

Charles Bean: The future of monetary policy

Speech by Mr Charles Bean, Deputy Governor for Monetary Policy of the Bank of England, at the London School of Economics, London, 20 May 2014.

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I left the London School of Economics to become the Bank of England's Chief Economist and a member of its fledgling Monetary Policy Committee (MPC) almost 14 years ago. The Bank had not long been given the responsibility for determining interest rates but had at the same time relinquished the responsibility for banking supervision. As I approach the end of my tenure, the Bank looks rather different: banking supervision has returned; and a new policy committee – the Financial Policy Committee – has been charged with preserving the stability of the financial system.

As I look back, I think it is fair to say that it has been a pretty extraordinary – indeed unique – period to be involved in economic policy. My first seven years were years of plenty: growth was steady; unemployment was low; and inflation never strayed far from target (Chart 1). From time to time, the MPC nudged Bank Rate up or down a quarter point, and the economy obediently stayed on course. To economists, this period of unusual macroeconomic tranquillity is known as the Great Moderation.

But the second seven years were years of famine, as the Great Moderation turned into a Great Tribulation: the worst financial crisis for a century; the most prolonged downturn on record; and inflation rising above 5%. The MPC slashed Bank Rate as low as it has ever been in the Bank's 320-year history. To bolster demand further, we then injected new money worth around a quarter of annual GDP through asset purchases. But despite the dosage, output is only now approaching its previous peak.

This evening, I will reflect on some of the innovations in monetary policy that took place as a result of the crisis. Then I will look at some of the broader changes in the framework it prompted.

Dealing with the crisis led central banks to innovate in several ways. In the first instance, this involved lending at longer tenors, against a wider range of collateral, and to a wider range of counterparties in order to keep financial markets functioning. For our part, as well as offering longer-term funding through our repo operations, we also introduced the Special Liquidity Scheme (SLS) enabling banks to borrow liquid Treasury Bills against their illiquid mortgage-backed securities. Later we introduced the Funding for Lending Scheme (FLS), providing banks with cheaper funding and a financial incentive to expand lending. Some of these facilities have since been made a permanent feature of our Sterling Monetary Framework. Others, such as the SLS and FLS, are by their nature temporary.

More noteworthy from a monetary policy perspective, though, was the use of unconventional tools to inject further stimulus when policy rates approached their zero lower bound. That took the form of explicit guidance to depress expectations of future interest rates; and large-scale asset purchases financed by the issuance of reserves – colloquially known as quantitative easing.

Let me start with forward guidance, which has particularly attracted academic interest.¹ By holding rates “lower for longer”, the central bank can implement an optimal, yet time-

¹ See e.g. Paul Krugman (1998), “It's baaack: Japan's slump and the return of the liquidity trap.” *Brookings Papers on Economic Activity*, pp.137–205; Gauti Eggertsson and Michael Woodford (2003), “The Zero Bound on Interest Rates and Optimal Monetary Policy.” *Brookings Papers on Economic Activity* 34.1, pp.139–235; Campbell, J. R., Evans, C. L., Fisher, J. D., & Justiniano, A. (2012), “Macroeconomic Effects of Federal Reserve Forward Guidance.” *Brookings Papers on Economic Activity*, pp.1–80.

inconsistent, path for rates that boosts demand today, by lowering future nominal rates and by raising future inflation. It is time inconsistent because, when the future comes, it will no longer seem appropriate to go through with the promised inflationary episode. Because policy committees cannot tie the hands of their successors, I do not believe such time-inconsistent strategies can be credibly implemented other than over rather short horizons.

Of course, all central banks provide guidance regarding the economic outlook and the factors determining policy so as to influence expectations. Several central banks, such as the Reserve Bank of New Zealand and the Swedish Riksbank, go as far as providing forecasts of their own future policy decisions. Until last August, the MPC had shied away from providing such explicit guidance, lest it be misinterpreted as a promise independent of the state of the economy. Instead we preferred to provide an implicit steer through the medium of the projections contained in our quarterly *Inflation Report*.

Last August, however, the MPC decided that more explicit guidance about our reaction function could be helpful. Rather than aiming to provide more stimulus as in the academic literature, we were merely seeking to ensure that the recovery was not nipped in the bud by a premature rise in market interest rates, despite there still being a significant margin of economic slack.

We said then that we would not even countenance a rise in Bank Rate until unemployment had fallen to 7%, subject to overrides relating to excessive upward movements in inflation expectations and to the risks to financial stability, the latter being policed by the Financial Policy Committee. We chose unemployment in part because its behaviour is directly linked to one of the key uncertainties at the current juncture, namely the scope for a recovery in productivity. This has been unusually weak since the onset of the crisis for reasons we do not yet fully understand (Chart 2). If productivity rebounded, then unemployment would fall slowly. But in that case, there would also be more scope to maintain an expansionary policy before inflationary pressures began to rise. The opposite holds if productivity growth remains weak: unemployment falls more quickly, but we would then also need to begin raising Bank Rate earlier.

Shorter-term market interest rates have moved higher since guidance was introduced, but no more so than is justified by a string of unexpectedly strong activity indicators. And there is persuasive survey evidence that businesses have both understood the message (Chart 3), and that it has made them more prepared to hire and invest (Chart 4).

In the event, though, unemployment fell rather faster than expected, reaching the 7% threshold in the data release for the three months to February. In anticipation of that, in our February *Inflation Report*, we provided further guidance, not only on the conditions that would lead the Committee to begin tightening, but also the likely trajectory thereafter.

Regarding the first question, while unemployment provides a useful conditioning variable for *not* tightening, the decision of *when* to tighten needs to take account of other margins of slack as well. These can arise in both the labour market – for instance, discouraged workers temporarily out of the labour force and those who are underemployed – and inside firms.

