronger-than-usual reaction of monetary policy to signs of credit market overheating is needed to reduce macroeconomic volatility. But given a full set of instruments, the optimal policy response would assign macroprudential instruments(5) the task of dampening credit shocks, leaving monetary policy to focus on inflation and real output.

Third, the strategy of using interest rates to lean against asset bubbles risks de-anchoring the private sector's expectations of inflation. Persistent deviations of inflation from target may make the central bank's commitment to return inflation to target in the medium term more challenging.(6) This underscores the importance of developing tools to target financial imbalances and lending exuberance at source.

Chart A Taylor rule with feedback from an asset price gap(a)



Source: Bank calculations.

(a) Output gap measured as the deviation of log(GDP) from an HP filter trend. Asset price gap measured as the deviation of a real asset price index from a linear trend.
(b) Light blue area generated by varying the weight on the asset price gap between 0 and 0.5.
(c) Weights on deviations from the inflation target and on the output gap set at 1.5 and 0.5 respectively.

(1) See Dale (2009).
(2) See Kohn (2008).
(3) See Bean (2009) and Dale (2009).
(4) A Taylor rule is an equation linking interest rates to the deviation of inflation from target and to the level of the output gap. Such rules have been shown to provide a convenient description of actual movements in interest rates. And, under some circumstances, they provide a useful normative guide. For this reason, Taylor rules are a widely used benchmark in the monetary policy literature.
(5) The model is insufficiently rich to specify the nature of these tools explicitly (banks are not explicitly modelled, for example). Rather, it is assumed that the policymaker has access to an instrument which affects credit spreads directly.
(6) See Carney (2009).

3 The causes of systemic problems: financial frictions and propagation channels

In debating whether and how prudential regulation — and internationally, the 'rules of the game' for the financial system — should be re-oriented to focus on systemic risk, a natural starting point is an assessment of the sources of systemic risk. Risk, by itself, is neither bad nor avoidable. But past and present crises have revealed a range of distortions which might result in risk across the financial system rising above its socially optimal level.

3.1 Market failures

Instances of market failure typically stem from three underlying sources: incentives; information; and co-ordination:

- Incentive problems can arise as an unintended consequence of public policy, as in the case where insurance distorts risk-taking incentives. They can also arise for institutional reasons, such as limited liability.

- Information frictions cause markets to fail when buyers doubt the quality of assets (adverse selection) or when principals cannot perfectly observe the actions of their agents (moral hazard). A large body of evidence also suggests that people may not process information in a fully rational way.(1)

- Co-ordination or 'free rider' problems also distort individual incentives to act. Collective action may be in the interests of each member of a group, but in the absence of a means of co-ordinating this equilibrium may be unachievable.

The history of financial crises provides a number of examples of these market failures (**Table 3.1**). *Incentive* problems are widely believed to have contributed to excessive risk-taking in the run-up to the crisis, including through:

- Moral hazard arising from explicit or implicit guarantees of official sector support offered to state-regulated financial institutions. Expectations of an official safety net potentially contributed to the underpricing of risk among financial institutions, perhaps especially among those deemed too big or important to fail.(2) Similarly, incentives of investors to monitor risk were distorted by the belief that macroeconomic policy would insure against future tail risks.

- Financial contracts typically limit the downside risk borne by shareholders and managers due to limited liability. This generates an incentive for both to take big risks in order to try to generate big returns. Strategies pursued by banks in the run-up to the crisis amplified asymmetries in these pay-offs. They included higher leverage, larger trading books and writing of deep out-of-the-money options on illiquid financial instruments.(3)

Information frictions also featured prominently in the run-up to the crisis, including via:

- Network externalities which arise when agents in a financial system do not have the information necessary to determine the risks to which they are exposed. For example, the contagious consequences of one firm failing may be opaque to others in the financial network.

- Risk illusion, or disaster myopia, which can occur when financial investors collectively underestimate the probability of adverse scenarios following a period of relative stability.(4) Misperceptions of risk are widely believed to have underpinned the historically low compensation that investors required to hold risky assets in the run-up to the crisis — the so-called 'search for yield'. This phenomenon has behavioural parallels with the concept of money illusion in a monetary policy context.

Co-ordination problems can generate financial instabilities such as booms, bank runs, asset fire sales, credit crunches and (market and funding) liquidity problems, all of which have been evident during the present crisis:

- The performance of individuals or firms within the financial sector is often judged relative to peer or industry benchmarks.(5) This relative-return benchmarking generates incentives to mimic others' risk-taking behaviour to maintain returns, even though it may be in no-one's long-run interest to do so.(6) The comments of Chuck Prince, former CEO of Citigroup, in July 2007 captured this co-ordination failure during the present crisis.(7)

- In the face of solvency concerns, banks may seek to reduce their balance sheet by selling legacy assets or constraining new lending. While individually rational, collectively this risks generating a worse outcome for everyone — for example, because a fire sale of assets impairs market liquidity and drives down asset prices, or because restricting new lending generates a credit crunch for the real economy. Both have been a feature of the crisis.

- The simplest model of a bank run arises because depositors lack a means of co-ordinating their actions. As long as there is a first-come-first-served advantage, there will be an incentive for depositors to be first in the queue.(8) This same dynamic applies to wholesale depositors. Funding liquidity

(1) See Rabin (1998).
(2) See Farhi and Tirole (2009), Calomiris (2009).
(3) See Alessandri and Haldane (2009).
(4) These effects receive prominent attention in classic studies by Minsky (1986) and Kindleberger (1978). See also Haldane (2009a), King (2009a) and Tucker (2009).
(5) Scharfstein and Stein (1990).
(6) See Tucker (2009).
(7) 'When the music stops, in terms of liquidity, things will be complicated. But as long as the music is playing, you've got to get up and dance. We're still dancing', *Financial Times*, 9 July 2007.
(8) See Diamond and Dybvig (1983).

Table 3.1 The role of market failures in financial crises, past and present

	Financial markets	Institutions
Incentive problems		
Moral hazard and 'too big to fail'	• 'The Greenspan Put' — some argue that soaring equity prices earlier this decade reflected investors' beliefs that the Federal Reserve would act to prevent the market from falling, but not to stop it rising (2000s).	• Support for Fannie Mae, Freddie Mac, Bear Stearns and AIG (2008). • October 2008 recapitalisation plan and March 2009 Asset Protection Scheme offered to large UK banks. • Continental Illinois (1984), US Savings and Loans crisis (1980s/90s).
Incomplete contracts		• Compensation structures that gave staff incentives to pursue unduly risky practices.
Information frictions		
Network externalities	• Credit default swap market at the time of Lehman Brothers & AIG stress (September/October 2008) — contagious consequences of default were unclear to others in the financial network.	
Risk illusion	• The 'search for yield' — buoyed by illusory reductions in macroeconomic uncertainty, investors tried to maintain high returns in a low interest rate environment by purchasing ever riskier products (2003–07).	• Widespread use of value at risk (VaR) models for risk management purposes, which were estimated over episodes of relative calm in financial markets, and so could not capture the possibility of extreme market volatility (1997 onwards). • Investors in Bernard L Madoff's funds extrapolated apparent trends in profits (2008). • Suspension by BNP Paribas of its hedge funds in August 2007 because of difficulties experienced in valuing sub-prime related exposures — illusion existed over the liquidity risk embedded within asset-backed securities.
Adverse selection	• The freeze of the interbank and asset-backed commercial paper markets (August 2007) — investors bid down prices as they had imperfect information on the quality of underlying assets, and sellers of 'good' assets were unwilling to sell at prevailing market prices.	
Information cascades	• Contagious currency devaluations during the Asian financial crisis (1997).	• Short-selling of the shares of some UK banks (2008).
Co-ordination problems		
Peer benchmarking	• Condition of financial system in mid-2007, as described by Chuck Prince's infamous quote (see Section 3.1). • Peer-group comparison among investment managers.	
Fire-sale externalities		• Series of bank mergers and rescues that followed failure of Lehman Brothers to prevent contagious fire-sales, eg Bradford and Bingley and HBOS (2008). • Long Term Capital Management — the Federal Reserve of New York facilitated a debt restructuring in order to prevent a disorderly unwinding of LTCM spilling over to other institutions (1998). • Following the 2001 'dotcom' equity correction, losses faced by UK life insurers could have led to a potential 'asset price loss-spiral' through equity sales — FSA intervened by relaxing solvency rules.
Credit crunch externalities	• Bank lending to households and corporates tightened significantly in 2008/09.	
Runs on retail or wholesale deposits	• Runs on money market funds (2008), prompting the introduction of the Federal Reserve's Money Market Fund facility.	• Runs on Lehman Brothers and Bear Stearns (2008). • Run on Northern Rock (2007), leading to the introduction of increased deposit insurance limit in the United Kingdom (2008). • Wholesale market run on Continental Illinois (1984).

problems, at both the retail and wholesale level, were a particular feature of the present crisis and in part arose because of co-ordination failures.

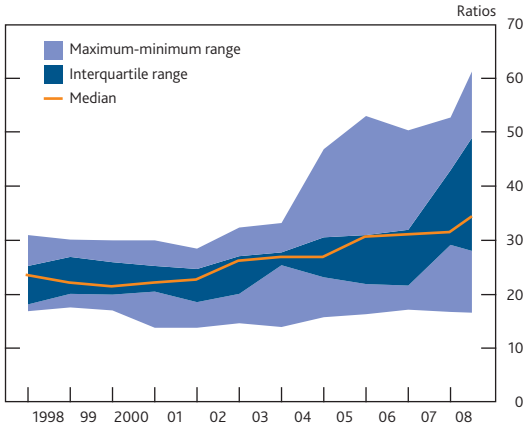
3.2 Propagation channels

These frictions propagate within the financial system and on to the real economy through two basic channels — *leverage* and *maturity transformation*. Leverage defines the degree to which assets are funded by debt, while maturity transformation defines the degree to which shorter-term liabilities are used to finance longer-term assets. Both leverage and maturity transformation are socially useful. For example, debt allows households to smooth their consumption in the event of disruptions to their income. It may also help discipline managers of financial firms by reducing free cash flows and forcing them to return to the capital market to justify new investments.(1) Maturity transformation, meanwhile, allows depositors to smooth consumption across time, while permitting society to fund long-term investments.

But leverage and maturity transformation can both become too much of a good thing, rising above their socially optimal levels. Financial frictions — incentives, information, co-ordination — can result in leverage and maturity mismatch becoming 'excessive'. Excess leverage and maturity mismatch make the real economy more fragile in the face of adverse shocks. They act as amplifying mechanisms, magnifying the

(1) See Jensen (1986) and Calomiris and Khan (1991).

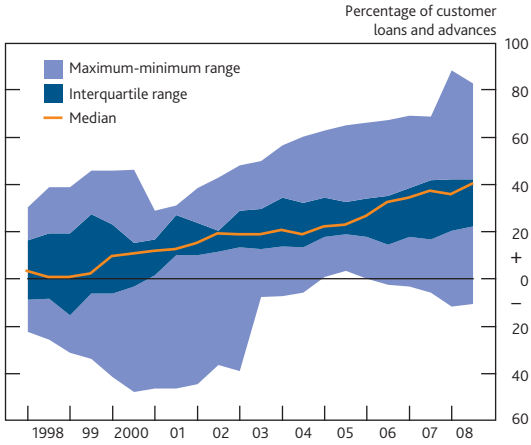
Chart 3.1 Major UK banks' leverage ratios[a][b]



Sources: Published accounts and Bank calculations.

