



BANK OF ENGLAND

Speech

How to: MACROPRU. 5 principles for macroprudential policy

Speech given by

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It is an honour to be here at this LSE London Financial Regulation Seminar.

My theme this evening is macroprudential policy – the business of ensuring, through regulation, that the financial system can serve the real economy, in good times and bad.

Macroprudential policy regimes are the child of the financial crisis; the institutional memory of the mistakes and behaviour that led to the crisis and that had such severe cost.

And the LSE has been the scene of many important contributions to assessing what went wrong and to the building of the post-crisis regime, including from central bank governors, past and present.

So I stand tonight on the shoulders of giants. But I want to simultaneously keep my feet firmly on the ground – on the practice of macroprudential policy.

It's now part of the framework of economic policy in the UK. Like monetary policy, it has a statutory policy committee to set it – the Financial Policy Committee of the Bank of England. And yet, if you ask ten economists what precisely macroprudential policy is, you're likely to get ten different answers.

So the time has come to take stock.¹ I want to lay out what I believe to be five guiding principles for macroprudential policy.

My aim in doing so is twofold: first, to help to build a common understanding of what it is and how it works; and second, to engage the finest minds – you – in partnership to push the frontiers of knowledge in ways that can make it better.

1) “It’s the real economy, stupid”²

The first of my five principles is the one that motivates the whole exercise of macroprudential policy.

For all that macroprudential policy may seem to be about regulating finance and the financial system, its ultimate objective – borrowing from James Carville’s famous election campaign advice – is: the real economy, stupid.³

It is captured more precisely by Eric Rosengren (President of the Federal Reserve Bank of Boston) as avoiding circumstances in which “*problems (or concerns about potential problems) within institutions, markets, payments systems, or the financial system in general ...substantially impact the expected path of real economic activity.*”⁴

These problems typically arise when the financial system is overwhelmed by events in the economy; when it doesn't have the resilience to absorb them and so amplifies them as:

Credit dries up. Lenders are not matched with borrowers.⁵

Risks can no longer be shared. Companies and households must protect themselves.

And in the limit, payments and transactions can't take place. Economic activity grinds to a halt.

These are the amplifiers that turn downturns into disasters; disasters that in the past have cost around 75% of GDP: £21,000 for every person in this country.⁶

So the job of macroprudential policy is to protect the real economy from the financial system, by protecting the financial system from the real economy.

It is to ensure the system has the capacity to absorb bad economic news, so it doesn't unduly amplify it.

This real economy focus doesn't for a minute mean that macroprudential policy is any sort of substitute for monetary policy in managing the regular business cycle.

In fact, it fundamentally complements monetary policy.

It relieves the burden on monetary policy to 'mop up' vigorously if and when the financial system amplifies a downturn.

And if the 2008 financial crisis proved one thing only, it was the failure of the doctrine that monetary policy had sufficiently powerful floor cleaning equipment to protect the real economy from the full force of such spillages.⁷

Focussing on the ultimate aim – the real economy – also reminds us not to intervene in ways that themselves damage the real economy.

Building a system that could absorb all shocks would be counterproductive. In the same way, road safety would be dramatically improved by a universal 10mph speed limit. But we don't do that: the economic and social costs it imposed would be vast.⁸

Our interventions to strengthen the system have to be expected to support the real economy more in the bad times than they hold it back in the good.

Such benefits are to be found – as always – where private decisions have failed to internalise the wider costs of their defences being overwhelmed in the bad times and hence, have too little capacity to absorb shocks. That is, where there are externalities.

It's well known, for example, that banks would choose to have too little capacity to absorb losses – too little equity capital – because their current shareholders don't bear the full economic costs of their failure or distress.

The economy needs better capitalised banks than the free market would deliver.

But it's also possible that, beyond a point, more loss absorbing capacity actually diminishes the ability of the system to do its job for the real economy, day in, day out.⁹

Depositors want to be sure they'll get their money back, immediately. Equity holders seem to want their equity to be equity-like. That is, to be risky and compensated accordingly.

The result is that the cost of banking to the real economy rises as banks substitute debt (deposits) for loss absorbing equity. The famous Modigliani-Miller result does not fully hold in practice.¹⁰

Too little capacity to absorb losses and the real economy pays when the system amplifies bad times.