The amount of slack in an economy is necessarily a fuzzy concept, as potential output cannot be observed and can be inferred only indirectly. Nevertheless, given the transmission lags, monetary policy makers cannot avoid forming a judgement about the level of activity consistent with inflation sustainably remaining at target, and thus of the margin of economic slack.

Our central view is that the margin of slack is presently around 1–1½% of GDP, though I should stress the considerable degree of uncertainty around that estimate. I should also stress that this is a short-run concept, relevant to inflationary pressures a year or so ahead, and does not incorporate any endogenous improvement in productivity that may materialise in the wake of faster growth over a rather longer horizon. We have said that we are aiming to

close this gap over the next two or three years, while keeping inflation at around our 2% target.

We have also said that when Bank Rate does rise, it is likely to do so only gradually and to a level that is likely to remain materially below its pre-crisis average of 5% for some while. That reflects: the continuing headwinds from public and private de-leveraging and continued weak growth in the euro area; continued downward pressure on global interest rates from high Chinese net savings; and the undue compression of risk premia during the run-up to the crisis.

Let me now turn to asset purchases, our preferred tool for adding stimulus when Bank Rate reached its effective lower bound. Under this programme, the Bank acquired £375 billion of longer-term UK government debt – equivalent to around 25% of annual GDP – comprising £200 billion purchased between March 2009 and February 2010 and another £175 billion acquired between October 2011 and November 2012. By depressing the term premium on gilts, the purchases lowered the long-term safe rate of interest. Such purchases also led to lower spreads on risky assets as investors rebalanced their portfolios. In addition, the extra liquidity in the banking system may have helped boost credit supply. Finally, such purchases may also have reinforced market perceptions that policy would remain loose for an extended period – the so-called “signalling channel”.

Analysis by Bank staff suggests that the first phase of our asset purchases lowered long rates by around a percentage point; other studies find a similar impact from the Federal Reserve’s asset purchases.² The impact of the second round is harder to isolate because some of the effect was probably already priced into the market when the programme was re-activated, but there are good reasons to believe the impact was smaller because markets were less dysfunctional than after the collapse of Lehman’s. There is also considerable uncertainty about the impact on growth and inflation, but our present central assessment is that the programme had a peak impact on GDP of around 2½% and raised inflation by a little more than 1 percentage point.

Since the evidence suggests that asset purchases lower longer-term rates and stimulate demand, should they be a permanent part of the central bank’s armoury? Or should they be reserved for emergencies?

I think there are a couple of reasons why they should be seen as just an emergency weapon for use when policy rates reach the effective lower bound. First, we have less of a handle on their impact than we do changes in short-term policy rates and, as I just indicated, that impact may well be less when markets are functioning normally. Second, if the central bank routinely deals in large quantities of government debt, it may find itself more open to pressure from the fiscal authorities, while market participants are more likely to fear that the debt will be permanently monetised.

That brings me naturally to the topic of unwinding our present large stock of asset purchases. We have committed to maintaining the stock, including reinvesting the cash flows associated with maturing gilts, at least until the first rise in Bank Rate. But at some stage thereafter, as part of the transition back to normality, we expect to start running down the portfolio and withdrawing the associated bank reserves.

In principle, we could do this just by letting the gilts mature. However, as Chart 5 demonstrates, it would take a long time to run off organically in its entirety because of the relatively long average maturity of the gilts held: the weighted average maturity of the portfolio is more than 12 years. So more active sales may be called for at some stage,

² For the United Kingdom, see: Michael Joyce, Matthew Tong and Robert Woods (2011), “The United Kingdom’s Quantitative Easing Policy: Design, Operation and Impact”, *Bank of England Quarterly Bulletin*, 51(3), pp.200–212. For the United States, see: Joseph Gagnon, Matthew Raskin, Julie Remache and Brian Sack (2011), “The Financial Market Effects of the Federal Reserve’s Large-Scale Asset Purchases”, *International Journal of Central Banking*, 7(1), pp.3–43.

though the MPC would be unlikely to initiate such a programme until Bank Rate was high enough that it could be cut to maintain demand if conditions deteriorated. Such a programme of sales could be expected to put upward pressure on yields, though by much less than the purchases pushed down on yields because markets would be functioning more normally.

In addition, both heightened risk aversion and regulatory changes mean that banks will want to hold significantly more high-quality liquid assets than in the past; Chart 6 shows these holdings had shrunk to less than 1% of bank assets pre-crisis. That means an additional source of demand for gilts and other highly liquid assets that can be easily sold or repo'd. That should also attenuate the upward pressure on yields from running down the portfolio.

In case this all sounds rather sanguine, I should say that I do not expect central banks' collective management of the exit from the present exceptionally stimulatory monetary stance will be easy. The bumpiness of the incoming data, allied to a state-contingent reaction function, means that market interest rates are bound to become more volatile along the exit path, however well central banks communicate their intentions.

We have already seen the sensitivity of markets to changes in the expected path of US monetary policy during the "taper tantrum" last spring and its attendant consequences for other countries – especially, but not exclusively, in the emerging economies. Movements in yield curves have been strongly correlated across countries, not only at the long end, which is not too surprising, but also at the short end of the curve, where domestic monetary policy considerations ought to dominate.

Another reason the exit may be bumpy stems from the starting point. Implied volatilities in many financial markets have been at historically low levels for some time now (Chart 7). Together with low safe interest rates in the advanced economies, that has underpinned a renewed search for yield and encouraged carry trades. Taken in isolation, this is eerily reminiscent of what happened in the run-up to the crisis. Episodes like the "taper tantrum", which produced a short-lived bout of volatility but no major disruption may also be contributing to a sense of complacency and an underestimation of market risk by investors.