(a) Leverage ratio defined as total assets divided by total equity excluding minority interest.
(b) Data excludes Nationwide.

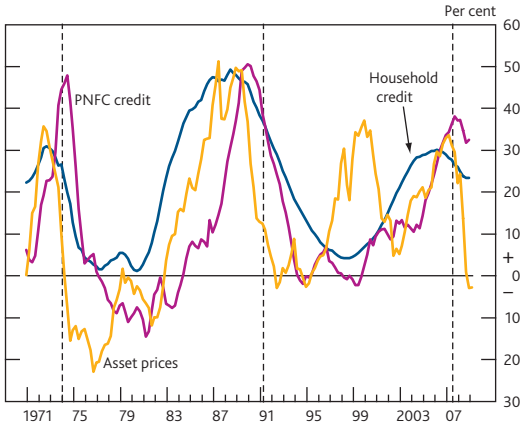
Chart 3.2 Major UK banks' customer funding gaps[a]



Sources: Dealogic, published accounts and Bank calculations.

(a) Customer funding gap is customer lending less customer funding, where customer refers to all non-bank borrowers and depositors.

Chart 3.3 Asset prices and credit in the United Kingdom[a][b][c]



Sources: Bank of England, Global Financial Data Inc., Halifax, Nationwide, ONS, Thomson Datastream and Bank calculations.

(a) The chart shows ratios of real asset prices, household credit and private non-financial corporate credit to GDP, relative to their ten-year moving averages. A positive level thus indicates above-trend growth.
(b) The dashed lines show start dates for banking crises. The chart shows the secondary banking crisis, small banks crisis and the current crisis.
(c) Asset prices index is a weighted average of real equity prices, real house prices and real commercial property prices. Weighted according to national accounts data for holdings of assets.

effects of liquidity and solvency shocks on the wider economy. In understanding these dynamics, it is useful to distinguish between *aggregate risk* which arises across the financial system as a whole and *network risk* which arises within the financial system.

3.2.1 Aggregate risk

History provides many examples of banks' collective tendency to assume excessive risk in an upswing and then to become excessively risk-averse during the downswing. This often reveals itself in procyclicality in the leverage and maturity mismatch position of the financial system — a credit and liquidity cycle. This cycle can also generate what in effect are concentrated business models, whether on the asset side of the balance sheet (exposures to particular sectors or firms) or on the liability side (reliance on particular funding instruments).

To illustrate these aggregate risk exposures, **Chart 3.1** shows the expansion of major UK banks' leverage over the past decade, while **Chart 3.2** illustrates the path of UK banks' customer funding gap — the shortfall in customer deposits over customer lending. The latter is a measure of the degree of reliance on wholesale funding, much of which tends to be short-term in nature. On these measures, aggregate leverage and mismatch rose very rapidly. So too did the indebtedness of the UK household and corporate sectors (**Chart 3.3**).

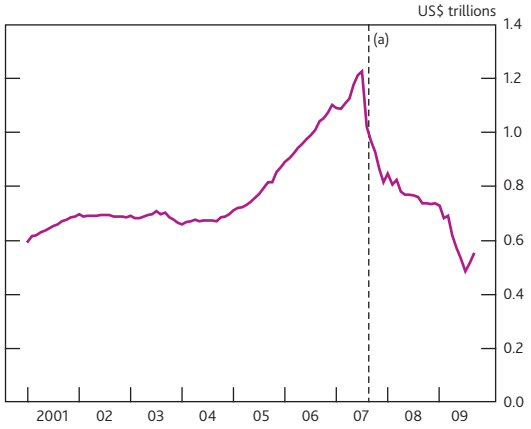
The expansion of leverage and maturity mismatch at the level of the financial system was also clearly evident in the behaviour of off-balance sheet vehicles — for example, conduits and structured investment vehicles (SIVs). These highly leveraged 'shadow banks' engaged in significant maturity transformation. For example, asset-backed commercial paper (ABCP) conduits issued short-term paper to fund various assets with longer maturities and higher yields. **Chart 3.4** shows the explosive growth of ABCP in the run-up to the present crisis.

These aggregate risk positions are unlikely to be taken into account either by individual banks in their risk management or by regulators focusing on individual banks' balance sheets, for reasons which include:

- Fallacies of composition. Consider a hypothetical bank borrowing at a one-week maturity and extending a two-week loan to another bank. This bank in turn uses the two-week loan to extend a three-week loan and so on. As this chain expands, the aggregate financial system could find itself funding very long-lived assets with a one-week deposit.[1] A regulator focused solely on monitoring the balance sheets of individual institutions might miss this

(1) Hellwig (1995).

Chart 3.4 US asset-backed commercial paper outstanding



Source: Federal Reserve.

(a) End-July 2007.

build-up in systemic risk, as no individual bank has a maturity mismatch of over one week.

- The risks facing individual intermediaries often depend importantly on system-wide behaviour. For example, the recovery rate on a bank's mortgage assets will depend importantly on aggregate credit conditions. And the funding vulnerability of a bank will depend on how many other banks are reliant on the same funding source. Only by looking at aggregate (leverage and liquidity) positions would risks across the financial system start to become apparent.

- The effectiveness of a bank's diversification strategy depends on others' strategies. The less diversity there is across banks' strategies, the smaller are the diversification benefits a bank can expect. Indeed, in some cases diversification strategies may reduce diversity across the system and thereby increase the amount of aggregate risk to which banks are exposed.

In each of these cases, a macroprudential perspective might have helped to identify broadly the risks to which the financial system as a whole was becoming exposed.

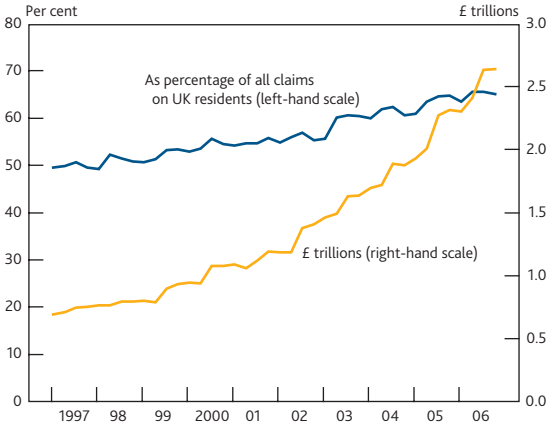
3.2.2 Network risk

Individual institutions are unlikely to take sufficient account of the spillover effects of their actions on others in the financial network. They are similarly unlikely to pay sufficient attention to the impact others' actions could have on their own balance sheets. This means that some risks across the financial system may go undetected and unmanaged. Network risk is, in this sense, an externality for the financial system: everyone bears this risk, but no one individual firm is likely to take action sufficient to mitigate it.(1)

During the current crisis, these spillover effects have often been potent. The losses generated by failures of some institutions have risked a cascade of counterparty defaults. Information contagion has often been as strong as financial contagion — for example, among several US security dealer groups after the collapse of Lehman Brothers. Spillovers may also amplify liquidity risks. For example, precautionary hoarding of liquidity contributed to the seizure in money markets during the crisis. Some banks responded by selling assets, impairing market liquidity and thereby generating losses for other banks — for example, in some asset-backed security markets.(2)

These spillovers operate across firms, but are also likely to amplify risks over time. For example, an underpricing of contagion risk may result in financial firms becoming larger or more interconnected than might be desirable or than they realise. This would manifest itself in excess gross leverage across the financial system — that is, high levels of *intra*-financial system activity. **Chart 3.5** shows that, in the five years preceding the crisis, intrafinancial system flows grew very rapidly. **Chart 3.6** provides a visualisation of the complex web of connections underlying this high gross leverage.

Chart 3.5 UK-resident banks' claims on other financial institutions in the United Kingdom(a)



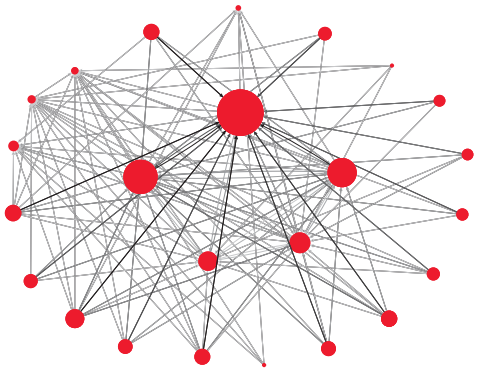
Source: Bank of England.

(a) Sterling and foreign currency claims on other MFIs and OFCs.

Many of the risks posed by these frictions were raised by the Bank of England in its speeches and its *Financial Stability Reports* in the run-up to the financial crisis and by others.(3) Although, with hindsight, it is now clear that such messages could have been put more forcefully, it is equally clear that words alone would not have been sufficient to curb banks' incentives to engage in excessive risk-taking. Actions were needed to break the collective action problem. That reinforces the need to explore whether there might be specific macroprudential policy tools backing up words, which could

(1) See Haldane (2009b).
(2) See Brunnermeier and Pederson (2009).
(3) See Bank for International Settlements (2007) and Trichet (2007).

Chart 3.6 Network of large exposures[a] between UK banks[b][c]



Source: FSA returns.

(a) A large exposure is one that exceeds 10% of a lending bank's eligible capital during a period. Eligible capital is defined as Tier 1 plus Tier 2 capital, minus regulatory deductions.
(b) Each node represents a bank in the United Kingdom. The size of each node is scaled in proportion to the sum of (1) the total value of exposures to a bank, and (2) the total value of exposures of the bank to others in the network. The thickness of a line is proportionate to the value of a single bilateral exposure.
(c) Based on 2008 Q1 data.

have provided a direct regulatory incentive to change risk-taking behaviour.

Bringing all of this together, in dealing with systemic risk four dimensions need to be considered. First, there are the two potential *sources* of systemic risk: aggregate risk (which varies over time) and network risk (which varies across institutions). And second, there are two potential *channels* of systemic risk propagation: maturity mismatch (liquidity) and leverage (solvency). In other words, the macroprudential policy problem is multifaceted.

This strongly suggests the need for a *set* of macroprudential tools to tackle systemic risk. These tools might usefully target the separate sources of systemic risk (**Table 3.2**). To that end, Sections 4 and 5 discuss possible tools that might aim to mitigate, respectively, aggregate and network risk across the financial system. The analysis in these sections focuses largely on the leverage dimension of the problem because (internationally consistent) prudential capital instruments have existed since the inception of the first Basel Accord (1988), whereas microprudential liquidity requirements are still in the process of being developed internationally. Given the prominent role played by liquidity problems during the crisis, however, there is considerable benefit in further work on using regulatory liquidity requirements as a macroprudential tool. The Bank hopes that this can feature in the policy debate.

Table 3.2 Different dimensions of the macroprudential problem

	Network risk	Aggregate risk
Capital	• Lower the probability of failure of systemically important firms. • Provide incentives to lower spillover effects.	• Act on the net leverage of the financial system over the credit cycle. • Provide incentives to curtail exuberant lending.
Liquidity	• Lower the probability of key providers of interbank funds hoarding liquidity. • Provide incentives for more robust funding network.	• Act on the net maturity mismatch of the financial system over the credit cycle. • Provide incentives to shorten excessive maturity transformation.

Summary

This section has argued that systemic risk has two principal sources. First, there is a strong collective tendency for financial firms, as well as companies and households, to overexpose themselves to risk in the upswing of a credit cycle, and to become overly risk-averse in a downswing. Second, individual banks typically fail to take account of the spillover effects of their actions on risk in the rest of the financial network. These frictions propagate within the financial system and on to the real economy through two channels: leverage and maturity mismatch. Frictions can cause both to rise above their socially optimal levels. The macroprudential policy problem is therefore multifaceted.

