



BANK OF ENGLAND

# Speech

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## How low can you go?

Speech given by

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The global financial crisis has thrown up a raft of issues about the future of central banks. These are the most fundamental challenges to face central banking in a generation, perhaps longer (Haldane (2014)). They include the role of monetary, macro-prudential and micro-prudential policies and optimal degrees of transparency and accountability. I will discuss two of these issues: the future of *money* and the future of *monetary policy*.

Both go to the very heart of what makes a central bank special – its balance sheet. A central bank's balance sheet is the foundation on which both money and monetary policy are built. A central bank's liabilities define the quantity of so-called base money in circulation. And the interest rate on central bank money defines monetary policy. In that sense, central bank money and monetary policy are two sides of the same coin.

Yet, in practice, money and monetary policy issues have tended to be detached. A central bank's liabilities comprise two elements – currency with the public and deposits from banks. Under operating procedures in most central banks, non-interest bearing currency is supplied perfectly elastically to the public on demand, while the monetary policy stance involves fixing the interest rate on bank reserves (McLeay et al (2014)). In this way, the cord connecting currency and monetary policy has been all but cut.

Events since the financial crisis have gone some way towards reconnecting that cord. As interest rates were lowered to their effective floor in a number of advanced countries, central banks engaged in so-called Quantitative Easing (QE) – buying assets and crediting banks' accounts at the central bank. So far, these asset purchases have totalled \$5 trillion, with more planned. They have augmented central banks' monetary policy armoury.

These “unconventional” monetary policy actions have re-established some link between central bank money and monetary policy. But these unconventional policies are intended to be temporary, crisis-related measures. As QE rolls off over time, the cord connecting central bank money and monetary policies would be expected to wither gradually. The two sides of the monetary coin would again be separated, the status quo ante restored.

Yet it is possible that the monetary status quo ante may not be fully restored. If global real interest rates are persistently lower, central banks may then need to think imaginatively about how to deal on a more durable basis with the technological constraint imposed by the zero lower bound on interest rates. That may require a rethink, a fairly fundamental one, of a number of current central bank practices.

I will discuss some of the medium-term options for dealing with this technological constraint. Because all of these options would represent significant shifts from the past, they would benefit from further research. And as these are options for the future, there is time to carry out this research. But these issues are also relevant to monetary policy today, on which I will end with some reflections.

## The Zero Lower Bound

Following the global financial crisis, short-term interest rates fell sharply in a great many countries internationally. They have remained at low levels in the period since. In a sample of countries globally, 40% have short-term interest rates below 1%, nearly two thirds have interest rates below 3% and 80% have interest rates below 5% (Chart 1). In some countries in Europe, short-term interest rates have entered negative territory.

Among the large advanced economies, official interest rates are effectively at zero. Japanese official interest rates have been there for over 20 years. In the US, Euro Area and the UK, official interest rates have been at zero for six years and counting. Each of these countries has augmented monetary policy with large-scale QE programmes, liquidity injections into the banking system and forward guidance on monetary policy (IMF (2013)).

The need for unconventional measures arose from a technological constraint – the inability to set *negative* interest rates on currency. It is possible to set negative rates on bank reserves – indeed, a number of countries recently have done so. But without the ability to do so on currency, there is an incentive to switch to currency whenever interest rates on reserves turn negative.<sup>1</sup> That hinders the effectiveness of monetary policy and is known as the Zero Lower Bound – or ZLB – problem (Ball (2014)).

The ZLB problem is, in one sense, not new. It was discussed at the time of the previous largest and most damaging financial crisis, the Great Depression. Keynes warned of the ineffectiveness of low interest rates in his *General Theory* (Keynes (1936)). It gave rise to his notion of the “liquidity trap”. Keynes also had a number of imaginative solutions, both monetary and fiscal, for dealing with this problem to which I will return.

Yet for much of the period after the Great Depression, the ZLB problem disappeared from policy view. It became a topic largely confined to academic rather than policy circles (Blanchard, Dell’Ariccia and Mauro (2010)). Based on simulations conducted *before* the crisis, that neglect looked benign. For example, Reifschneider and Williams (2000) find that, with a 2% inflation target, monetary policy would be constrained by the ZLB only around 5% of the time.