It is inevitable that at some stage market perceptions of uncertainty will revert to more normal levels. That is likely to be associated with falls in risky asset prices and could be prompted by developments in the Ukraine, the fault lines in the Chinese financial sector, monetary policy exit in the advanced economies, or something else. But it will surely come at some point.

The bottom line is that we may yet encounter a few potholes on the way to the exit. But the good thing is that banks are better capitalised now than in the run-in to the crisis, leverage is lower, there is better visibility of counterparty exposures, and we are better placed to deal with financial institutions that get into trouble. So the risk of major financial problems crystallising in the advanced economies should be much lower. Those emerging economies that have financed large external deficits through the accumulation of foreign currency debt may be more vulnerable, however.

Let me turn now to the impact of the crisis on the monetary policy framework itself. Before the crisis, the conventional wisdom in central banks was that monetary and financial stability were largely complementary in nature. The maintenance of price stability would help foster stable macroeconomic conditions more generally by anchoring expectations. And the consequent reduction in macroeconomic volatility should help reduce the likelihood of episodes of financial instability. All that was necessary was for banking supervisors to ensure that individual financial institutions followed responsible lending policies and all would be well.

Today, there is a tendency to claim that the crisis revealed a fatal flaw in focussing on price stability as the primary object of monetary policy, namely a failure to recognise that it could in some circumstances actually be detrimental to financial stability. While the years before the crisis were characterised by stability in the evolution of the market for goods and services, asset markets were anything but stable. In particular, there was a massive expansion in

credit, particularly within the financial system in many of the advanced economies, accompanied by upward pressure on a range of asset prices, including real estate. There was a boom in asset markets, even if there was no corresponding boom in the real economy. To some people, the relatively low level of interest rates necessary to maintain price stability was instrumental in generating this boom in credit and asset prices by encouraging an aggressive search for yield.

While there is some truth in this charge, I think it would be a mistake to conclude that monetary policy was the sole, or even the prime, cause of the crisis. Several factors coincided to form a potent cocktail. There were other factors that depressed the yield on safe assets, including high savings rates in China and a more general demand for US Treasuries as emerging economies accumulated larger stocks of foreign reserves in the wake of the Asia Crisis. Equally important, in my view, was the impact of the Great Moderation itself on risk-taking behaviour, as low volatility encouraged an underestimation of the likelihood and severity of adverse tail risks crystallising. Seen in this light, the Great Moderation sowed the seeds of its own destruction.

On top of this, of course, there was a litany of microeconomic features that aggravated the crisis, including: the development of complex securities that were impossible to value in stressed conditions and connected financial institutions in unexpected ways; disguised leverage through the use of securitisation vehicles, whose primary aim was regulatory arbitrage; remuneration packages encouraging positions that generated decent returns most of the time but high losses in some states of the world; excessive reliance on credit-rating agencies; defective risk management; weak funding structures; and insufficient high-quality bank capital to absorb losses.

That said, the experience of the past few years does appear to suggest that monetary policy ought to take greater account of financial stability concerns. Ahead of the crisis, Bill White and colleagues at the Bank for International Settlements consistently argued that when leverage was becoming excessive and/or asset prices misaligned, central bankers ought to “lean against the wind” by keeping interest rates higher than necessary to meet the price stability objective in the short run.³ Just as central banks are willing to accept temporary deviations from their inflation targets to limit output volatility, so they should also be willing to accept temporary deviations to attenuate the credit cycle. Essentially it is worth accepting a little more volatility in output and inflation in the short run if one can thereby reduce the size or frequency of asset-price busts and credit crunches. Such a view ran counter to that espoused by many central bankers, most notably Federal Reserve Chairman Alan Greenspan, who questioned the feasibility of addressing such financial imbalances with pre-emptive monetary policy; in his view, monetary policy should instead focus on minimising the fallout from any subsequent correction – the so-called “cleaning” approach.⁴

While the logic of leaning against the wind is sound in principle, the key question is whether a monetary tightening of plausible magnitude is likely to be effective in attenuating an established credit boom. Even if policy rates may appear with hindsight to have been held too low for too long in the years preceding the crisis, particularly in the United States, the empirical evidence suggests that they would need to have been significantly higher to have had a meaningful impact on the rate of credit expansion.⁵ It is a brave central banker who would deliberately induce a recession in order to head off the mere risk of a future financial correction.

³ For instance, William White (2006), “Is price stability enough?”, *Bank for International Settlements Working Paper* 205.

⁴ Alan Greenspan (2002), “Opening Remarks” in *Rethinking Stabilization Policy*, Federal Reserve Bank of Kansas.

⁵ Charles Bean, Matthias Paustian, Adrian Penalver and Tim Taylor (2010), “Monetary Policy after the Fall” in *Macroeconomic Challenges: The Decade Ahead*, Federal Reserve Bank of Kansas.

That explains the interest in deploying additional policy instruments that are better suited to restraining the build-up of dangerous financial imbalances and contributing to the maintenance of financial stability – so-called macroprudential tools. With two targets – price and financial stability – one really wants another instrument, or set of instruments, to complement monetary policy. In the new arrangements established following the crisis, the deployment of such instruments falls to the Bank’s Financial Policy Committee.

There are several potential macroprudential tools to deal with such cyclical risks, but they are of broadly two types: those that increase the resilience of the system; and those that work pre-emptively against a build-up of leverage. In addition, measures may be targeted or more general in impact.