4 Tools to manage aggregate risk

Aggregate risk increases the collective fragility of firms within the financial system. The aim of macroprudential tools would be to lean against the build-up of aggregate risk in the upswing, making firms more resilient and thereby lowering the probability of default across the financial system towards its social optimum. And, as important, these tools would aim to help to reduce impediments to risk-taking and lending during the downswing to support economic activity. If such tools were effective, the resilience of the system would thereby be strengthened in both phases of the credit cycle.

In principle, there are a number of regulatory levers that could be used to moderate banks' risk-taking, including quantitative restrictions on aggregate lending or limitations on lending criteria such as loan to value or loan to income ratios. In practice there is merit, where possible, in using existing regulatory tools when setting macroprudential policy. Indeed, liquidity and capital requirements should, in principle, be well-suited to influencing the two key channels through which systemic risk propagates — maturity mismatch and leverage.

4.1 Systemic capital surcharges

Perhaps the simplest macroprudential approach to dealing with aggregate solvency risk in the financial system would be to apply a top-up or 'surcharge' over and above microprudential capital requirements (including forward-looking dynamic provisions against *expected* losses). To counter the accumulation of aggregate risk, those surcharges would need to vary countercyclically, increasing in a credit boom. Requiring banks to raise equity would raise the marginal cost of their lending and thus provide incentives to slow balance sheet growth.(1) Equally, capital surcharges would fall in a downturn to provide incentives for banks to maintain the supply of credit.

The calibration of systemic capital surcharges would differ fundamentally from the setting of microprudential requirements normally construed. What would matter for macroprudential purposes would be the aggregate state of risk-taking and credit conditions, not that assumed by a particular institution. For that reason, the surcharge would be applied in an undifferentiated way across financial institutions exposed to the same aggregate risks. The policy judgement would, in that sense, be about the system as a whole, drawing on macro data, even though it would be implemented using prudential instruments.

Capital surcharges could be applied at varying levels of granularity. For example, surcharges could apply to banks' headline capital requirements.(2) That would have the advantage of simplicity and should definitely be part of future debate and research. But, at least in some situations, time-varying *headline* capital requirements may be a blunt tool for influencing risk-taking behaviour in, and banking exposures to, particular sectors. For example, consider banks that are engaged in highly profitable but risky lending to non-bank financial companies alongside less profitable lending to households and corporates. Faced with higher overall capital requirements, the banks may choose to conserve capital by slowing lending to the latter rather than the former.

One possible option for addressing that problem would be to vary the capital which is required to be held against particular sectoral lending exposures.(3) In regulatory terms, this could be described as varying the 'risk weights' that apply to different broad classes of lending and other exposures. This would enable the macroprudential regulator to influence the marginal cost of lending to exuberant parts of the economy, while preserving the flexibility to raise aggregate capital requirements if necessary. In the example from the preceding paragraph, the capital required to back lending to non-bank financial companies could be increased, so leaving lending to the real economy broadly unaffected.

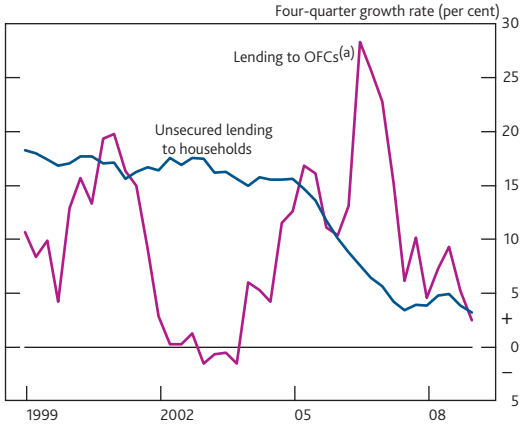
In general, such flexibility may be useful because episodes of exuberance typically originate in particular sectors of the economy. Arbitrage then tends to turn sectoral pockets of exuberance into aggregate exuberance, albeit with a lag. A sectoral approach to the setting of capital surcharges might allow a macroprudential policymaker to nip such problems in the bud more effectively than otherwise.

The potential benefits of such an approach were perhaps evident in the run-up to the present crisis. Growth in unsecured lending to households fell sharply between 2005 and 2007, at a time when lending to other financial companies (including securities dealers, SIVs, conduits and institutional investors) was growing very strongly (**Chart 4.1**). An increase in banks' headline capital requirements would arguably have been too blunt an instrument to control these problems.

A variety of degrees of granularity could be employed in a systemic surcharge regime, trading off flexibility on the one hand and simplicity on the other. The granularity of the macroprudential regime probably need not be anywhere near as great as for microprudential regulation. The aim would not be to adjust the 'risk weight' on every asset class whose risk characteristics differ. Rather it could perhaps be to define broad classes of assets or markets which might be susceptible to exuberance and also constitute meaningful exposures for the banking system. For example, for domestic credit

(1) This argument rests on there being financial frictions which distort the relationship between a bank's cost of debt and the amount of equity. Were capital markets to be fully efficient, the extra cost of raising equity would be exactly offset by the benefit of making debt safer and hence cheaper (see Box 1 and Modigliani and Miller (1958)). The capital structure of banks would then have no impact on the cost of lending. A variety of information and incentive problems and policy distortions are widely believed to cause deviations from this theoretical equilibrium.
(2) See Brunnermeier *et al* (2009) and Bank for International Settlements (2009).
(3) See Tucker (2009).

Chart 4.1 Sectoral M4 lending growth



Source: Bank of England.

(a) Excludes lending to intermediate OFCs.

exposures the 'risk buckets' might comprise banks' secured and unsecured exposures to households, commercial property lending, other corporate lending and lending to other financial companies. A further degree of granularity might plausibly distinguish sub-prime lending to households, 'leveraged' or high-yield lending to companies etc. If something broadly along these lines merited further debate, careful study of the sensible degree of granularity would be needed; and it would not have to be fixed for all time, but would depend partly on the circumstances. Within these broad risk buckets, institution-specific loan characteristics would, as now, be assessed and risk-weighted by the microprudential regulator.

4.2 Setting systemic capital surcharges

Whatever the degree of granularity of the systemic surcharge regime, a quantitative judgement would need to be made on the degree of 'overexuberance' in credit conditions. In practice, there is unlikely to be a single, quantitative indicator which captures accurately exuberance in credit markets. This mirrors the finding in other areas of macroeconomic policy, including monetary policy. Experience has illustrated that focusing on a single or fixed set of indicators is unlikely to be a robust guidepost to policy over time.

It may be possible, however, to define an eclectic set of indicator variables, at an aggregate and sectoral level, which might inform judgements about excessively risky lending. **Table 4.1** lists some of the variables that might be considered. Some are quantitative, others qualitative, including market intelligence. Some of the data for these indicators already exist; for others, new data would need to be collected.(1)

Translating this indicator set into possible summary measures of aggregate risk, and potentially a set of sectoral 'risk weights', will call for a technical judgement. One way of making this process concrete and quantitative would be to apply a prescribed set of stress scenarios to the factors driving default and recovery rates on classes of lending. These

Table 4.1 Indicator variables for capital surcharge

- Credit flows, stocks and spreads.*
- Income and capital gearing of households, corporates and other financial companies (OFCs).*
- Unemployment rate.*
- House price to earnings ratio, house price inflation.*
- Maximum loan to income and value ratios of first-time buyers.*
- Commercial property prices and rents.*
- Property pipelines and vacancy rates.*
- Credit conditions surveys.*
- Volumes/spreads data on LBO (leveraged buyout) and private equity deals.*
- Volumes/spreads data on syndicated loan activity.*
- Growth in assets under management at hedge funds and OFCs.*
- Contribution to growth in mortgage market from other specialist lenders.*
- Reliable data on leverage ratios of hedge funds/other OFCs.
- A granular geographical breakdown of banks' loan books.
- Richer data on the quality of institutions' loan portfolios — such as the loan to value breakdown of their mortgage and commercial real estate lending; a breakdown of their mortgage book between prime, adverse credit, self-certified and buy-to-let.
- A consistent breakdown of trading assets by class and quality.

Note: An asterisk (*) denotes that the data source is currently available to us.

prescribed stresses could depend on the state of the credit cycle — for example, gradually becoming more severe as a credit boom expanded. Capital buffers required on lending to each sector would then be adjusted to ensure the system was resilient to these tail scenarios.

Under this approach, the task for the macroprudential authorities would be to calibrate the stresses, their implications and the necessary adjustment in capital charges to ensure that banks would be likely to remain resilient were these risks to materialise. Box 4 sets out conceptual steps involved in such an exercise. It also provides an illustrative calibration of capital surcharges based on a very broad subset of currently available indicators. This calibration is intended to demonstrate some of the methodological steps that would need to be taken, *not* as a precise quantitative guide to how policy might actually have been set. Approaches such as this would need to be complemented with qualitative information from sources such as market participants and surveys in broadly the same way as monetary policy makers around the world draw on modelling, conjunctural data analysis and anecdotal information from real-economy contacts.

Nonetheless, this illustrative calibration is revealing in several respects. First, even though crudely assembled, the calibration does establish that using a plausible set of indicators to guide policy could have resulted in a material rise in capital surcharges during the middle of the decade. That might have helped curb the credit boom of the past decade. Second, it suggests that, in practice, it is difficult to find a single or fixed set of indicators that could be combined to deliver a robust *rule* for macroprudential policy in all states of the world.

(1) Section 7 has a more detailed discussion of data requirements for a macroprudential regime.

4.3 Complementary measures

It may be desirable to supplement macroprudential capital requirements with other prudential instruments which could help to achieve macroprudential objectives. Time-varying margins or haircuts on certain secured financial transactions between banks and non-banks are one example. They could be levied on secured lending to other parts of the financial system — for example, 'shadow' banks or hedge funds. This would allow the authorities to influence the marginal cost of lending to non-bank financial companies if conditions became overly exuberant. As such, they might be a means of averting an imprudent increase in the leverage of non-banks.(1)

In principle, countercyclical surcharges could also be applied to liquidity requirements to lean against the collective underpricing of liquidity risk during credit booms — for example, underpriced rollover risk in funding markets and market liquidity risk in asset markets.(2) As well as providing additional liquidity insurance for the financial system, liquidity surcharges would generate incentives for banks to put balance sheets on a more stable liquidity footing. Further work would be needed to calibrate any such instruments, taking into account both internationally agreed microprudential liquidity requirements,(3) and whether or not these instruments could sensibly be related to the terms on which central banks provide liquidity insurance. Measures on margins and liquidity insurance could be connected if central banks increased haircuts on eligible collateral over the credit cycle.(4)

Summary

This section has examined whether it would be practical to dampen cyclical overexuberance through a regime of capital surcharges on top of prevailing microprudential capital ratios. The Basel Committee and other international groups are working on this.

They could be applied to headline capital requirements or at a more disaggregated level (through so-called 'risk weights' on particular types of exposure). The sectoral approach might allow policy to be better targeted at pockets of exuberance, but would also entail greater complexity. Increasing capital requirements in a credit boom could offer greater system-wide self-insurance against a subsequent bust. It would also provide incentives for banks to restrain exuberant lending by raising its marginal cost. Lowering capital requirements in a bust, on at least some classes of lending, might provide an incentive for banks to lend and reduce the likelihood of a collective contraction of credit exacerbating the downturn and losses to banks themselves.