More recent experience has been salutary. The ZLB has emerged as a real and persisting constraint for some central banks and a prospective constraint for many more. Pre-crisis simulations of the likelihood of the ZLB binding were flattered by the low levels of macro-economic risk which characterised the Great Moderation. Re-calibrating macro-economic risk for experience during the Great Recession, the ZLB becomes a clear and present danger (for example, Chung, Laforte, Reifschneider and Williams (2012)).

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<sup>1</sup> Beyond a small wedge, reflecting the opportunity cost of currency storage.

Nonetheless, the prevailing orthodoxy among academics and policymakers is that the ZLB problem, while more persistent than expected, will still be a passing one. As countries recover from the Great Recession, the ZLB constraint would be expected to slacken, its policy relevance to weaken and the ZLB debate to return to an academic stage. That, after all, was the lesson from the Great Depression.

Yet that may be the wrong lesson. It was not the crisis alone that caused the ZLB constraint to bind: its deep roots in fact appear to predate the crisis. And it is questionable whether this constraint will disappear once the global recovery is complete: the deep roots of the ZLB constraint may be structural and long-lasting (Buiter and Rahbari (2015)). The Great Recession is, in that sense, different than the Great Depression. To see that, consider the recent behaviour of global long-term real interest rates.

Chart 2 plots global long-term real interest rates over the past 35 years. Back in the 1990s, world real interest rates averaged around 4%. With an inflation target of 2%, that meant nominal interest rates averaging around 6% over the course of a typical cycle. At those levels, monetary policy would have plenty of room for manoeuvre above the ZLB – 6 percentage points - to cushion the effects of troughs in the business cycle.

Over the past 30 years, however, world real interest rates have been in secular decline (Broadbent (2014)). At the dawn of the crisis, they had halved to around 2%. Since then they have fallen further to around zero, perhaps even into negative territory. With a 2% inflation target, that would now put nominal interest rates, on average over the cycle, at 2%. And that would mean there is materially less monetary policy room for manoeuvre than was the case a generation ago.

Too little room? One way to gauge that is to look at “typical” monetary policy loosening cycles in the past. Chart 3 plots interest rates in the UK, US, Japan and Germany since 1970, while Table 1 looks at loosening cycles in these countries since 1970 and 1994 (Haldane (2015)). The “typical” loosening cycle is between 3 and 5 percentage points. Either way, interest rate headroom of 2 percentage points would potentially be insufficient.

An alternative metric on the probability of the ZLB binding is to look at the likelihood of recession. Table 2 looks at cumulative recession probabilities over three time horizons (1, 5 and 10 years ahead) measured over three historical samples (the UK since 1700 and 1945 and a cross-country panel since 1870). Recessions occur roughly every 3 to 10 years. Over the course of a decade, they are overwhelmingly more likely than not.

So given these recession probabilities, how likely is it that interest rates will be at levels that would allow them to be cut sufficiently to cushion the effects of a typical recession? We can calculate the probability of interest rates having reached, say, 3% by using the market yield curve. These market-based probabilities are shown in the final column of Table 2, at different horizons.

This suggests that the probability of policymakers needing 3 percentage points of interest rate headroom comfortably exceeds the likelihood of this headroom being available. Put differently, it is much more likely than not interest rates may need to return to ground zero at some point in the future. Although no more than illustrative, these estimates suggest the ZLB could exert a strong gravitational pull on interest rates for some time to come.

This calculus would overstate that gravitational pull if the yield curve proves to be a poor guide to the future path of global real interest rates. For example, if global real rates quickly mean-reverted to their historical levels of 2-3%, monetary policy headroom would re-open (Chart 4). While the Great Recession and Great Depression look different today, at least in terms of long-term real interest rates, tomorrow may be different.

To assess the likelihood of real rates mean-reverting, we need to understand why it is they fell in the first place. Bank colleagues have recently tried to pinpoint the drivers of global real rates (Rachel and Smith (*forthcoming*)). The factors they identify can account for the majority of the 450 basis point fall since the 1980s. They include lower trend growth (100 basis points); worsening demographic trends (90 basis points); low investment rates due to the falling price of capital goods (50 basis points); rising inequality (45 basis points); and savings gluts in emerging markets (25 basis points).