Too much capacity and the real economy pays because the system can't perform as efficiently in the good times.

So in determining bank capital and more generally, macroprudential policy is a balancing act. To support the real economy it must be both prudent and make economic sense.

But make no mistake: the consequences of the financial system's defences being overwhelmed are typically so great that it should be able to absorb very severe economic shocks. Tales of such shocks should be passed down through generations.

2) “What could, not what will”

Central to assessing that the system can absorb severe shocks – is stress testing. And my second principle is the one that guides the calibration of the economic scenarios that we test the system against.

It is to always make sure those scenarios are the answer to “what could happen?”, not to “what will happen?”. In this principle, we embody a central lesson of the financial crisis.

Our shared profession is easily criticised for its failure to foresee the crisis. But clairvoyance is not a reasonable standard to be held to. The real failure of economists was that too much energy was devoted to forecasting – to trying to assess whether economies would turn down – and not enough was spent analysing the question of “well, what if they do; how bad could it be?” And as a result, the financial system was unprepared.

It was not a failure of economics. It was a failure to apply economics to the right question.

Without economics, the answers to “how bad could it be?” relied all too often on recent historical precedent; on this time being different.¹¹

And, even more dangerously, they relied on market measures of risk; indicators that – as recent work at here the LSE Systemic Risk Centre shows – often point to risks being at their lowest when risks are actually at their highest.¹²

The Financial Policy Committee’s mandate is to break free of the shackles of forecasting, to free us from trying to predict if the economy will turn down, and to apply economic analysis to the question of how bad it could be if it did.¹³ The re-focussing of economic research since the crisis has supported us in that. It has established, for example, how far:

Recessions that follow credit booms are typically deeper and longer-lasting than others¹⁴;

Over-indebted borrowers contract aggregate demand as they deleverage¹⁵;

While they have high levels of debt, households are vulnerable to the unexpected. They cut back spending more sharply as incomes and house prices fall, amplifying any downturn¹⁶;

Distressed sales of homes drive house prices down¹⁷;

Reliance on foreign capital inflows can expose the economy to global risks¹⁸;

And credit booms overseas can translate to crises at home¹⁹.

All of this economic analysis would still not have told us what would happen in 2007. It would not have allowed us to predict the roll of the economic dice. But it would have revealed that a bad roll would have very serious consequences.

The financial system could have been stress tested against that. Its resilience could have been reinforced. It could have been prepared. What became a disaster could have been contained to a downturn.

Now, with my second principle ringing in our ears, the toughness of our stress scenarios reacts not to whether a downturn is likely to unfold but to how deep it could be if it did. So when all appears bright – as real estate prices rise, credit flows, foreign capital inflows increase, and the last thing on people’s minds is a downturn – our stress scenarios get tougher.

And my first call to arms for academia this evening is for further research into indicators that can help to guide us in asking how bad it could be.

3) The system is not the sum of its parts

My next principle concerns the stress tests themselves – where the stress scenario is applied to the system.

It is to beware; the system is not the sum of its parts.

Feedback loops within the system mean that the entities in the system can be individually resilient, but still collectively overwhelmed by the stress scenario.

These are the feedback loops that helped to turn around \$300 bn of subprime mortgage-related losses into well over \$2.5 trillion of potential write-downs in the global banking sector within a year.²⁰

There are the obvious feedback loops that arise because entities have direct exposure to each other: think lending from one bank to another.

The good news is that the importance of this loop is now negligible. Unsecured interbank lending has contracted and banks are materially less leveraged.²¹ And this loop is now incorporated into our annual banking system stress test, so should it ever re-assert itself, we can ensure resilience keeps up.

But we need to go further.

At the next level are the feedback loops that link seemingly unrelated entities in the system. These are loops created by firesales of assets into illiquid markets, driving down market prices, forcing others to mark down the value of their holdings.²²

This type of loop will be most aggressive when the fire-seller is funded through short-term debt. As asset prices fall, there is the threat of needing to repay that debt.²³

But even financial companies that are completely safe in their own right, with little leverage, and making no promise that investors will get their money back, can contribute to these loops.