(1) However, it should be noted that academic studies have typically found little evidence that federal margin regulations in the United States have been effective in limiting stock price volatility. See Kupiec (1997).
(2) See Perotti and Suarez (2009). Brunnermeier *et al* (2009) suggest a capital surcharge based on banks' maturity mismatch.
(3) See Bank for International Settlements (2008).
(4) For example, see Bank of England (2008a).

Box 4
Calibrating time-varying capital surcharges

The aim of (aggregate and sectoral) surcharges is to lean against cyclical exuberance in bank lending that may lead to the accumulation of excessive aggregate risk in the financial system. This box considers how time-varying capital surcharges might be calibrated for this purpose. It is intended to highlight the set of judgements that a macroprudential regulator would need to make to implement countercyclical capital surcharges. The precise approach outlined here should be considered no more than illustrative. In practice, a variety of approaches, models, data and qualitative information would be required to inform policy judgements.

In broad terms, this calibration requires quantification of:

- The link between indicators of exuberance and banks' default probabilities; and
- The link between banks' probability of default and capital ratios.

There are no simple metrics for quantifying the first ready-reckoner. Translating a set of economic and financial indicators into default probabilities for the financial system will inevitably be somewhat subjective. Here, a largely statistical approach is adopted. For the second ready-reckoner, a Merton (1974)-based approach is used as a starting point.(1) This involves simulating the future value of a bank's assets to assess the likelihood of default when debt payments fall due. It allows a quantification of the link between a bank's capital ratio and its default probability.

To fix ideas, the calibration is applied to a set of six banks over the past decade. As a starting point, banks' domestic credit exposures are partitioned into the following set of 'risk buckets': secured and unsecured exposures to households; commercial real estate lending; other corporate lending; and lending to other financial companies. Other exposures are grouped together in a catch-all residual bucket, which is given the average surcharge. The choice of risk buckets is purely illustrative. In practice, the granularity of the sectors chosen should reflect their quantitative significance.

There are four steps involved in calibrating time-varying capital surcharges for these sectors.

Step 1: Benchmark calibration

Calibrate the expected return ('drift') and volatility parameters of the Merton model so that the balance sheet of the aggregate financial system is consistent with a default probability of, say, 0.1%. Where individual banks appear undercapitalised, it is assumed that the microprudential regulator demands additional capital so that the probability of default for all institutions is equal to or below 0.1%.

Step 2: Choose the 'neutral' macroprudential surcharge

Set the neutral or average surcharge to be applied when all sectors are in equilibrium. If a 'neutral' surcharge is positive, this is equivalent to demanding a more stringent threshold for the default probability of the system.

Step 3: Estimate exuberance in each sector

Identify a set of indicators of exuberance in lending to each of the sectors. The indicators considered in this exercise are drawn from **Table 4.1**. These have been chosen to reflect pressures on credit supply, incorporating information from both financial prices and quantities. The approach to measuring exuberance is common to each sector. We normalise each of the indicators so they share the same variance. And we define our indicator of exuberance at each point in time as the median value across the range of indicators. The task of judging exuberance would in practice be less mechanical, involving a judgemental sifting of all available evidence. **Charts A–E** present the swathe of indicators used for each sector, together with the median.

Step 4: Estimate the capital surcharge for each sector

The benchmark calibration of the expected return and volatility of banks' assets (from Step 1) is then adjusted in light of these estimates of exuberance. The greater the exuberance, the higher the expected drift and variance of returns on exposures to the exuberant sector. All else equal, this increases the probability of default of the banking sector.

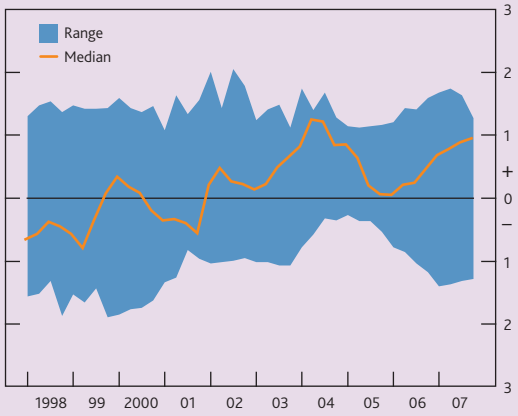
In precise terms, an adjustment factor is first computed for the volatility of each bank's assets. This factor is given by taking the weighted average of exuberance estimates (from Step 3) at each point in time, where the weights reflect balance sheet shares. The volatility of each bank's assets is then adjusted in proportion to this adjustment factor. A similar adjustment is made to the expected drift to ensure a common market price of risk across banks. Given these adjustments, the aggregate capital surcharge for each bank at each point is determined as that required to bring the default probability back to the default threshold from Step 2.

Chart F illustrates the results of this process, reporting surcharges by sector.(2) The cumulative effect is an upward-sloping profile. This is largely driven by exuberance in mortgage lending, reflecting both the time-profile of estimated exuberance in this sector and the large share of mortgage lending. But it is notable that all sectors carry

higher capital surcharges in the second half of the sample period.

Chart G illustrates the counterfactual trajectory for aggregate capital surcharges on a bank by bank basis. As collective risks from the credit cycle build over time, countercyclical capital surcharges increase, in particular from around 2002 onwards. Although higher capital surcharges are applied equally across banks, the incidence of these charges differs across firms according to their precise exposures to exuberant sectors.

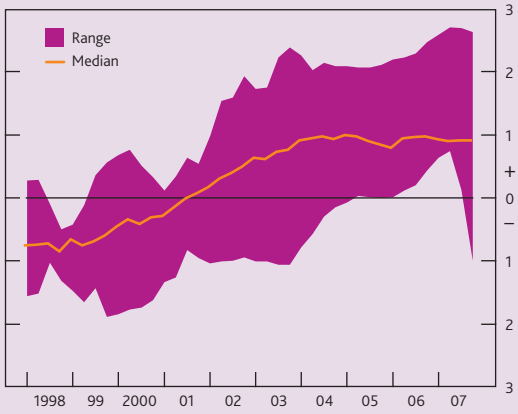
Chart A Swathe of exuberance indicators in unsecured lending to households(a)(b)



Source: Bank of England.

(a) The following quarterly indicators for exuberance in unsecured lending to households are used: spreads on personal loans, credit cards and overdrafts; stocks and flows of unsecured lending to households; and income and capital gearing of the household sector. All indicators are de-trended and have been normalised by their standard deviation to allow for comparison with other indicators.
(b) The top of the swathe shows the value of the largest indicator, the bottom of the swathe the value of the smallest indicator, and the orange line the median value of all indicators, all at a given point in time.

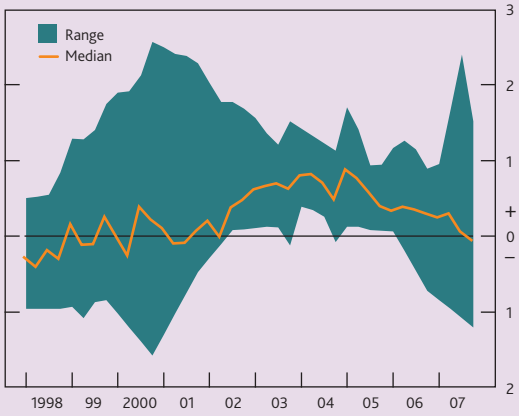
Chart B Swathe of exuberance indicators in secured lending to households(a)(b)



Source: Bank of England.

(a) The following quarterly indicators for exuberance in secured lending to households are used: spreads on mortgage lending; measures of the house price to earnings ratio; stocks and flows of secured lending to households; and income and capital gearing of the household sector. All indicators are de-trended and have been normalised by their standard deviation to allow for comparison with other indicators.
(b) The top of the swathe shows the value of the largest indicator, the bottom of the swathe the value of the smallest indicator, and the orange line the median value of all indicators, all at a given point in time.

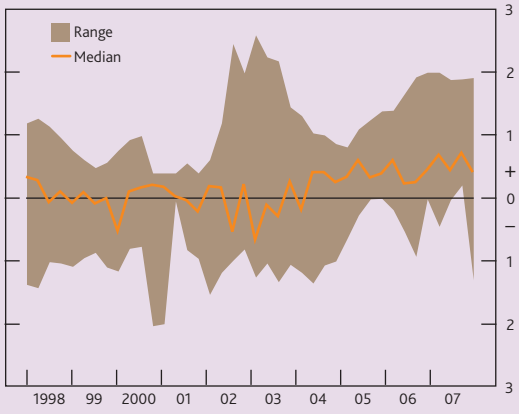
Chart C Swathe of exuberance indicators in lending to commercial real estate(a)(b)



Source: Bank of England.

(a) The following quarterly indicators for exuberance in lending to commercial real estate are used: commercial rents; vacancy rates; stocks and flows of credit to commercial real estate; and commercial property price inflation. All indicators are de-trended and have been normalised by their standard deviation to allow for comparison with other indicators.
(b) The top of the swathe shows the value of the largest indicator, the bottom of the swathe the value of the smallest indicator, and the orange line the median value of all indicators, all at a given point in time.

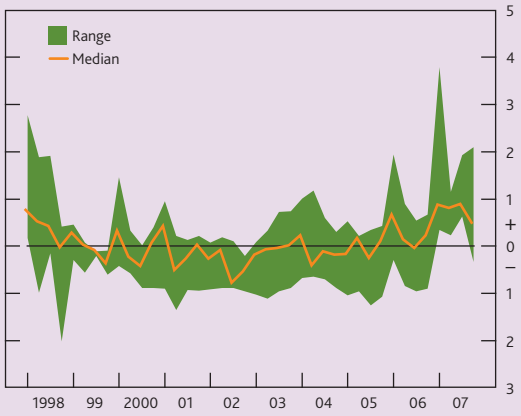
Chart D Swathe of exuberance indicators in lending to other PNFCs(a)(b)



Source: Bank of England.

(a) The following quarterly indicators for exuberance in lending to other PNFCs are used: spreads on syndicated loans and corporate bonds; credit conditions for corporates; stocks and flows of lending to other PNFCs; and income and capital gearing of the corporate sector. All indicators are de-trended and have been normalised by their standard deviation to allow for comparison with other indicators.
(b) The top of the swathe shows the value of the largest indicator, the bottom of the swathe the value of the smallest indicator, and the orange line the median value of all indicators, all at a given point in time.

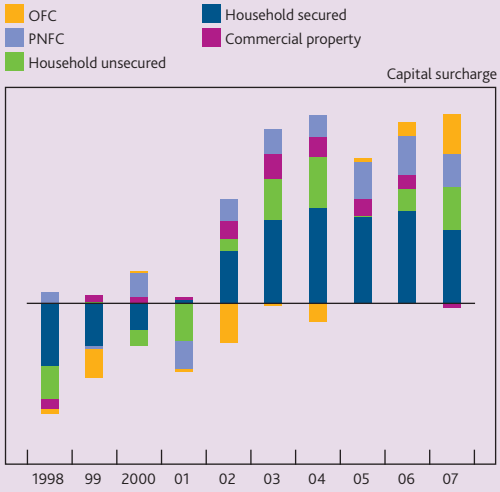
Chart E Swathe of exuberance indicators in lending to other financial companies[a][b]



Source: Bank of England.