These factors are not will-of-the-wisp. None is likely to reverse quickly. That being so, lower levels of global real rates may persist at levels well below their long-term average. This time may indeed be different, not just from the recent past (the 1980s and 1990s), but from the distant past (the 1930s). And if so, central banks may find themselves bumping up against the ZLB constraint on a recurrent basis.

Neglect of the ZLB problem would then no longer be benign. So even if policymakers cannot know with certainty how often it will bind, there are benefits on risk management grounds from considering policy options which would slacken the ZLB constraint on a durable basis (see Buiter and Panigirtzoglou (2003), Buiter (2004), Buiter (2009), Kimball (2015)). From a non-exhaustive list, let me discuss three such options. Each would mark a significant departure from current central bank practices and, as such, would benefit from further research and reflection.

### **Revising monetary policy mandates**

Over the past few decades, inflation targets in advanced economies have steadily fallen and typically converged around 2% (Chart 5). In emerging economies, they have fallen faster still and are currently around 4%. This fall in average inflation targets has mirrored the fall in inflation itself (Chart 6). Indeed, at present inflation is undershooting those targets, on average by around 1.5 percentage points.

After the inflation scare of the 1970s and early 1980s, that disinflationary trajectory has been hugely beneficial. Nonetheless, the ratchet down in inflation, alongside falls in global real interest rates, has not been costless. Taming inflation through tight monetary policies came at an output cost, albeit probably a temporary one. More fundamentally, by lowering steady-state levels of nominal interest rates, lower inflation targets will have increased the probability of the ZLB constraint binding.

That being so, one option for loosening this constraint would simply be to revise upwards inflation targets. For example, raising inflation targets to 4% from 2% would provide 2 extra percentage points of interest rate wiggle room. That is roughly the order of magnitude researchers have suggested might be desirable (Ball (2014) and Blanchard et al (2010)). Simulations suggest a 4% inflation target gives sufficient monetary policy space to cushion all but the largest recessions historically (Leigh (2009)).

Put another way, the optimal inflation target is likely to be state-dependent depending, among other things, on the likelihood of the ZLB constraint binding. That likelihood depends, in turn, on the level of equilibrium real interest rates. If equilibrium real rates shift, so too should the optimal inflation target (Reifschneider and Williams (2000)). In other words, theory also would support a revision of monetary mandates.

What of the costs? The welfare costs of inflation arise through various channels (Camba-Mendez and Rodriguez-Palenzuela (2003), Schmitt-Grohe and Uribe (2010)) and have been catalogued in a rich literature (Briault (1995)). But there is little evidence to suggest these costs would be large when moving from steady-state inflation rates of 2% to 4%. Cross-country studies have found evidence for a negative relationship between inflation and growth, but the negative effect is typically only observed at rates of inflation above current targets.<sup>2</sup>

Let me now add some important notes of caution. This evidence is drawn almost exclusively from periods when inflation was high and falling. There could be a fundamental difference between the dynamics of inflation expectations during periods when inflation is high and steadily falling on the one hand, and low and suddenly rising on the other. At a turning point, there is a risk of excess and asymmetric responses in inflation expectations (Kobayashi (2013), Kurozumi (2014) and Ascari et al (2014)).

The pattern of UK inflation expectations over time suggests a steady sequence of disinflationary ratchets, associated with shifts in monetary policy regime and a gradual accretion of credibility (Chart 7). Inflation expectations have become moored, and increasingly tightly anchored, around the inflation target. And once moored and anchored, they have been resilient to sea-swells. Even during the Great Recessionary storms, longer-term measures of UK inflation expectations were remarkably stable.

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<sup>2</sup> Estimates of the level of this threshold in advanced economies range widely, from around 3% (Khan and Senhadji (2001) and Kremer, Bick and Nautz (2013)) to 8% (Burdekin, Denzau, Keil, Sitthiyot and Willett (2004)).

Reputation, in all walks of life, is hard-earned and easily lost. Inflationary reputation is unlikely to be any different. So consciously de-anchoring the boat, with a promise to re-anchor some distance north, runs the risk of a voyage into the monetary unknown. Once un-moored and de-anchored, the course of inflation expectations is much harder to fathom. That navigational uncertainty is likely to be damaging to macro-economic stability.