To give some examples, first consider the Basel III counter-cyclical capital buffer, implemented in the European Union under the Capital Requirements Directive. By forcing banks to hold extra high-quality loss-absorbing capacity during a credit boom that can be released during a subsequent downturn, this primarily improves resilience. But because it raises the marginal cost of bank funds, the counter-cyclical capital buffer should also inhibit the build-up of leverage in the first place. There are several reasons why debt finance is cheaper than equity finance, including the implicit subsidy from being Too Big To Fail, and the advantageous tax treatment of debt. Moreover, debt pays the same return in all states of the world except when default takes place, while the return on equity will vary; that makes debt more attractive for some investors, especially during financial booms when the probability of default appears low.

Raising the capital requirements on particular components of banks’ balance sheets by varying sectoral risk weights is different in that it alters the relative attractiveness of different sorts of lending. Assuming that the increase in capital requirements is targeted at those sectors where the risks are most material, then not only is resilience increased but it also encourages substitution towards safer forms of lending and thus has a pre-emptive character.

Finally, there are tools that directly target borrowing, such as loan-to-income or loan-to-value caps, and restrictions on the share of banks’ portfolios that can be allocated to high loan-to-income or loan-to-value lending, as recently introduced by the Reserve Bank of New Zealand. By acting directly on the riskiest segments of lending, such tools are more obviously pre-emptive in nature.

Importantly, while monetary policy is well-suited to dealing with the problems that arise from sluggish wage and price adjustment, a good macroprudential tool will be one that is well targeted at dealing with a particular financial market failure, such as the underestimation of risk.

To see, in a highly stylised way, how monetary and macroprudential tools can be combined, as well as the appropriate instrument assignment, consider first Chart 8. The left-hand panel is relatively conventional and portrays the market for goods and services. IS is an aggregate demand schedule, with demand a decreasing function of both the policy rate, R , and a macroprudential instrument, K . PC is an expectations-augmented Phillips curve, in which inflation expectations are assumed to be anchored at the inflation target.⁶ For any given set of shocks to aggregate demand and supply, the inflation target can be achieved by the set of pairs of R and K along the downward sloping schedule PS (for Price Stability) in the right-hand diagram. An increase in demand resulting from, say, an increase in the propensity to invest, would shift this schedule out to the right.

⁶ In the literature, credit frictions and macroprudential policies can also affect potential output; see for instance Vasco Cúrdia and Michael Woodford (2010), “Credit spreads and monetary policy.” *Journal of Money, Credit and Banking* 42(S1), pp3–35. For simplicity of exposition, I abstract from such effects here.

Turn now to the credit market. Conventional macroeconomic analyses of the market for loanable funds tend to focus on the flow of funds from saving households to businesses undertaking capital expenditures. But, as Chart 9 makes clear, such lending constitutes only a small fraction of the assets held by UK banks. The vast majority of loans are instead provided to finance the acquisition of existing assets, especially real estate.

This should be borne in mind when contemplating the factors behind the demand and supply of credit, shown in the left-hand panel of Chart 10 as CD and CS respectively. Demand decreases with the cost of borrowing, R_B and supply increases with the return on bank debt (including deposits), R_D , which for simplicity is taken to move in line with the policy rate R . In addition, there is a spread between R_B and R_D , reflecting expectations of default not only by end borrowers but also by the financial intermediary. In credit booms, this spread is often unsustainably compressed, while during credit crunches it widens sharply. Our macroprudential instrument, K , is assumed either to reduce the demand for credit, or to increase the spread between R_B and R_D , or both. Either way it reduces the total quantity of credit, C .

Now unlike macroeconomic stability, which can be characterised as output being at its sustainable level once nominal wages and prices have adjusted and inflation is at target, there is no corresponding simple characterisation of financial stability. But for simplicity, let us assume that the authorities have in mind some maximum level of leverage that is consistent with the risks to future financial stability remaining acceptable. Then we have the downward-sloping frontier FS (for Financial Stability) in the right-hand panel that shows the minimum acceptable level of the policy rate for any given setting of the macroprudential tool. A reduction in perceived risk leading to excessive exuberance on the part of investors or borrowers would shift this frontier to the right.

Putting these two policy relationships, PS and FS, together we get Chart 11. The respective slopes of these two schedules depend on the relative impact of the policy rate and the macroprudential tool on aggregate demand and on the quantity of credit. A well-chosen and well-designed macroprudential tool is one that has a relatively large effect on the quantity of credit but only a modest impact on aggregate demand. That would generate a relatively flat FS schedule. Moreover, since changes in policy rates also affect aggregate demand through routes other than the credit channel, such as the exchange rate, it seems reasonable to assume that the PS schedule is relatively steep. That is the configuration of relative slopes shown in the Chart. Provided the two schedules do not coincide, both price and financial stability objectives can be achieved simultaneously.

With this configuration, it is natural to assign the monetary instrument to the pursuit of price stability and the macroprudential instrument to the pursuit of financial stability. Moreover, with these slopes and this assignment, no active co-ordination in the setting of the instruments is strictly necessary: a process whereby each instrument is set independently, taking the other as given would converge on the equilibrium, A. That said, appropriate co-ordination and information exchange is desirable to achieve it efficiently and is facilitated in the real world by housing the MPC and the FPC in the same institution, with overlapping memberships, and the scope to meet jointly when required.

Some sorts of shocks will involve a tightening in both instruments. For instance, consider a bout of “irrational exuberance” on the part of households, businesses and investors. The increased optimism is associated with an increase in the demand for goods and services from households and businesses, together with increased demand for credit and a reduction in the credit spread. So both PS and FS shift out to the right, as in Chart 12. As drawn, both instruments are therefore tightened.

In other cases, it will be appropriate for the instruments to move in opposite directions. For instance a beneficial supply shock will usually generate disinflationary pressure requiring lower interest rates, other things equal. So the price stability schedule shifts in. But it may well also encourage increased borrowing and a compression in spreads, leading the financial

stability frontier to shift out. In this example, monetary policy is loosened at the same time as macroprudential policy is tightened (Chart 13). Superficially this could look as if the monetary and macroprudential policymakers are at odds with each other, though such a rebalancing of the mix of policies is in fact entirely appropriate.