(a) The following quarterly indicators for exuberance in lending to other financial companies are used: US securities houses' gross leverage; net capital flows into hedge funds; stocks and flows of credit to the 'leveraged' OFC sector, including securities dealers; fund managers (including hedge funds); leasing and factoring companies; credit unions; and private equity firms. All indicators are de-trended and have been normalised by their standard deviation to allow for comparison with other indicators.
(b) The top of the swathe shows the value of the largest indicator, the bottom of the swathe the value of the smallest indicator, and the orange line the median value of all indicators, all at a given point in time.

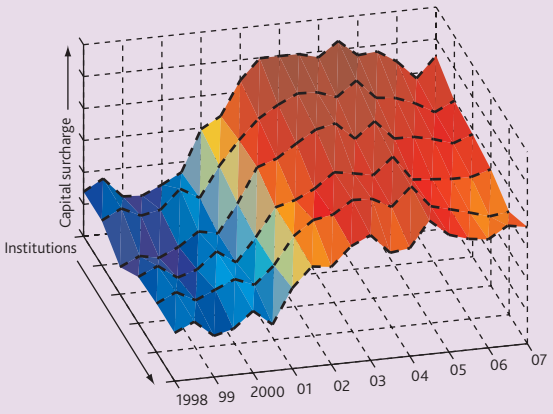
Chart F Contributions by sector to time-varying capital buffer[a]



Source: Bank calculations.

(a) Calculated using end-year balance sheet data and end-year exuberance indicators (see **Charts A–E**).

Chart G Capital surcharges for cyclical overexuberance (time-series dimension)



Source: Bank calculations.

(1) A modified version of the standard Merton model is used, incorporating a more sophisticated treatment of the default boundary. Specifically, equity is treated as a 'down-and-out barrier option' claim on assets. While this is an improvement over the most basic form of the model, it still has deficiencies. For example, it assumes that banks have only one aggregate asset and that the liability side of the balance sheet is static and not subject to runs.
(2) Limitations of the data mean that the sectoral breakdown of these surcharges is no more than illustrative. In particular, lending by banks to SIVs and conduits is captured by the cross-sectional rather than time-series surcharge.

5 Tools to manage network risk

Network risk arises from the spillovers that are generated within a closely interconnected financial network. While aggregate risk increases the probability of default (PD) across the financial system, the effects of network risk are instead felt in the loss given default (LGD) of the financial system (that is, the resulting increase in distress felt across the financial system when one bank fails). Because individual firms are unlikely fully to internalise the costs of their distress on others, the objective of macroprudential policy is to provide additional incentives for banks to do so.

5.1 Institution-specific systemic capital surcharges

In practice, this means setting prudential surcharges that better reflect individual institutions' contribution to system-wide risk.(1) One way of achieving this is by setting capital add-ons which lower the probability of failure of banks whose system-wide LGD would be greatest were they to fail. Capital surcharges would then provide additional insurance for the system as a whole.(2) They would also provide an incentive for such firms to adjust their balance sheet to limit system-wide losses — for example, by reducing their size and connectivity to other banks. In this role, systemic surcharges may be one means of addressing the 'too-big-to-fail' problem.

Under such a scheme, capital requirements would not only depend on the risk profile of the bank, but also on a measure of the spillover effects of their distress. In practice, there is no single balance sheet metric of the system-wide losses which might arise from a particular institution failing. It is possible, however, to define a set of indicator variables which might provide information on the scale of such losses. **Table 5.1** sets out a possible list of some of these variables. They include balance sheet size, connectivity to other institutions and measures of potential asset impairments in the event of fire sales.(3)

Table 5.1 Indicator variables for cross-section capital surcharge

- Values of a bank's total assets.*
- A bank's interbank and OFC liabilities.*
- A bank's repo liabilities.*
- Value of a bank's trading assets and assets available for sale.*
- Information on common exposures across financial institutions.*
- Banks' capital structure (for instance, the loss-absorbing capacity of its capital structure).*
- Presence of infrastructures that reduce uncertainty about interbank exposures (eg central counterparties for derivatives).*
- Banks taking action to ease their orderly resolution as a result of a recovery and resolution plan (also known as a 'living will').*
- More detailed information on network structure, including:
  - Subsidiaries, branches and off-balance vehicles to which banks have explicit or implicit (ie reputational) commitments to support.
  - Banks' credit default swap exposures and other derivative exposures within the financial system.
  - Large liabilities to foreign banks and non-bank financial institutions.

Note: An asterisk (*) denotes that the data source is currently available to us periodically.

In addition to quantitative data, there is a potentially important role for qualitative indicators. For example, the preparation of recovery and resolution plans, sometimes referred to as 'living wills', would facilitate the orderly wind-down of firms, thereby lowering potential costs to the financial system in the event of failure. The existence of such plans, if credible, should lower a bank's systemic capital surcharge. This would have the beneficial side-effect of providing incentives for firms to establish these plans in the first place. Information gleaned from market intelligence would also be an important qualitative input to the calibration of these capital surcharges.

As with capital surcharges for aggregate risk over the credit cycle, it is likely to be difficult to find a fixed set of indicators that would deliver a robust rule for dealing with network risk.(4) That points, again, to the need for a degree of discretion when setting cross-sectional capital surcharges. Nonetheless, it is possible to generate illustrative calibrations of how a policymaker might determine these surcharges based on observed balance sheet characteristics. Box 5 provides such an illustrative calibration, again as a demonstration of the steps that would need to be followed rather than as a precise quantitative guide to actual macroprudential policy. The calibrations could be complemented with a range of qualitative indicators, underlining the importance of judgement in augmenting any quantitative or modelling approach. The calibration suggests a considerable degree of cross-institution differentiation in capital surcharges might have been necessary to mitigate this source of systemic risk.

5.2 Complementary measures

There are again other instruments that could be used to tackle network risk. Microprudential liquidity standards could be adapted for macroprudential ends. For example, these might aim to provide additional insurance against liquidity problems emerging at critical lenders in the interbank network. Liquidity hoarding would perhaps be less likely to occur if these critical institutions were more resilient to shocks. Macroprudential liquidity surcharges could also conceivably be calibrated to provide incentives to reduce complexities in bank funding markets, as reflected in long intra-financial system lending chains. These chains increase counterparty uncertainty and hence the potential for liquidity hoarding by institutions.

Concentration risk is a recurring theme in the history of bank failures. In theory, limits on interbank exposures are a direct way of capping the risks posed by concentrated exposures. Within the European Union, banks are already subject to some

(1) See Acharya and Richardson (2009) and Squam Lake (2009a).
(2) So-called 'contingent capital' instruments, which automatically convert to common equity upon the trigger of a threshold, may have a role to play in providing such insurance.
(3) A similar set of factors are considered by Tarashev *et al* (2009). See FSA (2009b) and IMF/BIS/FSB (2009) for a discussion of indicators of systemic importance.
(4) FSA (2009b) is an important recent contribution to this debate.

limits on exposures to individual financial institutions or groups of connected institutions.(1) In principle, there may be advantages in introducing an analogous tool for the liabilities between institutions. Large liability limits might usefully fill a gap in the existing regime that occurs when large banks extend loans to smaller counterparties. In those cases, the value of the loan is insufficiently large to represent a large exposure of the creditor, yet represents a significant liability to the debtor.

Structural policies may also make it easier for financial institutions to fail without imposing high spillover losses on the rest of the economy.(2) Several policies have been proposed internationally, and the Bank of England is keen to debate their relative merits. One example is the introduction of 'central counterparties' for reasonably liquid market instruments that are currently cleared bilaterally, thereby reducing interconnectedness and complexity in the financial network.(3) These systemic risk benefits, however, would need to be weighed against the increased concentration of risk exposures within a handful of central counterparties around the world, and so would require robust central risk management and effective official oversight. Another policy proposal would be subsidiarisation of different geographical parts of a cross-border financial firm, in order to reduce the potential for cross-country financial spillovers.(4) Another would separate core payment activities or proprietary trading from other banking activities, in order to limit the contamination of critical bank business functions when risks crystallise in those wider activities.(5)

Summary

This section has explored how capital surcharges might be set across firms to reflect better their individual contribution to systemic risk. Surcharges could be levied based on factors such as banks' size, connectivity and complexity. This would lower the probability of those institutions failing and so provide some extra systemic insurance. It would also provide incentives for these banks to alter their balance sheet structure to lower the impact of their failure.

(1) However, in most EU countries, including the United Kingdom, exposures with maturity of less than one year have in the past been exempted from any such limits. Following changes to EU legislation, the rules will be tightened up with effect from 2011 so that the interbank exposures of all but the smallest UK (and other EU) banks will not be permitted to exceed a quarter of the bank's total regulatory capital .
(2) King (2009b).
(3) See FSA (2009b) and the references therein. See also the Bank of England *Financial Stability Report*, June 2009 and HM Treasury (2009).
(4) See FSA (2009b).
(5) Kay (2009) and G30 (2009).

Box 5
Calibrating cross-section systemic capital surcharges

The aim of cross-section systemic capital surcharges would be to reduce the default probabilities of institutions whose failure would cause greater damage across the financial system. A bank's contribution to systemic risk is given by the product of its probability of failure (PD) and the system-wide spillover effects associated with its default or distress. Cross-section capital surcharges can be calibrated to equalise banks' marginal contributions to systemic risk at a chosen level. This box outlines an illustrative methodology for performing such a calibration. This is intended to highlight the set of judgements that may be required to operationalise such a regime.

In general terms, the calibration requires quantification of:

- The link between the observable balance sheet characteristics of a bank and its contribution to system-wide loss given default; and

- The link between an individual bank's probability of failure and its capital ratio.

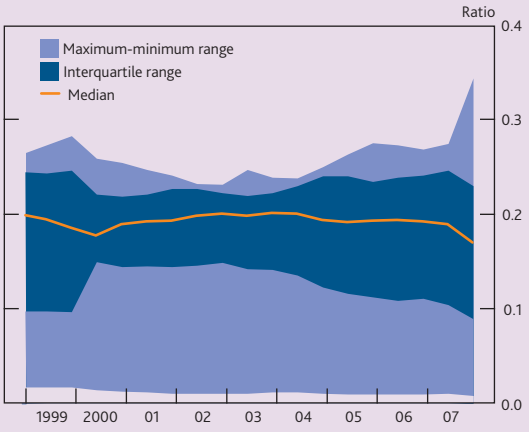
Quantifying the spillover effects associated with an institution's default is challenging. One approach would involve constructing quantitative models to analyse the response of the network to the default of an institution.(1) But that is made significantly more complicated by uncertainty about banks' behavioural responses under stress. An alternative is to use statistically based models calibrated from market data.(2) But such approaches tend to underestimate asset value correlations during credit booms and hence systemic risk. The link between default probabilities and capital ratios can be analysed using the same Merton-type approach used in Box 4.

To make the calibration concrete, a simple illustrative algorithm is outlined for determining individual banks' capital surcharges.

Step 1: Identify indicators of systemic importance

Spillovers within financial networks arise as a result of firms' size and connectivity to others in the network.(3) For example, the failure of a large bank would be expected to impose a greater cost on the system at large. Size may also be correlated with complexity. In the calibration, size is measured by taking the value of a bank's total assets (including off-balance sheet items) scaled by total banking system assets (**Chart A**).

Chart A Indicators of systemic importance: size(a)

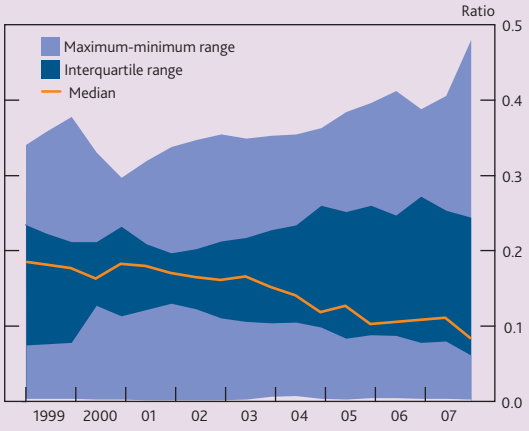


Source: Bank calculations.