The rapid growth of open-ended investment funds, offering the opportunity to invest in less liquid securities but still to redeem the investment at short notice, has been a sea change in the financial system since the crisis.

Assets under management in these funds now account for about 13% of global financial assets.²⁴

It raises a question about whether end investors, under an ‘illusion of liquidity’ created by the offer of short-notice redemption, are holding more relatively illiquid assets.²⁵

That matters. Investors have shown a tendency to want to liquidate their holdings as asset prices fall.²⁶ This investor behaviour *en masse* has the potential to create a feedback loop, with falling prices prompting redemptions, driving asset sales and further falls in prices.

And in a few cases, that loop can be reinforced by advantages to redeeming your investment first.

Just look back seven months, to June 24th. Following the referendum, markets downgraded the outlook for UK commercial real estate prices and, amidst great uncertainty, the market went into hiatus.

With no transactions taking place, open-ended funds found themselves needing to meet redemptions with their cash buffers. The valuations offered for redemptions were increasingly uncertain and – in some cases – lagging behind investors’ perceptions of falling property values.

You’d be hard pressed to create greater incentives for your investors to cash in.

Faced with overwhelming redemption pressure, many funds were forced to suspend. Even so, at least 18 per cent of the suspended funds’ assets under management – £2.3bn – had a for sale sign put up outside.

Notwithstanding the recent signs that the market has stabilised, I welcome the Financial Conduct Authority’s action to open up a public discussion of the challenges associated with funds that invest in illiquid assets and offer short notice redemption.²⁷

The impact of firesales depends crucially on whether there are others out there willing to buy.

The firesale feedback loop can be made more pernicious as ‘liquidity providers’ – the market-makers and active investors – step back at the same time as others are selling into the market.

In recent years, market-making dealers have been less willing to see their inventory of securities rise – a preference likely to become more pronounced in times of higher volatility.²⁸ And insurance companies and pension funds can face incentives to step back as the value of their assets falls towards their liabilities.²⁹

Such behaviour is very understandable from the perspective of the individual company. But as Andrew Crockett of the BIS observed back in 2000, “*actions that may seem desirable or reasonable from the perspective of individual institutions may result in unwelcome system outcomes*”.³⁰

That system outcome could be a feedback loop from falling asset prices to pressures on one side of the market to sell and pressures on the other side not to buy; a loop that magnifies asset price falls.

Asset prices are not our concern *per se*. The question for macroprudential policy is whether these loops mean that smaller economic shocks can overwhelm the financial system, amplifying the damage to the real economy.

To get at this, macroprudential policy must move – and is moving – beyond the core banking system.

Our focus is increasingly on these loops, working in partnership with the LSE Systemic Risk Centre and others.

In partnership with other countries, we must – and are – developing system-wide simulations to examine how the different entities – funds, insurers, dealers – combine to shape how the system responds to stresses.

And my second call to arms for researchers in academia is to push out the frontiers of knowledge and understanding of these feedback loops.

4) An ounce of prevention can be worth a pound of cure³¹

Having calibrated the economic stress and applied it to the system, it’s a question of building the necessary resilience into it. And the guiding principle here is that an ounce of prevention can be worth a pound of cure.

The focus of strengthening the system since the crisis has been on building the resilience of the core banking system.

The results have been transformative. A system that could absorb losses of only 4% of (risk weighted) assets before the crisis now has equity of 13.5% and is on track to have overall loss absorbing capacity of around 28%.³² Our stress tests show that it could absorb a synchronised recession as deep as the financial crisis.

And if signals emerge that what could happen to the economy is getting worse, or the feedback loops in the system that would be set in motion are strengthening, we will go further.

But bank capital is not always the best tool to use to strengthen the system and is almost certainly not best used in isolation.

It is a classic 'cure' – a largely fatalistic approach, taking what could happen in the economy and the feedback loops in the financial system as given, and ensuring they can be withstood.³³

Sometimes we must be fatalistic. We don't have the means to prevent foreign credit booms, for example. But building resilience into the financial system solely using bank capital is equivalent to addressing road safety only with tougher car safety standards – more airbags – while ignoring standards of driving behaviour.