Moreover, there is a deeper point to bear in mind here about society's preferences, as distinct from economists' utterances. The costs of inflation as calculated by economists may not be the same as the costs of inflation as perceived by normal people. International survey evidence suggests stronger concerns among the general public about inflation than the academic literature would imply (Shiller (1997)).

In the UK, the Bank conducts regular surveys of public attitudes towards the inflation and the inflation target. This is revealing about societal inflation preferences. Public attitudes towards the Bank have a strikingly high correlation with inflation perceptions (Chart 8). This underscores the importance of low inflation for central bank reputation. It also suggests the public's preferences appear, if anything, to be for inflation *below* rather than above current targets.

Consistent with that, when the public are asked directly about the inflation target they suggest, on average, that it may if anything be a little too high (Chart 9). Taken together, this evidence suggests that an inflation target above current levels would not only risk putting central banks' reputations on the line. More fundamentally, it could also jar with the general public's preferences.

The choice of inflation target in the UK is ultimately, and rightly, a choice for the government rather than the Bank of England. But Friedrich Hayek once likened controlling inflation to holding a tiger by the tail (Hayek (1979)). In my view, it would be a brave step to tweak this tiger's tail at the very point we appear to have it tamed.

### **QE for all seasons**

A second policy option would simply be to accept the ZLB constraint and allow currently "unconventional" monetary measures to become "conventional". That might mean accommodating QE as part of the monetary policy armoury during normal as well as crisis times - a monetary instrument for all seasons.

This approach has some attractions. Unlike increases in inflation targets, it would not be a voyage into the monetary unknown. QE has been carried out by a number of advanced economy central banks over recent years. That has provided a fairly rich evidence base on which to assess its efficacy. Moreover, this evidence base suggests that the QE undertaken so far has, more or less, had its desired impact.

One approach to gauging QE's impact is to assess the response of asset prices following announced interventions. Event studies have found that most QE interventions had a statistically significant impact on asset prices, such as short and longer-term interest rates, corporate bond yields, the exchange rate and financial market uncertainty (for example, Gagnon, Raskin, Remache and Sack (2011), Breedon, Chadha and Waters (2012)).

As a simple eyeball-metric, Chart 10 looks at responses of financial market variables across a range of QE interventions by the Bank of England, US Federal Reserve, the European Central Bank and the Bank of Japan over the past few years. Each intervention is scaled by national GDP. These charts do not control for how much QE was expected in advance, but typically, though not always, these responses are correctly-signed. In a number of these cases, they are also statistically significant.

A second strand of the literature has looked not at the immediate effects of QE on asset markets, but instead on demand and inflation over medium-term horizons. Often, these studies have used identified VAR time-series techniques (for example, Baumeister and Benati (2012)). One example is work by my Bank colleagues, Martin Weale and Tomasz Wieladek (Weale and Wieladek (2015)).

Chart 11, taken from Weale and Wieladek (2015), looks at the impact on real GDP and inflation of doing QE equivalent to 1% of annual GDP in the US and UK using one of the four identification schemes proposed in their paper. The impact is correctly-signed and statistically significant. It is also *quantitatively* significant and persistent, with an average peak impact on GDP of around 0.3% after around 12 months.<sup>3</sup>

Taking these ready-reckoners at face value, QE appears to have had a reasonably powerful and timely impact in stimulating demand and inflation, with impact multipliers not dissimilar to conventional interest rate policy. Taken at face value, this suggests QE could be a practical and proven means of keeping the monetary policy engine running and the economy ticking over, should interest rates in future find themselves parked on the ZLB.

The case against QE becoming a permanent monetary policy fixture hinges, in my view, on three concerns. First, QE's effectiveness as a monetary instrument seems likely to be highly state-contingent, and hence uncertain, at least relative to interest rates. This uncertainty is not just the result of the more limited evidence base on QE than on interest rates. Rather, it is an intrinsic feature of the transmission mechanism of QE.