(a) Measured as the ratio of individual banks' assets relative to system-wide assets. The chart shows the range, interquartile range and median of this measure across the sample banks.

But size alone may be a poor proxy for systemic impact. There is greater risk of contagious spillover effects for banks with larger interconnections. The concept of connectivity has two dimensions. The first dimension is captured by the absolute level of intra-financial system activity — a network with higher gross flow volume tends to be more susceptible to contagion. The second dimension is captured by the distribution of exposures — a network which contains a small number of critical nodes tends to be less robust to systemic failure.(4) In the calibration, these aspects of connectivity are measured using the value of a bank's interbank liabilities scaled by total system assets (**Chart B**).

Chart B Indicators of systemic importance: interconnectedness(a)



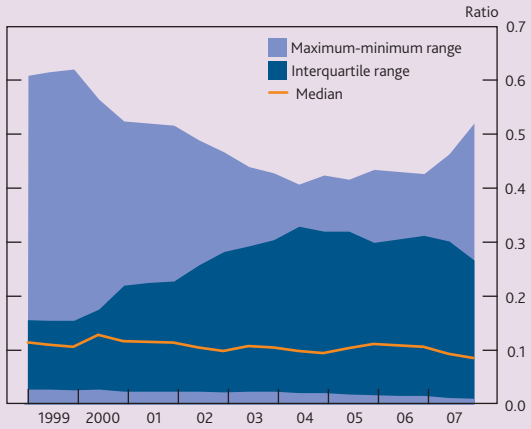
Source: Bank calculations.

(a) Measured as the ratio of individual banks' interbank liabilities relative to system-wide interbank liabilities. The chart shows the range, interquartile range and median of this measure across the sample banks.

A third, distinct channel of connectivity occurs when fire sales of assets by a weak institution inflict damage on the balance sheets of other institutions in the network. Fire sales may also occur when secured lenders to defaulting banks sell the assets

pledged by the bank as collateral. In the illustrative calibration, these fire-sale propensities are measured by taking the value of each bank's repo liabilities (**Chart C**). This reflects the risk that secured lenders to a bank might sell off assets used as collateral in repo contracts in the event of the bank defaulting.

Chart C Indicators of systemic importance: asset fire sale risk[a]



Source: Bank calculations.

(a) Measured as the ratio of individual banks' repo liabilities relative to system-wide repo liabilities. The chart shows the range, interquartile range and median of this measure across the sample banks.

Step 2: Compute each bank's contribution to system LGD

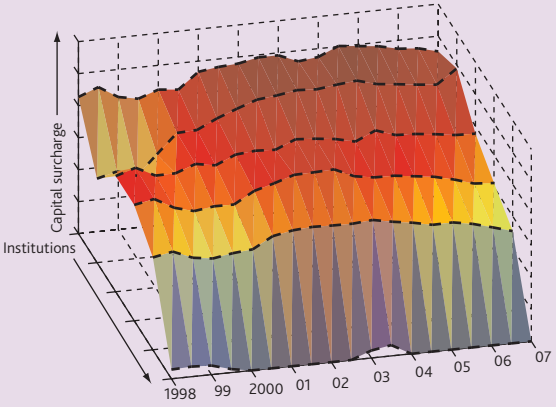
By arbitrarily placing equal weight on each of these balance sheet characteristics, a composite indicator of systemic importance can be calculated. For illustrative purposes, assume that total system-wide losses are 20% of system assets. These system-wide losses are then allocated across the banks according to their systemic impact score.

Step 3: Calculate the capital surcharge required to equalise expected system-wide losses

The next step is to calculate the required adjustment in the probability of failure of each institution necessary to equalise their contribution to expected system-wide losses. The chosen tolerance level for system-wide losses is arbitrarily taken to be 0.001% of system assets. The Merton model is used to map the required adjustment in default probabilities into a capital surcharge. These steps result in a calibration which seeks to equalise the expected losses felt by the system in the event of any firm failing, at a threshold chosen by the macroprudential policymaker.

Chart D presents a visualisation of the capital surcharges that result from applying this algorithm to a set of banks. There is substantial variation across institutions, reflecting significant differences in their size, interconnectivity and fire-sale propensities. Larger and more connected banks carry a larger surcharge, to reduce their default probability and hence their contribution to system-wide risk. These surcharges increase across all institutions over time, reflecting the increased volume of intra-financial system activity in the lead-up to the crisis. The ordering of surcharges across banks is, for the most part, relatively stable — although this need not be the case when business models change.

Chart D Capital surcharges for spillover risk (cross-sectional dimension)



Source: Bank calculations.

(1) See Aikman *et al* (2009) and Boss *et al* (2002).
(2) See Adrian and Brunnermeier (2009) and Tarashev *et al* (2009).
(3) See FSA (2009b) and IMF/BIS/FSB (2009) for a discussion of the factors determining systemic importance.
(4) See Anderson and May (1991).

6 Building a robust macroprudential regime

To be effective, a macroprudential regime would need to meet some high level criteria: it would need to be simple, but robust to uncertainty and structural change. Policy decisions themselves would need to be credible, predictable and transparent to banks, borrowers and to the general public. And the policymaker should be held accountable for their actions. This section outlines some of the features of a macroprudential regime that might help to deliver these objectives.

6.1 Rules versus discretion

Any policy framework should seek to be credible, with policy decisions applied consistently and systematically. To be consistent over time, a regime needs to be robust to uncertainty and unforeseen events. Robustness is a key characteristic of any policy regime, but especially a new one.

The level of microprudential regulatory capital and liquidity requirements has a direct bearing on the robustness of a macroprudential regime. With hindsight these are now generally regarded as having been too low to accommodate the losses that have arisen during past crises (Box 6). The higher is the microprudential floor, the greater is the quantum of capital and liquidity in the financial system and the lower is systemic risk. The lower is systemic risk, the lesser the need for an activist macroprudential policy regime to moderate risk over the credit cycle.

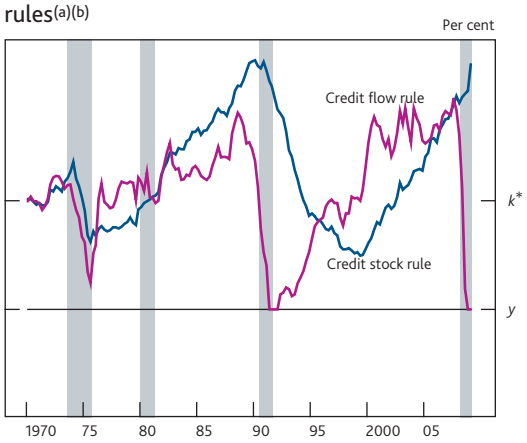
Another dimension to robustness is adaptability in the face of structural change or uncertainty. Structural change might arise as a result of technological progress in the financial system over time. But it is also likely to result from changes in banks' behaviour arising from the introduction of a new policy framework. For example, banks' capital planning decisions would likely be affected significantly by the implementation of systemic capital surcharges. These changes would compound the uncertainty that policymakers would anyway face at the outset of a new policy regime.

As Sections 4 and 5 discussed, unless effective rules could be designed, macroprudential policy choices would likely be based significantly on judgement. Importantly, this would include qualitative evidence, such as that gathered from market participants. A discretionary approach would also allow policymakers to learn from observing the interaction between macroprudential instruments, the financial system and the economy, helping them improve modelling approaches and data collection and, ultimately, the quality of policy judgements.

Some studies have argued that credit growth and asset prices are useful leading indicators of banking system crises.(1) It is important that this work be pursued, as it may be possible to introduce a baseline rule-like element into any system. The pros and cons of this would need to be evaluated as such work progresses. Designing a fixed macroprudential policy rule that would stand the test of time may not, however, be easy. For example, while rules based on stock imbalances perform reasonably well in capturing mounting risks in an upswing, they appear to be slow to react in a cyclical downturn.(2) Flow measures such as growth rates of credit and asset prices seem to be affected by the reverse problem, reacting more quickly to the downswing but missing the steady accumulation of risk in the upswing.

These effects are apparent when simulating capital ratio rules based on UK lending data (**Chart 6.1**). A stock-based rule would have implied a very gradual unwind of capital ratios at the onset of the recession in the early 1990s. And in the current crisis, a stock-based rule would have continued tightening policy into the depths of the recession. The flow-based rule would have generated persistently high but stable capital ratios throughout the decade preceding the crisis. This suggests that any rule might need to be quite simple; and may need to be accompanied by the use of judgement to make robust policy choices.

Chart 6.1 Banks' capital ratios under alternative rules(a)(b)



Source: Bank calculations.

(a) Illustrative paths presented in the spirit of exposition, assuming a microprudential minimum of y%. We focus on the simplest case: a linear mapping from macrofinancial indicators, X_t, to capital requirements, k_t, of the form: $k_t - k^* = \beta (X_t - X_t^*)$. For the purpose of this calibration, we choose β such that the variance of capital ratios, K_t, is similar across different choices of indicators, X_t. k^* represents the steady-state capital ratio. X_t^* is the steady-state level of the indicator variable, calculated from a real time linear trend (ie using data available up to the date of the calibration). 'Stock' rules use X_t equal to the stock of lending to households and PNFCs in the United Kingdom as a percentage of nominal UK GDP. 'Flow' rules use X_t equal to the annual real flow in lending to households and PNFCs in the United Kingdom.
(b) Shaded areas indicate recessions in the United Kingdom. Recessions are defined as two consecutive quarters of falling output (at constant prices) estimated using the latest data. The recessions are assumed to end once output began to rise, apart from the 1970s where two separate occasions of falling output are treated as a single recession.

While those arguments point to the importance of a macroprudential regime being flexible, flexibility and discretion would not, however, be costless.(3) The costs of discretion

(1) See Borio and Drehmann (2009) for example.
(2) See Borio (2009).
(3) See Kydland and Prescott (1977).

within a macroprudential policymaking framework might include:

- Decision-making would be less predictable than under a fixed rule. That lack of predictability may have a cost, with banks facing greater uncertainty about their future regulatory requirements. They may respond by holding higher precautionary buffers of liquidity and capital, driving up the overall cost of capital and credit in the economy.

- This uncertainty might in turn lower the effectiveness of the regime. In general, the effects of regulatory action are likely to be greatest when it is understood and is found to be credible. If banks lacked clarity, their expectations and actions would be less likely to adapt to macroprudential policy changes, so reducing the impact on lending. So under discretion, there would be a risk of adjustments in macroprudential policy needing to be somewhat larger than under a rule.

- There might also be a bias towards forbearance, with policymakers unwilling to act promptly to head off problems.(1) If the act of intervening were perceived to reflect badly on the regulator, they may be reluctant to face up to problems. Such behaviour was evident in the crisis amongst Savings and Loans institutions in the United States, the extent of whose problems were effectively masked in the hope that favourable macroeconomic developments would allow the thrifts to recapitalise.(2) A system of prompt corrective action was instituted in response, the intention being to provide a timely and non-discretionary triggering mechanism for supervisory actions.