Such an approach is not robust: no airbags will deal with all types of crash.

And it is not comprehensive: it won't protect pedestrians, and pile-ups will still block important highways to traffic.

In macroprudential policy as in road safety: an ounce of prevention can be worth a pound of cure.³⁴

Crash resilience must be accompanied with standards of driving behaviour that prevent accidents in the first place – with speed limits and a Highway Code.

We have applied that principle in the mortgage market. Alongside capitalising banks to withstand a deep downturn in the housing market, we have put guards in place against looser lending standards:

A limit on mortgage lending at high loan-to-income ratios;

And a requirement to test that borrowers can still afford their loan repayments if interest rates rise.³⁵

These measures guard against lending standards that make the economy more risky; that make what could happen even worse. Debt overhangs – induced by looser lending standards – drag the economy down when corrected. And before they are, high levels of debt make consumer spending more susceptible to the unexpected.³⁶

So they guard against lenders being exposed to both the direct risk of riskier individual loans, and the indirect risk of a more fragile economy.

This multiplicity of effects means there is uncertainty about precisely how much bank capital would be needed to truly ensure bank resilience as underwriting standards loosen.³⁷ A diversified policy strategy – speed limits and air bags – is more robust to that uncertainty. (Many economists remember the famous

result of Brainard (1967) that uncertainty implies caution; few recall the more interesting result that uncertainty motivates diversity – the use of all available policy tools in concert.³⁸⁾

A diversified policy is also more comprehensive.

It guards against regulatory arbitrage; of lending moving to foreign banks or non-bank parts of the financial system.

And by reducing the risk of debt overhangs and high levels of debt, it makes the economy more stable too. Why use the cure that creates just resilient banks when you can use the prevention that gives you a stronger economy too?³⁹⁾

Consideration must now be given to how far to take these road safety standards. Is it optimal to address risks from the commercial real estate market and consumer credit solely with the cure of bank capital? Or might a preventative approach be more robust and comprehensive?

Similar consideration must also be given to the feedback loops in the financial system. Where should they be addressed directly? That is a topic for another day, but robustness and completeness will call for some to be addressed directly. Macroprudential policy – at home and internationally – is moving into this space.⁴⁰⁾

So this is my third – and final – call to arms for academic research: where – in building resilience – is an ounce of macroprudential prevention worth a pound of cure?

5) Fortune favours the bold

The fifth and final principle is one without which the others are superfluous. It is that fortune favours the bold.

The Financial Policy Committee needs to match its judgements that what could happen has got worse with action to make the system more resilient.

Why will that take boldness?

Our actions will stop the financial system doing something it might otherwise have chosen to do in its own private interest – there will be opposition.

The need to build resilience will often arise when private agents believe the risks are at their lowest.

And if we are successful in ensuring the system is resilient, there will be no way of showing the benefits of our actions. We will appear to have been tilting at windmills.

As the memory of the financial crisis fades in the public conscience, making the case for our actions will get harder.⁴¹

Fortunately, we are bolstered by a statutory duty to act and powers to act with. And whether on building bank capital or establishing guards against looser lending standards, we have been willing to act.

Just as building resilience takes guts, so too does allowing the strength we've put into the system to be drawn on when 'what could happen' threatens to become reality.

Macroprudential policy must be fully countercyclical; not only tightening as risks build, but also loosening as downturn threatens.

Without the confidence that we will do that, expectations of economic downturn will prompt the financial system to become risk averse; to hoard capital; to de-risk; to rein in. To create the very amplifying effects on the real economy we are trying to avoid.

A truly countercyclical approach means banks, for example, know their capital buffers can be depleted as they take impairments;

Households can be confident that our rules won't choke off the refinancing of their mortgage.⁴²

And insurance companies know their solvency won't be judged at prices in highly illiquid markets.

We must be just as bold in loosening requirements when the economy turns down as we are in tightening them in the upswings.⁴³

Boldness in the upswing to strengthen the system creates the space to be bold in the downturn and allow that strength to be tested and drawn on. Macroprudential fortune favours the bold.

Conclusion

To conclude, boldness is needed in general to set policy while the practice is so far ahead of the development of the theory – the playbook.⁴⁴ We are many years from having rules to guide macroprudential policy.