All monetary interventions rely for their efficacy on market imperfections. The non-neutrality of interest rates relies on imperfections in *goods and labour* markets. Stickiness in goods prices and wages - for example, as a result of overlapping wage and price contracts (Taylor (1979), Fischer (1977), Calvo (1983), Yun (1996), Mankiw and Reis (2002)) –allow shifts in nominal interest rates to influence real activity. The effectiveness of

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<sup>3</sup> Weale and Wieladek (2015) argue there is currently no consensus identification scheme to identify QE shocks. It is for this reason that they examine four different identification schemes. The 0.3% impact is an average across these four different identification schemes.



QE relies on these goods and labour market frictions too. But it relies, in addition, on imperfections in *asset markets*. These are necessary for a QE-induced rebalancing of portfolios to generate an impact on risk premia and asset prices (Joyce et al (2014)).

Market frictions are not all created equally. Frictions in goods and labour markets arise from contractual arrangements, or rules of thumb, between employers and employees of labour or buyers and sellers of goods (Blanchard and Fisher (1989)). Because there are costs - menu and behavioural - from changing these arrangements, they tend to be fairly static. Goods and labour market frictions are thus relatively fixed, or at least state-invariant, over time.

The same is not true of frictions in asset markets. These are shaped, for example, by constraints on investors' portfolios and by their risk preferences (Vayanos and Vila (2009)). Both are likely to be time-varying and highly state contingent (Baker and Wurgler (2007) and Guiso, Sapienza and Zingales (2013)). Portfolios themselves are altered at high speed and frequency. So too are risk appetites. So shifts in asset risk premia are sharp and unpredictable (Bollerslev and Todorov (2011)). And assets prices tend to exhibit excess-sensitivity. Asset market returns are thus likely to be volatile, fat-tailed and highly state-contingent (Haldane and Nelson (2012)).

All of which has direct implications for the transmission mechanism for QE. If asset frictions are highly state-dependent and volatile, so too will be the efficacy of QE. Estimates of the impact of QE during periods of high risk premia and disturbed financial conditions may be very different than when asset markets are tranquil and risk premia low.

Consistent with that, existing empirical studies point to wide margins of error around QE ready-reckoners (Table 3). Different episodes of QE have generated quite different impacts. Chart 12 compares the impact of QE1 (2003-08) and QE2 (2008-15) in Japan. The ready-reckoners differ not just in scale, but also sign. The key micro-economic point is that these uncertainties are inherently greater for QE than interest rates. This poses a significant challenge to regularising its use.

Second, executing QE on a larger-scale or putting it on a more permanent footing would risk blurring the boundary, however subtly, between monetary and fiscal policy. To see why, consider the mechanics of QE. This typically involves a central bank purchasing either a government or private sector asset. If done so permanently and on a large enough scale, both are quasi-fiscal acts.

If a central bank executes QE by buying government debt, this is likely to have an impact on the cost of servicing that debt – indeed, that is one of the channels through which QE is supposed to work. If that purchase is permanent, it also has implications for the quantity of debt the government needs to issue, for a given fiscal stance. Either way, there are direct consequences for the government's budget constraint (Kirby and Meaning (2015)).

If QE is instead executed by purchases of private assets, although this may have no immediate fiscal implications, it does have indirect implications for the government's inter-temporal budget constraint. For example, if risk on these private asset purchases then crystallises, the liability ultimately falls on the government's finances. Whether through public or private purchases, QE has potentially important fiscal consequences.

This blurring of the fiscal/monetary boundary is likely to be limited if asset purchases are modest in scale and temporary in nature. Those conditions are likely to be satisfied for the QE executed so far in advanced economies. The fiscal/monetary boundary can also be demarcated in ways which lessen the risk of blurring. For example, in the UK there is an explicit agreement to indemnify the Bank against financial losses arising from QE.

Nonetheless, were QE to grow in scale and permanence, that boundary would become fuzzier. QE then morphs into fiscal policy and monetary policy risks falling victim to so-called "fiscal dominance" (Woodford (2001), Cochrane (2011), BIS (2012), Roubini (2014)). That would corrode another hard-won monetary prize over recent decades – namely, central bank independence. In short, as QE becomes permanent, monetary policy credibility heads down the most slippery of slopes.

Third, one of the channels through which QE operates is the exchange rate. Conventional interest rate policy works through the exchange rate channel too. But because QE acts directly on stocks of assets held by the private sector, the potential for asset market – including foreign exchange market – spillovers is prospectively greater.