- It is well known that regulators are commonly subject to pressures to modify regulation. A discretionary regime may be more susceptible to regulatory capture and the influence of lobbying, especially at peaks and troughs of the credit cycle when macroprudential policy would likely be doing most work.(3)

6.2 Constraining discretion in a macroprudential regime

Given those potential costs to discretionary action, how could a macroprudential regime be buttressed to make it more transparent, predictable and accountable — a regime of 'constrained discretion'? There are several potential options including:

- **Objectives**: In the near-term, it seems unrealistic to think that it would be possible to settle on an easily comprehensible numerical target for macroprudential policy, equivalent to the inflation target in a monetary policy context. But that need not be fatal. Many public policy frameworks operate effectively with a qualitative objective, which here would be maintaining a stable supply of financial intermediation services to the real economy (Section 2). Given time, it may be possible to refine this objective by better defining the authorities' risk tolerance. Because financial instability is a low probability tail event, however, there are clear constraints on how meaningful and credible quantitative objectives could be.

- **Decision-making framework**: To increase the effectiveness of macroprudential policy decisions, the regime might usefully set out in some detail the process and analysis which underpins decision-making. This would amount to communicating the macroprudential policy 'reaction function'. It would include setting out a menu of instruments around which policy decisions would be based — for example, in addressing cyclical risk, the categories of 'risk weight' which might be adjusted and in what sized steps, and the extent of reliance on 'headline' capital requirements. It might include a listing and evaluation of the set of indicators that would be used in the calibration — for example, what variables best capture 'exuberance' in a particular sector. If stress-testing were used to help calibrate surcharges, details of the stress scenarios might be made available. Some of this information and these judgements are already regularly made available by the authorities — for example, by the Bank of England through the publication of its bi-annual *Financial Stability Report* and by the Financial Services Authority in its *Financial Risk Outlook*. But in a macroprudential regime such reports would probably take on greater significance, explaining the operation of the policy regime and the justification for policy choices.

- **Decision-making**: Having defined the decision-making framework, it would be important that policy decisions themselves were communicated clearly and understood. One possibility would be for macroprudential policy to be set on a fixed timetable which was transparent to the wider world. For example, decisions might be made on, say, a six-monthly cycle, but with the option of intervening more frequently if developments were sufficiently significant. Another, not mutually exclusive option, would be for policy decisions themselves to be publicly communicated, both as a means of enhancing transparency and to strengthen market discipline over banks' decision-making. Either way, it would be important that the authorities were able to explain their decisions. That might be achieved via a formal policy announcement and/or published minutes on the decision-making process.

(1) See Dewatripont and Tirole (1994).
(2) See Kane (1989).
(3) See Stigler (1971).

- **Accountability**: Macroprudential policy decisions involve an important element of social choice. For instance, the degree to which society values stability over growth, or the extent to which the actions of individual firm's behaviour can be legitimately constrained for the benefit of the system as a whole. It is important, therefore, that macroprudential policy decisions are backed by a clear, explained mandate set by governments or legislatures. This would be vital to ensure appropriate accountability to such bodies and to the general public about macroprudential decisions. Published reports can enhance transparency, allowing policy judgements to be explained and the analysis behind them to be set out. Appearances before parliamentary committees serve a similar purpose. Having to explain why certain policy actions have been taken and why others have not would act as a substantial constraint on discretion. It would be likely to sharpen policymakers' incentives to avoid showing forbearance and to act promptly to stem incipient problems. Parliamentary scrutiny may also provide legitimacy for policies which could face lobbying pressures — for example, 'taking the punch bowl away' from a credit boom in full swing. The precise modalities of accountability may need to take into account the extent of international co-ordination (Section 7).

Taken together, these features might help to form a macroprudential regime which, while largely judgemental, could still aim to be sufficiently systematic, transparent and accountable. The regime could be designed to place constraints on the exercise of discretion. A macroprudential policy regime of this type would, in many respects, be similar in spirit to frameworks for monetary policy — a regime of so-called 'constrained discretion'. In general, regimes with these mixed features are generally felt to be more robust and time-consistent than either a fixed rule or pure discretion.

A systematic, transparent and accountable macroprudential regime should be easier to integrate alongside the existing arms of public policy. A well-defined macroprudential regime would enable monetary, fiscal and microprudential policymakers to take into account macroprudential policy in the course of their decision-making and *vice versa*. This could contribute to a greater degree of co-ordination in public policy overall. But on each of these issues, a lot more debate and analysis would be needed to make any such regime a reality.

Summary

This section has suggested that it may be unlikely that macroprudential instruments of the kind described earlier could be set wholly according to a fixed rule. All available evidence would need to be weighed and policymakers would themselves need to adapt as they learned about how their instruments affected behaviour. But it would be important that constraints were placed on a macroprudential regime to ensure transparency and accountability. That would call for clarity around the objectives of macroprudential policy, the framework for decision-making, and the policy decisions themselves. It also suggests a need for robust accountability mechanisms. Such a macroprudential regime of 'constrained discretion' would share some similarities with existing macroeconomic policy frameworks.

Box 6
Estimates of capital levels to weather crises

What levels of capital would banks have needed to weather past crises? This box considers two alternative methods for addressing this question. One looks at evidence from past international crises, the other how banks fare under plausible 'stress tests'.

Evidence from past crises is, at best, illustrative and should not be used as a guide to the levels of capital banks might need to weather stress in the future. As the Governor made clear in a recent speech, given our limited knowledge of the dynamics of financial systems, it is difficult to know with any precision what levels of capital the market might demand of banks.(1)

Evidence from past financial crises

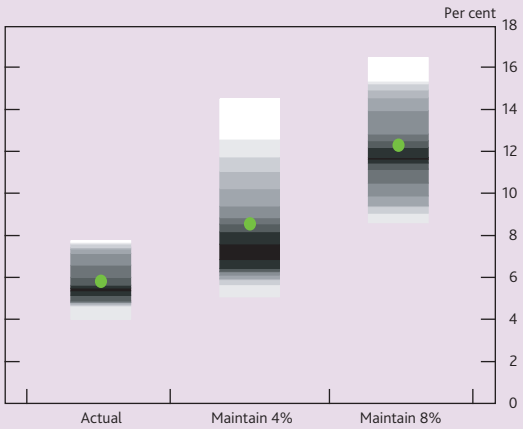
There have been a number of recent historical episodes where banks have experienced abrupt credit losses that have materially affected their capital positions. Examples include the Nordic banking crises in the early 1990s and the Japanese banking crisis of the 1990s.

Table 1 (first row) reports our estimates that an average Tier 1 capital ratio of roughly 8.5% would have been required by Nordic and Japanese banks entering these episodes to maintain a Tier 1 ratio of 4%, in the absence of additional capital raising or direct government support.(2) Moreover, this average conceals substantial differences across banks (**Chart A**). As non-core Tier 1 capital instruments have been found to be insufficiently loss-absorbing during this crisis, these ratios can be more prudently thought of as estimates of the core Tier 1 (stockholders' equity) which banks would have needed to tap in order to offset the losses that they incurred.

Evidence from stress testing

Stress testing offers a useful framework to estimate the severity of shocks that may arise during a systemic crisis. It is for this reason that stress tests have been used by the authorities internationally during the recent crisis to assess the creditworthiness of their banking systems.(3)

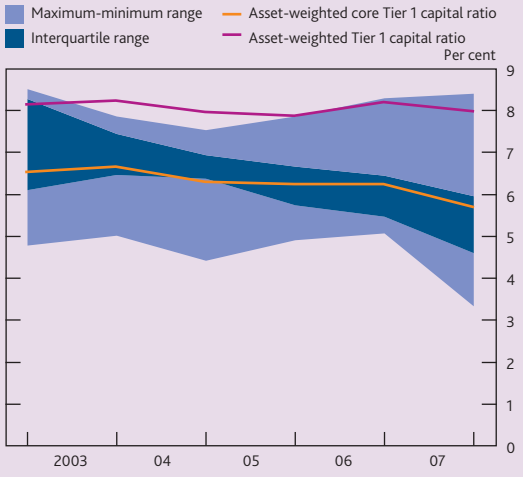
Chart A Tier 1 capital ratios required to withstand past crises(a)(b)



Sources: Bankscope and Bank calculations.

(a) Sample of 15 banks from Sweden, Finland, Norway and Japan.
(b) Each shaded band shows 5 percentage points of the distribution of actual, or required, pre-crisis Tier 1 capital ratios across banks between the 5th and 95th percentiles. Circles show means.

Chart B Major UK banks' capital ratios(a)(b)(c)(d)



Sources: FSA regulatory returns, published accounts and Bank calculations.

(a) Ratios measured on a Basel I basis.
(b) Core equity includes ordinary share capital, reserves and equity minority interests.
(c) Data exclude Nationwide and Santander.
(d) RBS data for end-2007 include ABN Amro.

Table 1 (second row) shows the results of a stress test applied retrospectively as part of the analysis for this paper by the Bank to the year-end 2007 balance sheets of the main UK

Table 1 Lessons from past crises regarding appropriate levels of capital

Source		Description	Capital requirement	
Past international financial crises	Bank calculations	Based on experiences of Sweden, Finland, Norway and Japan	8.5%	Tier 1
Macroeconomic downturn scenario	Bank calculations	Stress test. Variables include GDP growth, CPI inflation and unemployment	9%–10%	Core Tier 1
Turner Review	Financial Services Authority	Through-the-cycle fixed minimum At the top of the cycle(a)	4% 6%–7%	Core Tier 1 Core Tier 1
US stress tests	Federal Reserve	For 19 largest US banks to survive a deeper and more protracted downturn than Consensus forecasts	8.1%	Tier 1

Sources: Federal Reserve, Financial Services Authority and Bank calculations.

(a) The Turner Review explains that the dynamic capital mechanism 'is expected to generate an additional buffer (above a revised through-the-cycle minimum core Tier 1 capital requirement of 4%) equivalent to 2%–3% of core Tier 1 capital at the top of the cycle'. However, 'it should remain open to supervisors to require a further discretionary buffer above this'.

banks — the peak of the credit cycle. The scenario assumes paths for macroeconomic and financial variables consistent with a severe but plausible slowdown in the UK economy, anchored around the profiles observed in the early 1980s recession. Under these conditions, banks would have needed to enter the crisis with core Tier 1 capital or instruments convertible[4] into core Tier 1 capital of around 10% of their year-end 2007 risk weighted assets in order to have been able to keep their core Tier 1 ratio above 4% throughout the crisis without recourse to additional capital raising from the markets or the government.[5] This is almost double average levels of core Tier 1 capital at the onset of the crisis (**Chart B**).

Table 1 (fourth row) shows the results from the stress tests co-ordinated by the Federal Reserve earlier this year, as applied to the 19 largest US banks. These suggested that a Tier 1 capital ratio of around 8% was necessary to ensure those institutions could survive a deeper and more protracted downturn than implied by Consensus forecasts.

(1) See King (2009b). The estimates do not refer to minimum regulatory capital requirements and do not take account of the proposed changes to the definitions of capital eligible to meet such requirements.
(2) Based on realised retained income over the crisis periods for a sample of Nordic and Japanese banks and making a number of other simplifying assumptions, including that dividend payments to shareholders and the paths of risk-weighted assets remained as observed in reported accounts.
(3) Box 4 from the October 2008 Bank of England *Financial Stability Report* explains the logic behind the stress-testing approach used in recapitalising the UK banks in Autumn 2008. Details of stress tests performed by the US authorities can be found in Board of Governors of the Federal Reserve System (2009).
(4) It is assumed that such convertible capital would convert into core Tier 1 capital if the core Tier 1 ratio fell below a certain threshold (where that threshold is above 4%).
(5) Adopting a through-the-cycle microprudential minimum of 4% core Tier 1 capital, as suggested in FSA (2009a).