There are, however, important qualifications to this somewhat Panglossian view of the ability to maintain both price stability and financial stability by assigning monetary policy to the former and macroprudential policy to the latter. Compared to the impact of changes in interest rates, we have relatively little experience of deploying macroprudential instruments. And there will often be scope for those affected to work out ways to circumvent them, including by moving activities outside the regulatory perimeter. As Federal Reserve Board Governor Jeremy Stein has noted, monetary policy may be a blunt tool for addressing financial stability risks, but it does have the virtue that it “gets in all of the cracks”.⁷ So, there may well be times when monetary policy is the only game in town to guard against incipient financial stability risks. In that case, we are back in the world where monetary policy makers need to be prepared to consciously lean against the wind by deliberately undershooting their inflation target in the near term in order to reduce the likelihood of something nastier down the road.

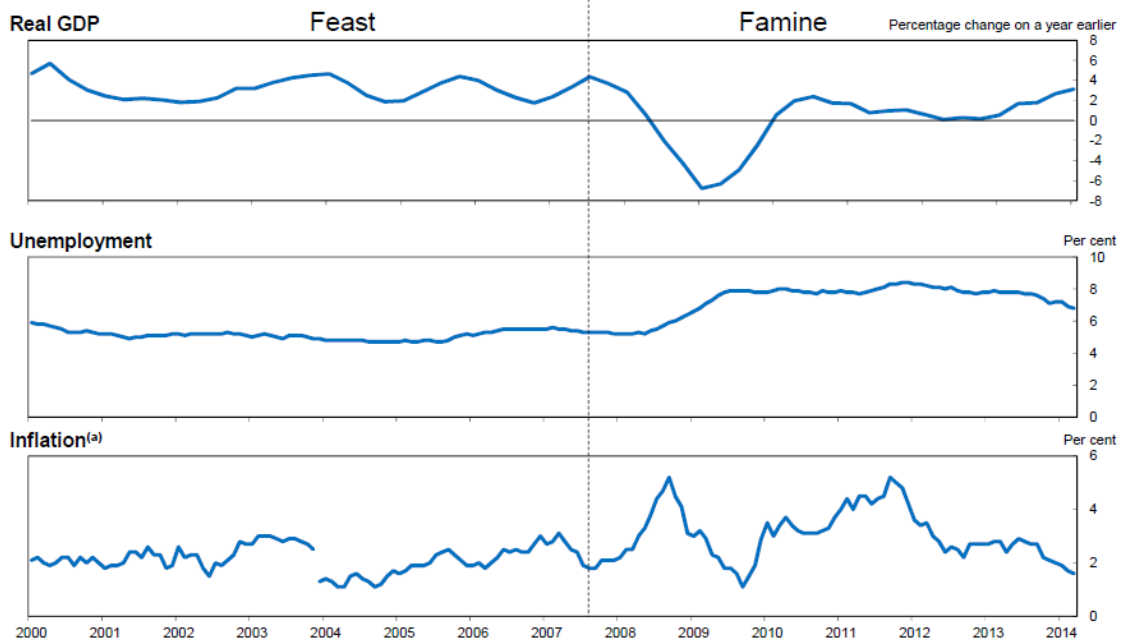
This thinking has now been embodied in the Chancellor’s remit for the MPC, which sets our objectives each year. It notes that “circumstances may arise in which attempts to keep inflation at the inflation target could exacerbate the development of imbalances that the FPC may judge to represent a potential risk to financial stability. The FPC’s macroprudential tools are the first line of defence against such risks, but in these circumstances the MPC may wish to allow inflation to deviate from the target temporarily.” The remit also directs the MPC to have regard for the actions of the FPC and vice versa.

I opened my remarks tonight by observing that my time at the Bank has neatly fallen into two halves. Seven years of unparalleled macroeconomic stability have been followed by seven years characterised by financial instability and a deep recession. It was a salutary lesson for those, like me, who thought we had successfully cracked the problem of steering the economy, and highlighted the need to put in place an effective prudential framework to complement monetary policy. Policy making today consequently looks a much more complex problem than it did fourteen years ago.

In Genesis, following his interpretation of Pharaoh’s Dream, Joseph is made the most powerful bureaucrat in Egypt, in which position he ensures that enough grain is hoarded during the seven years of plenty to provide sustenance during the seven years of famine that followed. That is a parable on the value of prudence that the central bankers of the future would do well not to forget. Thank you for your attention!

⁷ Jeremy Stein (2013) “Overheating in Credit Markets: Origins, Measurement, and Policy Responses”, speech at the Federal Reserve Bank of St. Louis, 7 February.

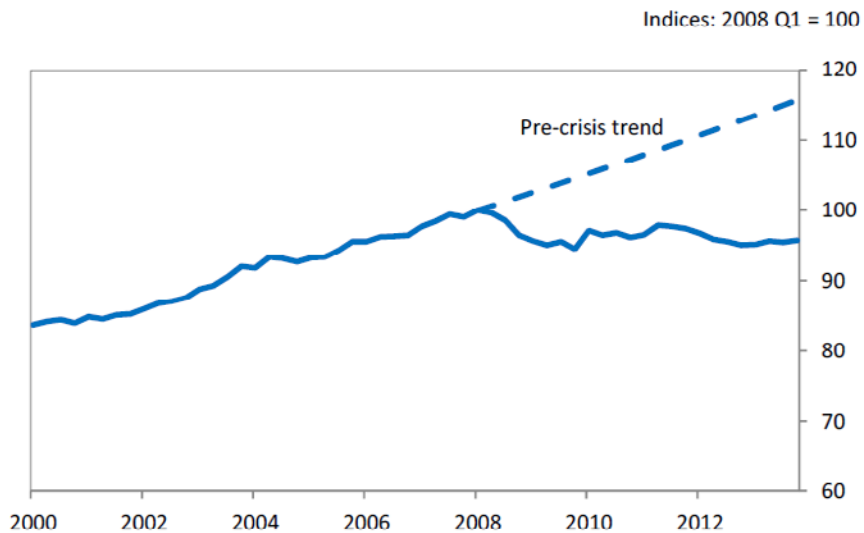
Chart 1: GDP growth, unemployment and inflation



(a) The inflation target was changed from RPIX inflation to CPI inflation in December 2003.