Evidence from QE interventions is consistent with significant exchange rate responses in many cases (Chart 13). Domestic currencies have tended to depreciate in response to domestic QE policy announcements. But, particularly for small open economies, there are also spillovers from *international* QE that might be as important. Chart 14 plots the impact on UK output and inflation of both UK and US QE, scaled as a percentage of national GDP. US QE appears to have had, if anything, a larger impact on the UK economy than UK QE.

Given the close alignment of UK and US business cycles, this cross-border spillover is potentially positive for both countries. But that may not be the case if business cycles are misaligned. International spillovers from QE could then complicate the setting of national monetary policies. Indeed, the cross-border impact of QE could then be seen as imposing a potential externality on the international monetary system.

That systemic externality is likely to be small if QE is modest in scale and temporary in nature, as over recent years. But placing QE on a permanent footing, or operating it on an industrial scale, would amplify that systemic externality. In my view, that would risk having adverse implications for the longer-term stability of the global financial system.

For these three reasons, I am doubtful QE for all seasons would be a desirable steady-state monetary solution for the ZLB problem. And I say that without prejudice to whether QE may have some further temporary role to play in stimulating aggregate demand, were that required in the near future.

### **Negative interest rates on currency**

That brings me to the third, and perhaps most radical and durable, option. It is one which brings together issues of currency and monetary policy. It involves finding a technological means either of levying a negative interest rate on currency, or of breaking the constraint physical currency imposes on setting such a rate (Buiter (2009)).

These options are not new. Over a century ago, Silvio Gesell proposed levying a stamp tax on currency to generate a negative interest rate (Gesell (1916)). Keynes discussed this scheme, approvingly, in the *General Theory*. More recently, a number of modern-day variants of the stamp tax on currency have been proposed – for example, by randomly invalidating banknotes by serial number (Mankiw (2009), Goodfriend (2000)).

A more radical proposal still would be to remove the ZLB constraint entirely by abolishing paper currency. This, too, has recently had its supporters (for example, Rogoff (2014)). As well as solving the ZLB problem, it has the added advantage of taxing illicit activities undertaken using paper currency, such as drug-dealing, at source.

A third option is to set an explicit exchange rate between paper currency and electronic (or bank) money. Having paper currency steadily depreciate relative to digital money effectively generates a negative interest rate on currency, *provided* electronic money is accepted by the public as the unit of account rather than currency. This again is an old idea (Eisler (1932)), recently revitalised and updated (for example, Kimball (2015)).

All of these options could, in principle, solve the ZLB problem. In practice, each of them faces a significant behavioural constraint. Government-backed currency is a *social convention*, certainly as the unit of account and to lesser extent as a medium of exchange. These social conventions are not easily shifted, whether by taxing, switching or abolishing them. That is why, despite its seeming unattractiveness, currency demand has continued to rise faster than money GDP in a number of countries (Fish and Whymark (2015)).

One interesting solution, then, would be to maintain the principle of a government-backed currency, but have it issued in an electronic rather than paper form. This would preserve the social convention of a state-issued unit of account and medium of exchange, albeit with currency now held in digital rather than physical wallets. But it would allow negative interest rates to be levied on currency easily and speedily, so relaxing the ZLB constraint.

Would such a monetary technology be feasible? In one sense, there is nothing new about digital, state-issued money. Bank deposits at the central bank are precisely that. The technology underpinning digital or crypto-currencies has, however, changed rapidly over the past few years. And it has done so for one very simple reason: Bitcoin.

In its short life, Bitcoin has emerged as a monetary enigma. It divides opinion like nothing else (for example, Yermack (2013), Shin (2015)). Some countries have banned its use. Others have encouraged it. Some economists have denounced it as monetary snake oil. Others have proclaimed it a monetary cure-all for the sins of the state.

What I think is now reasonably clear is that the distributed payment technology embodied in Bitcoin has real potential. On the face of it, it solves a deep problem in monetary economics: how to establish trust – the essence of money – in a distributed network. Bitcoin’s “blockchain” technology appears to offer an imaginative solution to that distributed trust problem (Ali, Barrdear, Clews and Southgate (2014)).

Whether a variant of this technology could support central bank-issued digital currency is very much an open question. So too is whether the public would accept it as a substitute for paper currency.