But the absence of the playbook doesn't excuse an absence of clarity about what is guiding macroprudential policy setting. The principles I have outlined aim to provide a little more clarity; to begin to fill in the 'how to' guide for macropru.

And I hope you will respond to my call to arms for your research to aid the development of that guide, because we are a very long way from the last word. We are not even at the first words of the last chapter. How to: macropru, is at best reaching the last words of its first chapter.

I look forward to helping to write the rest together.

Thank you.

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¹ Recognising this, others have started to take stock on progress on macroprudential frameworks. The most notable contribution to this effort is a recent report to the G20 by the IMF, the FSB and the BIS (IMF-FSB-BIS, 2016).

² The basis of many of the ideas in this section stems from Kashyap et al (2014).

³ James Carville, strategist for Bill Clinton's 1992 presidential campaign, coined the phrase 'The economy, stupid'.

⁴ See Rosengren (2011).

⁵ Ivashina and Scharfstein (2010) document a sharp contraction in new loans to large borrowers during the peak of the financial crisis with a 47% quarter-on-quarter fall from Q3-Q4 2008.

⁶ Brooke et al (2015).

⁷ Haldane (2013) for instance argues that "We need to build defences to protect against the collateral damage from financial flood. We need to be popping, not mopping".

⁸ Consistent with that, the FPC is not authorised to take actions that would "have a significant adverse effect on the capacity of the financial sector to contribute to the growth of the UK economy in the medium or long term", Financial Services Act (2012), Section 9C; see http://www.legislation.gov.uk/ukpga/2012/21/pdfs/ukpga_20120021_en.pdf.

⁹ The Bank of England published a staff paper in 2015 that sets out a framework for measuring the macroeconomic costs and benefits of higher bank capital requirements. See Brooke et al (2015).

¹⁰ Brooke et al (2015) estimate that a 1 percentage point increase in risk-weighted capital ratios will result in a 10 basis point increase in lending rates. This estimate includes a partial offset due to the Modigliani Miller (1958) theorem, under which the capital structure has no impact on funding costs as more equity makes debt safer and equity less volatile, lowering the required rate of return for both. The conditions for the full offset in the theorem are unlikely to hold in practice for banks. However, recent empirical estimates for the UK suggest the effect is qualitatively present with the increase in banks' overall funding costs due to higher capital requirements lower than in the absence of the theorem by 45% (Miles et al 2013) and 53% (Brooke et al 2015).

¹¹ For example, the now defunct authority regulating the US Government-sponsored mortgage agencies stress tested them to only an 11% fall in house prices – a more severe shock than any nationwide house price decline to be found from 1945 onward. The peak-to-trough fall of 11% was calibrated based on house price data for the West South Central Census Region between 1984 and 1993. Frame et al (2015) show that an alternative scenario based on realised post-2006 data would have revealed that Fannie and Freddie's capitalisation was much weaker than what the original stress tests suggested. It wasn't only regulators who made the mistake of relying on the recent past only. During a week when Goldman Sach's Global Equity Opportunities fund lost 30%, Goldman's chief financial officer famously stated: "We were seeing things that were 25-standard deviation moves, several days in a row." His focus was too narrow. While the moves in 2007 were substantial, they were not unprecedented. Even within the last thirty years, equity prices had experienced larger single day falls than they did during 2007.

¹² Danielsson et al (2016) show that systemic risk indicators constructed with market data were low and falling before the stress events in 1997 and 2008, and shot up during the events. They conclude that setting macro-prudential policy on the basis of these indicators might have procyclical effects: it would facilitate the build-up of systemic imbalances during booms, and their amplification during busts. Crockett (2000) had the foresight to argue that "The received wisdom is that risk increases in recessions and falls in booms. In contrast, it may be more helpful to think of risk as increasing during upswings, as financial imbalances build up, and materialising in recessions."

¹³ The FPC's statutory mandate includes a responsibility to identify risks; see Financial Services Act (2012).

¹⁴ Jordà et al (2013) use data for 14 advanced countries between 1870 and 2008 and find that more credit-intensive booms are typically followed by slower recoveries and deeper recessions. This is true both for recessions that follow financial crises and those that do not.