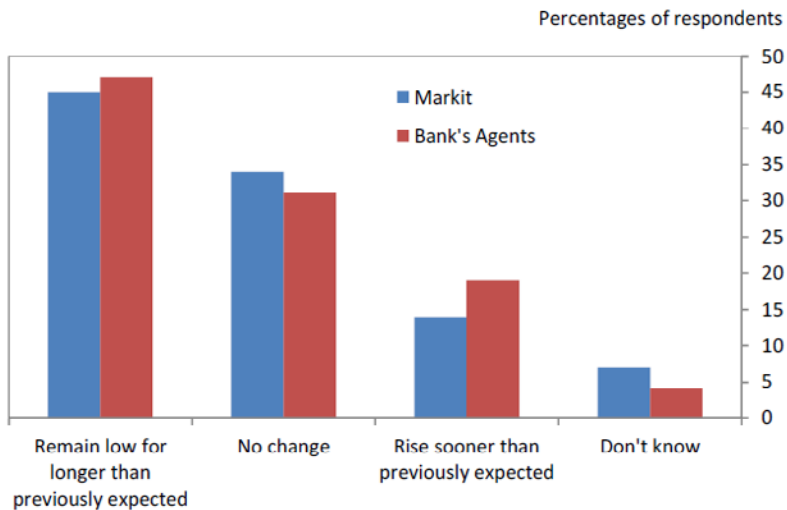
Chart 2: Productivity^(a)



(a) Pre-crisis trend is projected using quarterly growth rates between 1999 and 2007.



Chart 3: Effect of guidance on companies' rate expectations^(a)

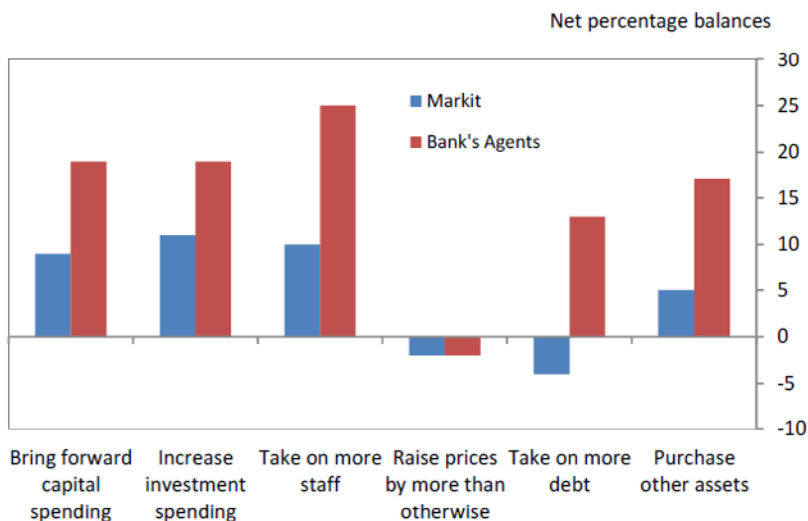


Sources: Bank of England and Markit.

(a) Companies were asked: 'Which of the following best describes how the Bank's policy guidance has changed your view of when Bank Rate (the official interest rate) will next change?'



Chart 4: Effect of guidance on company behaviour^(a)

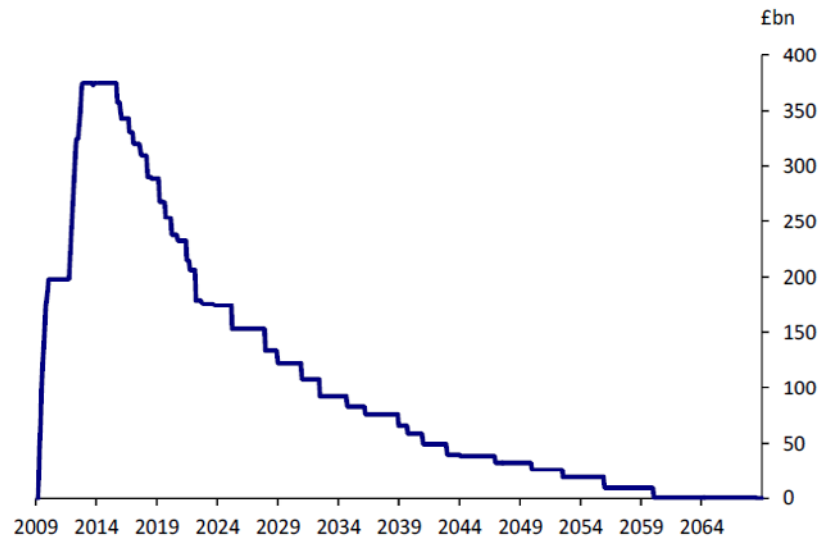


Sources: Bank of England and Markit.

(a) Companies were asked whether they were more or less likely to take the actions listed. Net percentage balances are the differences between the percentages more likely and less likely to take the listed action.