Central bank-issued digital currency raises big logistical and behavioural questions too. How practically would it work? What security and privacy risks would it raise? And how would public and privately-issued monies interact?

These questions do not have easy answers. That is why work on central bank-issued digital currencies forms a core part of the Bank’s current research agenda (Bank of England (2015)). Although the hurdles to implementation are high, so too is the potential prize if the ZLB constraint could be slackened. Perhaps central bank money is ripe for its own great technological leap forward, prompted by the pressing demands of the ZLB.

### **Monetary policy today**

Crypto-currencies may, or may not, shape monetary policy in the future. Let me conclude with some thoughts on the factors shaping monetary policy in the present.

Over the past few months, debate on the global economy has been dominated by news from Greece and China. In my view, these should not be seen as independent events, as lightning bolts from the blue. Rather, they are part of a connected sequence of financial disturbances that have hit the global economic and financial system over the past decade.

Recent events form the latest leg of what might be called a three-part crisis trilogy. Part One of that trilogy was the “Anglo-Saxon” crisis of 2008/09. Part Two was the “Euro-Area” crisis of 2011/12. And we may now be entering the early stages of Part Three of the trilogy, the “Emerging Market” crisis of 2015 onwards.

This trilogy has a common storyline. The three crisis legs have common cause in a large slug of global liquidity. As this has rotated around the international financial system, it has by turns inflated then deflated capital flows, credit, asset prices and growth in different markets and regions. That pattern characterised the first and second legs of the crisis (Wolf (2014)). And the embryonic third leg has many of the same ingredients.

Immediately after the crisis, \$600 billion of capital rotated out of crisis-afflicted advanced and into emerging market economies (EMEs). Peak to trough, this lowered EME bond spreads by around 200-300bp. And as capital rotated into EMEs from advanced economies, so too did growth. Since 2010, annual growth in EMEs has averaged 6%, three times that in advanced economies. EMEs have accounted for 80% of global growth, with China alone contributing around half.

Over the past 18 months, that cycle has turned decisively. In the past year, \$300 billion of capital has flowed *out* of EMEs on official estimates. Unofficial estimates put that number much higher, not least given recent capital flight from China. EME bond yields have risen by over 100bps. And, as on the way up, where money has lead growth is now following. The IMF forecast EME growth will slow to below 4% this year.

It is not difficult to identify the headwinds to EME growth, few of which seem likely to abate quickly. They include a debt overhang from the credit and capital flow boom; a significant downturn in the commodity price cycle, which has intensified and generalised recently; political instabilities; and the prospect of an imminent tightening of dollar interest rates, in which much of EMEs’ overseas borrowing has been conducted.

In the past, this conflation of factors has often presaged a perfect EME storm (Corsetti et al (1999), Krugman (2009)). Its epicentre recently has been China. But these headwinds are shared by a significant number of other EMEs. It is unclear whether these forces will result in a fully-fledged financial crisis, as some EMEs have significant stock-piles of foreign currency reserves. But these headwinds do seem likely to sap future EME growth.

From a UK and global perspective, the question then becomes how much of a disinflationary influence, if any, this EME growth headwind will provide? Experience during the Asian and Latin American crises of the late 1990s and early 2000s offers some reassurance. Then, advanced economy growth remained robust, at an average of almost 3%, despite financial convulsions in a sequence of EMEs.

Nonetheless, the world today is rather different. At that time, EMEs accounted for just over 40% of world output on a PPP-weighted basis. Today, they account for nearer 60%. The global growth implications of

EME slowdown are that much greater now than then. So too is the likely impact on world trade, where EMEs' importance has risen from around 25% to around 40% over the same period. Notably, world trade volumes have contracted during the first part of this year, for the first time since the crisis.

Taking various channels together, the Bank's non-structural models suggest a 1% fall in EME growth could slow global and UK growth by around 0.5% over a two year period. It would slow the ship, but not sink it. Moreover, an important mitigating factor is the significant improvement in the terms of trade for commodity-importing countries, with oil prices having fallen by 50% and metals prices by 20% over the past year. Provided the marginal propensity to consume of commodity-importers exceeds that of exporters, this would be expected to provide a fillip to world growth.