7 Operational issues

There would be a number of important practical challenges in implementing a macroprudential policy regime along the lines discussed in previous sections. Among the more important are institutional coverage, international scope and data requirements, as discussed in turn below.

7.1 Institutional coverage

In determining the appropriate institutional boundary of a macroprudential policy regime, there would be broadly two alternative approaches:

- Restricting coverage to deposit-taking institutions ('banks'); and
- Including any institution engaged in material maturity transformation and/or leveraged finance.

Under the first approach, the perimeter of macroprudential regulation would be the banking sector. Aggregate or sectoral capital surcharges would aim to ensure that the banking sector was resilient over time to aggregate risk; and systemic capital surcharges would aim to offset spillover effects from the failure or distress of individual banks onto the banking system.

A possible drawback of this approach would be that disintermediation may shift systemic risk into the unregulated sector — for example, 'shadow banks'. But if banks' exposures to non-banks were tightly controlled, this problem may be contained: there seem to be few examples of highly leveraged non-bank institutions that are not reliant, directly or indirectly, on bank credit and bank-provided liquidity lines. Additional macroprudential tools could also be employed to contain the disintermediation problem — for example, time-varying margins on hedge funds' secured borrowing (Section 4.3).

Under the second approach, coverage would be extended to a wider set of institutions. The treatment of 'shadow banks' would then be the same as deposit-taking institutions, with time series surcharges applied to real economy exposures and cross-section charges applied to offset spillover effects. This option has two drawbacks. First, operational complexity, as it requires monitoring and regulation of perhaps a far larger set of institutions. Second, there might be greater risk of moral hazard if non-banks were perceived as having gained access to the official sector safety net.

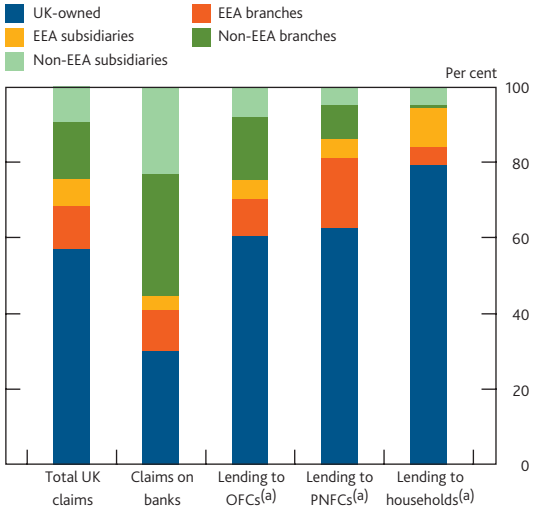
7.2 International scope

Leakages from prudential regulatory regimes are inevitable (Box 7). From an international perspective, a macroprudential regime would be susceptible to four broad sources of potential leakage or arbitrage:

- Lending via foreign branches: foreign-owned banks can operate in the United Kingdom via branches that are subject to capital requirements imposed by their home authorities. If capital requirements on these firms' UK exposures were lower than those imposed on UK-registered firms, they could exploit their competitive advantage by increasing lending to the UK real economy.
- Direct cross-border lending: foreign-owned banks not subject to tougher capital requirements could lend cross-border to the UK real economy, either directly or via corporate bond or commercial paper markets.
- Foreign lending via domestic non-bank financial companies: foreign-owned banks could lend through wholesale markets to UK non-bank financial companies which could, in turn, lend these funds on to the real economy.
- Intragroup corporate lending: corporates could borrow abroad from foreign-owned banks and then lend intragroup to their UK arm.

Some of these channels of intermediation are, of course, already large. For example, lending by foreign branches accounts for a material share of total corporate lending by UK-resident banks (**Chart 7.1**). Under European Union single market rules, banks headquartered in an EEA member state have the right to open branches in other member states or to provide cross-border services.

Chart 7.1 UK-resident banks' claims by sector, end-2008



Source: Bank of England.

(a) Loans and advances and claims under sale and repurchase agreements (reverse repos).

International co-ordination might be one means of containing potential leakage problems. Ideally, there would be explicit co-ordination of the setting of macroprudential regulatory requirements. Importantly, this co-ordination would focus on the ultimate destination of these funds (the 'host'), at least as

much as the source of these funds (the 'home'). For example, under an explicit international accord, control over the regulatory requirements applied to exposures to UK residents could reside with the UK authorities, irrespective of the origin of the lender.

Practical constraints mean that a high degree of international co-ordination, while clearly desirable, may not be feasible, at least initially. In that event, a regime of international communication and co-ordination of macroprudential analysis and requirements may be more feasible. National regulators might be encouraged to make clear to the international regulatory community their concerns about exuberance within their domestic economies. This could then be an input to influence macroprudential choices among regulators of banks which are big lenders into the United Kingdom.

For example, if the UK authorities were to raise capital requirements on, say, UK commercial property exposures of UK-registered banks, this decision might be communicated to home regulators of overseas-domiciled banks lending into this market. These authorities might then consider regulating the UK commercial property exposures of their home banks more stringently. Over time, this approach might evolve into effective international regulatory co-ordination with a system-wide orientation. However, for this approach to work, a very great deal would need to be considered, including how to maintain a relatively level playing field among different regulatory jurisdictions.

7.3 Data requirements

There are large data gaps that would need to be filled before a macroprudential policy regime could be made operational. Sufficient data would be needed to capture the evolution of both the aggregate risk of the consolidated financial system over time and the network risk operating across institutions at any point in time.

Consolidated balance sheet information for the financial system, netting out intrafinancial system assets and liabilities, would be required to evaluate aggregate leverage and maturity mismatch. Data on the consolidated balance sheet could be constructed bottom-up from the balance sheets of individual financial institutions, both branches and subsidiaries. **Table 4.1** lists the set of information that might be required.

Many of these indicators are already collected by regulators, but in some cases without sufficient granularity. For example, for some home countries there is insufficiently detailed information on the geographical split of banks' overseas exposures. Perhaps most pressing would be a need for more detailed and timely reporting of exposures to the non-bank financial sector, including hedge funds, securities dealers, private equity funds and insurance companies.

Turning to network risk, data on the network of counterparty exposures between financial institutions is, at best, partial at present. Regulatory large exposures data provide some information. But this would be an insufficient basis for assessing accurately the complex web of financial connections between firms, on and off balance sheet. **Table 5.1** sets out some of data required for this purpose. There would also be questions about the appropriate frequency with which this information should be collected, given the possibility of exposure positions adjusting significantly and rapidly, especially in situations of financial stress. There would also need to be careful consideration of whether any of this information should be publicly disclosed, consistent with not falling foul of commercial confidentiality constraints for individual firms.(1)

Summary

This section has outlined some of the important practical challenges in implementing a macroprudential policy regime. International arbitrage (through branching and cross-border lending) might significantly weaken the effectiveness of macroprudential policies. To be wholly effective, the macroprudential regime might require significant international co-ordination, although in its absence appropriate macroprudential instruments might still be able to serve to strengthen the resilience of the domestic banking sector.

(1) Squam Lake (2009b) proposes disclosure of regulatory data to the private sector, with time lags to protect proprietary information.

Box 7
Leakages in past regulations

The problem of disintermediation is endemic to financial regulation.(1) Recent financial history provides a number of instructive examples of the powerful incentives that exist to circumvent regulation. In the United Kingdom, these include direct credit ceilings in the 1960s and the supplementary special deposit scheme, also known as the 'Corset', in the 1970s. International examples include federal margin and deposit interest rate regulation after the Great Depression in the United States and the introduction of Basel I. Most of the examples were not primarily directed at prudential regulation — many were seen as monetary policy instruments. But without exception, they all resulted in financial activity leaking to the unregulated sector. This box draws lessons from past episodes of financial disintermediation.

Direct credit ceilings (1961–71)

In the United Kingdom, direct ceilings on the growth in lending to the private sector were enforced on clearing banks in the 1960s through to the introduction of Competition and Credit Control in 1971. Although these appeared to be effective in limiting credit creation by the firms they covered, financial activity migrated to the less regulated secondary banks. These fringe institutions developed large exposures to the commercial property sector, financed through the wholesale market, including from the clearing banks. The emergence of this highly vulnerable 'shadow' banking system culminated in the Secondary Banking Crisis in the mid-1970s, forcing the Bank of England to intervene for fear of a loss of depositor confidence in the core banking sector.(2)

Supplementary special deposit scheme — 'the Corset' (1973–80)

The implementation of the 'Corset' at different phases between 1973 and 1980 aimed to limit the rapid growth in credit that had occurred following the introduction of Competition and Credit Control in 1971.(3) Banks were required to hold a share of their assets as non-interest bearing reserves if growth in certain sterling interest-bearing (retail and wholesale) deposits grew beyond a specified limit.

These rules were quickly circumvented. Instead of borrowing directly from banks, large companies financed themselves by issuing bills that were guaranteed (accepted) by banks. The growing 'bill mountain' had to be factored into monetary policy decisions at the time. Non-bank financial institutions were willing to buy these bills in the knowledge that they were guaranteed by the major banks. Financial activity also diverted to building societies which were not covered by the scheme. During the Corset period, building societies' share of personal sector deposits grew substantially and was used to finance rapid growth in mortgage lending. Following the abolition of the Corset, there was large-scale re-intermediation and a marked increase in conventional measures of broad money and bank lending growth.

Margin and Deposit Interest Rate Regulation (1933–34)

US Federal regulations governing minimum initial margin requirements have been in place since 1934, but there has been no change in their level since the early 1970s because of doubts about their effectiveness given the development of derivatives and other financial innovation. Regulation Q — which imposed ceilings on the interest rates that financial institutions in the United States could pay on deposits — spurred the development of the Eurodollar market in London, especially after it was tightened in 1963.(4)

The Basel Capital Accord (1992–2007)

At an international level, the incentive structure underlying the original 1988 Basel Capital Accord contributed to the rapid growth in securitisation over the past two decades. Banks responded to the imposition of risk-weighted capital requirements by engaging in regulatory arbitrage. Exposures with high regulatory capital relative to economic capital were shifted off balance sheet. The problem, as witnessed during the current crisis, is that many of the vehicles used to securitise these assets remained reliant on banks, actually or implicitly through reputational effects. So when liquidity risks materialised they were borne, to a significant extent, by the regulated institutions.

This historical experience with international leakages from regulatory frameworks underscores the importance of international co-ordination in implementing a robust macroprudential regime.

(1) As Goodhart (2008) states, 'effective regulation, one that actually bites, is likely to penalise those within the regulated sector, relative to those just outside, causing substitution flows towards the unregulated'.
(2) Bank of England (1978).
(3) Bank of England (1982).
(4) Milton (1971).

8 Conclusion

Effective macroprudential policy instruments are an important missing ingredient from the current policymaking toolkit, in the United Kingdom and internationally. Had they existed, the current crisis might plausibly have been less costly for the real economy. This discussion paper identifies some of the issues around how a macroprudential policy regime might be envisaged and made operational. It does not reach definitive answers and does not seek to advocate a particular operational regime. A lot of further work would be required before policies such as these could be ready to be put into practice. But it does suggest some directions for the international policy debate in the period ahead. The Bank of England would welcome comments on, and criticisms of, the ideas expressed in this paper. Comments should be sent to:

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