¹⁵ Eggertsson and Krugman (2012), present a new Keynesian model in which aggregate demand is depressed when indebted agents are forced into a rapid deleveraging. If this deleveraging is large enough it can push interest rates to the zero lower bound. Korinek and Simsek (2016) show that this can result in an aggregate demand externality which can be corrected through pre-emptive macroprudential policy.

¹⁶ Dynan (2012) uses household-level data for the US and finds that between 2007 and 2009 declines in spending were larger for highly leveraged homeowners.

¹⁷ Campbell et al (2011) find that foreclosed houses have an average sale price discount of 27%, using 20 years of data for Massachusetts.

¹⁸ Forbes and Warnock (2012) present evidence that high capital inflows can end suddenly, with global factors typically more important than the domestic macroeconomy.

¹⁹ Cesa-Bianchi et al (2017) find that foreign credit growth is a strong predictor of financial crises, over and above domestic credit growth. The result is driven by a combination of contagion from foreign crises, capital inflows and (global) market sentiment.

²⁰ The first number is the April 2008 Global Financial Stability Report's estimated subprime-related global bank losses as of March 2008 (IMF (2008), Table 1.6). The second number is the April 2009 Global Financial Stability Report estimated potential total mature economies banking sector write-down for the 2007-2010 period (IMF (2009), Table 1.3). The corresponding April 2010 Global Financial Stability Report estimate revises this number down to 2.3 trillion (IMF (2010), Table 1.2).

²¹ Bardoscia et al (forthcoming).

²² Cont and Schaanning (2014).

²³ This was revealed during the crisis where some investors – typically 'shadow banks', which took bank-like risks but without being subject to commensurate regulatory standards – funded their investment in long-term securitised assets with short-term asset-backed commercial paper. When this funding was withdrawn during the crisis, it resulted in a sell-off of these long-term assets, depressing their price (Brunnermeier, 2009).

²⁴ Regulated open-ended funds include mutual funds, exchange-traded funds, and institutional funds. Based on BlackRock, The Investment Company Institute and Bank calculations.

²⁵ In 2015, Bank and FCA staff conducted a joint information-gathering exercise on investment funds with large holdings of corporate bonds. Analysis drawing on the information gathered suggests that "in aggregate, surveyed funds expected to be able to liquidate over one day roughly three times estimated dollar corporate bond market turnover"; see Bank of England (2015b), Box 2.

²⁶ Interestingly, investors in bond funds do not invest with the same eagerness when prices increases; see Goldstein, Jiang and Ng (forthcoming).

²⁷ See Bank of England (2015a) and FCA (2017).

²⁸ See Baranova, Chen and Vause (2015).

²⁹ The FPC has reviewed the risks to financial stability from insurers' investment activities and concluded that the introduction of Solvency II, in January 2016, might affect the propensity of UK life insurers to invest procyclically. See Bank of England (2016).

³⁰ Crockett (2000).

³¹ This was the advice Benjamin Franklin gave to inhabitants of Philadelphia, on the subject of firefighting, writing anonymously to the Pennsylvania Gazette in 1735: *"In the first Place, as an Ounce of Prevention is worth a Pound of Cure, I would advise 'em to take care how they suffer living Coals in a full Shovel, to be carried out of one Room into another, or up or down Stairs, unless in a Warmingpan shut; for Scraps of Fire may fall into Chinks and make no Appearance until Midnight; when your Stairs being in Flames, you may be forced, (as I once was) to leap out of your Windows, and hazard your Necks to avoid being oven-roasted."*

³² A firm's overall loss absorbing capacity is the sum of its capital and subordinated long-term debt which can be bailed in.

³³ Of course, it is not the case that changes in banking system capital requirements have no bearing on developments in the wider economy; such changes are likely to impact the price and quantity of credit provided by the banking system and, via this channel, economic growth. But the best empirical estimates we have suggest that this channel is likely to be weak during credit booms, when it's most needed (Bahaj et al, 2016). Moreover, changes in banking system capital will have no direct impact on build-ups of risk in the market-based financial sector.