Chart 5: Asset Purchases – Organic run-off^(a)

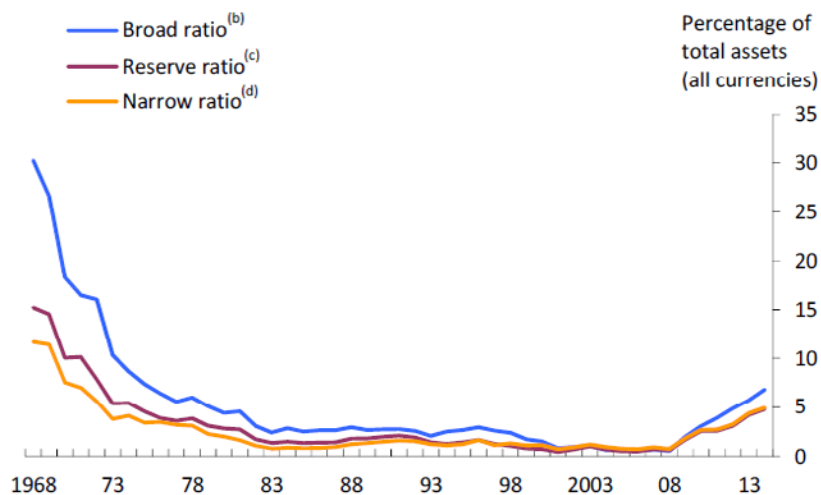


Source: Bank of England.

(a) For expositional purposes only, this exercise assumes that reinvestment ceases at the time that market participants currently expect the first rise in Bank Rate.



Chart 6: Sterling liquid assets of UK banking sector^(a)



Source: Bank of England.

(a) Data for building societies are included from 2010 onwards. Prior to this, data are for UK banks only. Data are end-year except for 2013 where end-November data are used.

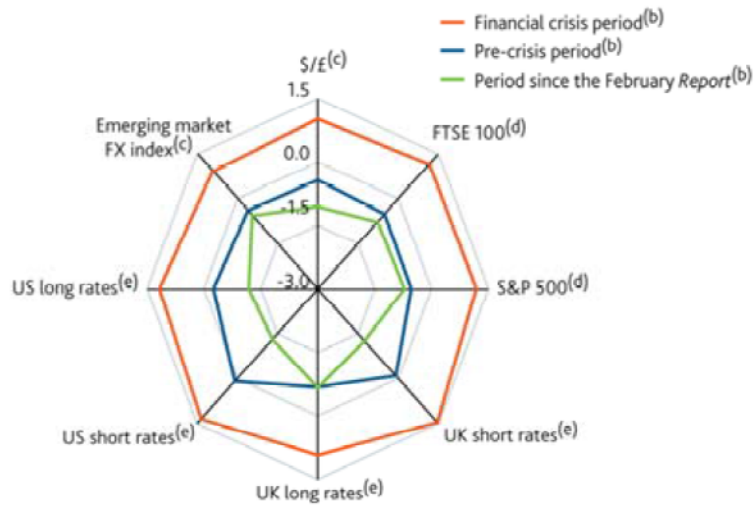
(b) Broad ratio: Cash + Bank of England balances + money at call + eligible bills + UK gilts.

(c) Reserve ratio proxied by Bank of England balances + money at call + eligible bills.

(d) Narrow ratio: Cash + Bank of England balances + eligible bills.



Chart 7: Three-month implied volatilities^(a)



Sources: Bank of England, Barclays Live, Bloomberg and Bank calculations.

(a) Differences, in number of standard deviations, between the values of these indicators and their averages between 2 January 2003 and 7 May 2014. Based on daily data.

(b) Pre-crisis period refers to 2 January 2003 to 8 August 2007. Financial crisis period refers to 9 August 2007 to 31 December 2009. The period since the February Report refers to 6 February 2014 to 7 May 2014.

(c) S/£ refers to implied volatilities from three-month options on the US dollar into sterling exchange rate. Emerging market FX index refers to the JPMorgan Implied Volatility index.

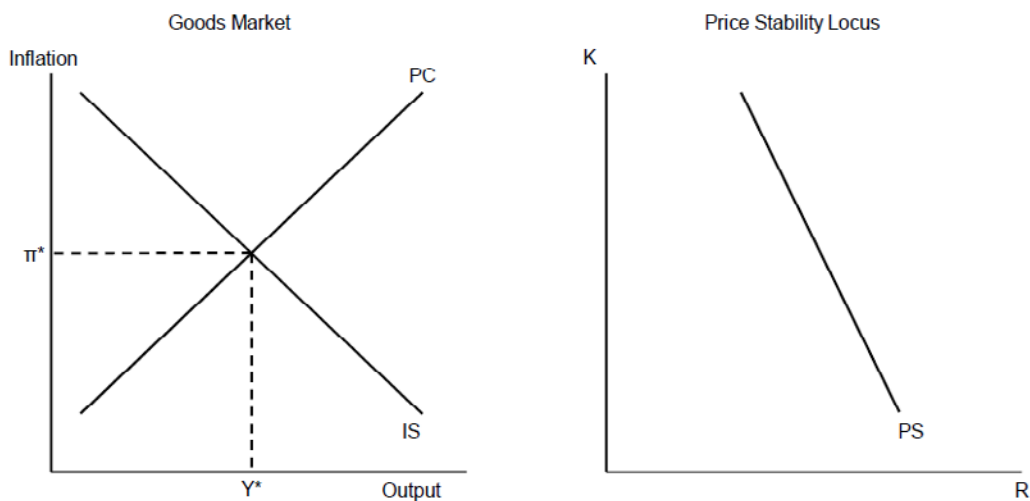
(d) Implied volatilities from three-month options on the FTSE 100 and S&P 500 respectively.

(e) Implied volatilities from three-month options on one-year and ten-year interest rate swaps.



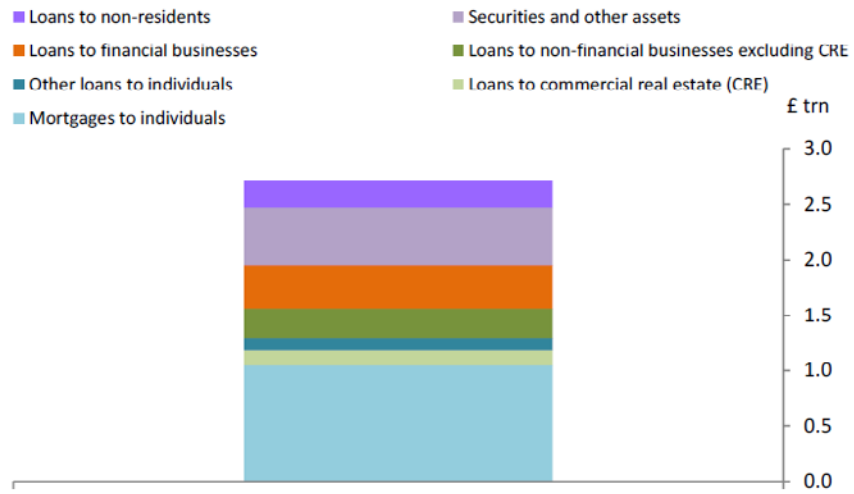
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Chart 8: Goods market equilibrium



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Chart 9: Consolidated balance sheet of UK resident MFIs^(a)



Sources: Bank of England and Bank calculations.

(a) Based on end-March 2014 data for sterling only, using data on MFIs, which include banks and building societies. The Bank of England is excluded from the chart. Data for loans to UK residents are calculated from the industrial breakdown of loans and excludes MFIs' holdings of bills and statistical allocations.



Chart 10: Credit market equilibrium

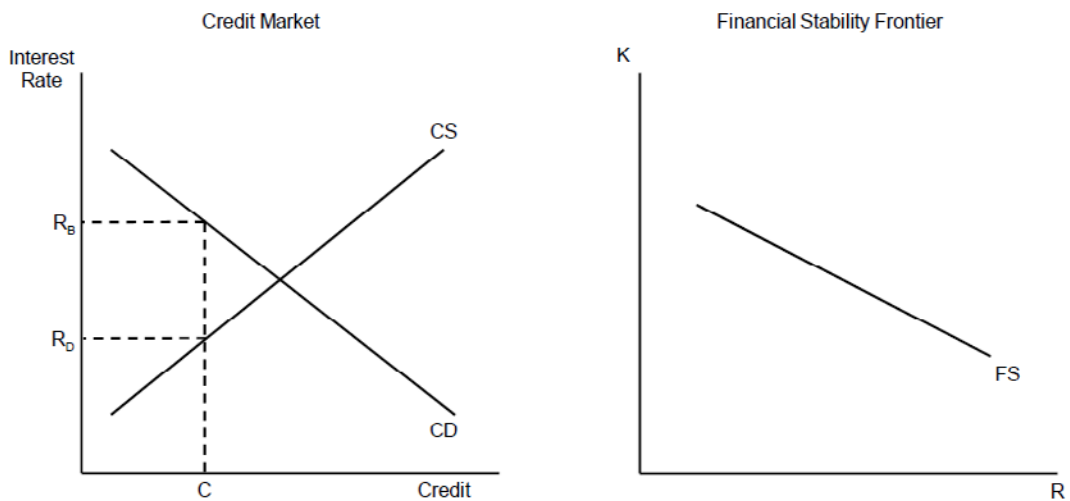


Chart 11: Assigning monetary and macroprudential policies

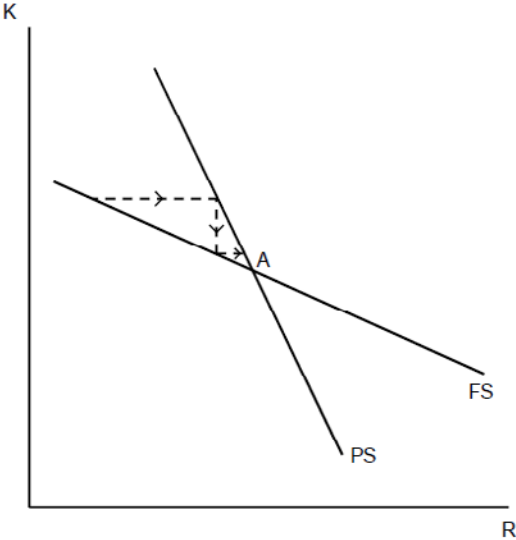


Chart 12: Irrational exuberance

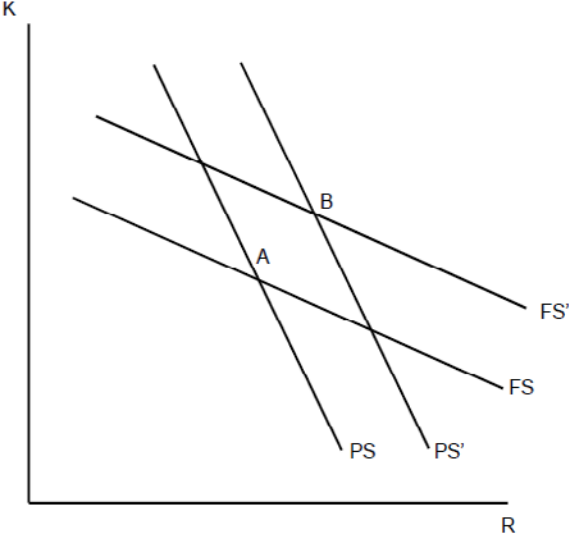


Chart 13: Beneficial supply shock