³⁴ Constancio (2014) argues that "It seems unacceptable that macro-prudential authorities would passively watch the development of a bubble in housing prices and other asset prices, comforted by the idea that the banking sector is prepared to weather the storm and that the central bank would deal with the painful aftermath. The crisis showed that the amount of risk endogenously generated by a financial cycle spinning 'out-of-control' dwarfs the 'mopping up' ability of fiscal and monetary policy due to fiscal capacity limits and the zero lower bound on nominal interest rates. In matters of financial instability, prevention is always better than cure".

³⁵ The FPC recommendation on the loan-to-income (LTI) flow limit is that the PRA and the FCA should ensure that mortgage lenders do not extend more than 15% of their total number of new residential mortgages at LTI ratios at or greater than 4.5. The FPC recommendation regarding mortgage affordability is that when assessing affordability, mortgage lenders should apply an interest rate stress test that assesses whether borrowers could still afford their mortgages if, at any point over the first five years of the loan, Bank Rate were to be 3 percentage points higher than the prevailing rate at origination. For further detail, see for instance Bank of England (2014) for a documentation of the Bank of England's 2014 housing market measures.

³⁶ See Bank of England (2016).

³⁷ An additional mechanism that creates amplification is that if and when these risks do materialise, market participants begin to doubt the solvency of even banks that are resilient. This is a form of what economists call 'Knightian' uncertainty (Knight, 1921); Caballero and Krishnamurthy (2008) present a model based on this concept.

³⁸ In his classic paper on policymaking under uncertainty, Brainard (1967) argues that it will generally be optimal to use all instruments available when pursuing particular targets. This result holds provided the tools have less-than-perfectly correlated impacts on the target. In these circumstances, while any given tool may prove ineffective, it is less likely that their combined use will be. There is, therefore, an insurance benefit to using multiple tools in moderation.

³⁹ Under the Bank of England Act 1998, as amended by the Financial Services Act 2012, the Bank of England has a statutory objective to protect and enhance the stability of the financial system of the United Kingdom. Subject to achieving this primary objective, the FPC must also support 'the economic policy of Her Majesty's Government, including its objectives for growth and employment' (Section 9C(1) of the Bank of England Act 1998).

⁴⁰ The first signs of that can be seen in the work being conducted internationally and domestically to study and address risks around asset management, market liquidity and derivatives. For example, the FSB published a policy recommendation in January that funds' investment strategies should be consistent with their redemption terms, see Financial Stability Board (2017). The FPC has also noted declines in the liquidity of key dealer-intermediated markets, and the Bank is contributing to an international review of repo market functioning by the Bank for International Settlements' Committee on the Global Financial System, see Bank of England (2016). The FPC has also asked the Bank to complete an in-depth assessment of financial stability risks associated with derivative markets. This will examine progress towards implementation of the post-crisis reforms to these markets and consider implications for the resilience of the financial system.

⁴¹ International Monetary Fund (2011) discusses the risk that macroprudential policy would be subject to biases toward inaction or insufficiently timely action, given that the benefits of policy interventions can appear uncertain while the costs are often felt more immediately.

⁴² The policies introduced by the FPC in 2014 to guard against risks from the mortgage market do not apply to re-mortgages with no change to the principal amount outstanding.

⁴³ In July 2016, the FPC became the first macroprudential authority in an advanced economy to cut the so-called countercyclical capital buffer for banks. That was consistent with the FPC's intention to release the countercyclical capital buffer in situations where risks materialise, and to act pre-emptively before losses crystallise. This cut sent a clear signal that, if losses were to materialise, banks would be able to draw on their buffers, reducing any perceived need for banks' to preserve capital and restrict lending, with consequent negative impacts on the real economy. For details, see the FPC Record of meetings held on 28 June and 1 July, available at <http://www.bankofengland.co.uk/publications/Documents/records/fpc/pdf/2016/record1607.pdf>

⁴⁴ A classic view from Brainard (1967) is that uncertainty over the impact of a policy instrument should make a policymaker less active. Bahaj and Foulis (2016) show that this conclusion may not hold for the complex reality faced by a macroprudential policymaker. Specifically, the large costs of financial crises, the presence of unquantifiable sources of risk, the ability to learn from policy, and private sector uncertainty can all be supportive of bolder, more active policy.