Against that, two important features of the recent fall in commodity prices need to be weighed. First, recent moves appear largely to have reflected a slowdown in global demand rather than an increase in supply. A decomposition of oil price moves using asset prices suggests nearly three-quarters of the fall since early May has been demand-induced (Chart 15). The terms of trade improvement has not been heaven-sent.

Second, for this fall in commodity prices to generate a boost to global growth, any terms of trade windfall needs to be spent by commodity-importers. The evidence on that having happened over the past 12 months is mixed. In an environment of post-crisis traumatic stress, it could be that consumers and companies are playing it safe, using their windfall to save or pay down debt, rather than spend (Haldane (2015)).

It is simply too soon to tell how potent contagion from EMEs to the world economy will be. As events following the first two legs of the trilogy made clear, however, traditional trade channels are likely to be only part of the contagion story. In an integrated world, financially and informationally, banking and uncertainty channels may be every bit as important. Indeed, during the first two legs of the trilogy, they were often the most potent channels.

It may be third time lucky. Even today, EMEs remain somewhat less integrated into global capital markets than advanced economies. Nonetheless, degrees of EME financial integration are significant and have grown rapidly. The share of bond issuance by EMEs as a proportion of total issuance has roughly doubled since 2006, from around 7% to 13%. As a proportion of global stock market capitalisation, EMEs have risen from 8% to 14%.

Banking channels are also potentially potent. UK-owned banks' exposures to Greater China total \$540 billion or 100% of core capital. Their exposures to EMEs total \$820 billion or 150% of core capital. By comparison, exposures to the United States – the epicentre of Part One of the trilogy - are \$655 billion. Exposures to the euro-area – epicentre of Part Two – are \$960 billion. On these metrics, Part Three is not so different.

Against these negative external forces are weighing solid UK domestic demand forces. Spending by UK consumers and companies continues around trend growth rates, supported by high levels of confidence, easy credit conditions and rising real incomes. The UK unemployment rate has fallen sharply, from over 8% to 5.5%. Estimates of slack in the economy have fallen sharply too. And with surveys suggesting skill shortages, there is now some evidence of a long-awaited pick-up in wage growth.

While the UK's recovery remains on track, there are straws in the wind to suggest slowing growth into the second half of the year. Employment is softening, with a fall in employment in the second quarter and surveys suggesting slowing growth rates. Surveys of output growth, in manufacturing, construction and possibly services, have also recently weakened. All of these data were taken prior to recent EME wobbles.

Standing back a little, output surveys suggest UK growth has been on the gentlest of downward glidepaths since early 2014. The descent appears to be continuing into the second half of the year. This demand pattern does not suggest UK monetary conditions have been over-accommodative. That would have generated a pattern of above-trend and rising growth rates. Instead, we have had a pattern of at-trend and falling growth rates.

Part of the reason may be the 20% appreciation of sterling in effective terms since mid-2013. Although it is difficult to pinpoint its precise causes, this appreciation is at least in part a monetary phenomenon. The lion's share of sterling's rise probably reflects the tightening of UK monetary conditions relative to other countries, the US excepted. During the course of this year alone, at least 35 countries have loosened monetary conditions.

That is relevant when turning from the real to the nominal side of the UK economy. The picture here is a weak one. Headline UK consumer price inflation is close to zero, having been significantly but temporarily depressed by lower energy prices. Even after stripping out food and energy prices, however, the Bank's range of core inflation measures average around 1% - in other words, one percentage point shy of the Bank's inflation target.

Much the same could be said of labour costs. Stripping out volatile bonuses, whole economy wage inflation lies in the 2-3% zone. And while underlying wage growth has nudged-up this year, this rise has been at least matched by higher productivity growth. That leaves unit wage growth at probably no more than 1% and possibly less – again, about a percentage point shy of the levels necessary to hit the inflation target.

With subdued world growth and prices, and a sharp appreciation of sterling whose effects in lowering imported prices have yet fully to pass-through, I am not as confident as I would like that one percentage point of additional nominal pick-up will be forthcoming over the next two years. In my view, the balance of risks to UK growth, and to UK inflation at the two-year horizon, is skewed squarely and significantly to the downside.

Against that backdrop, the case for raising UK interest rates in the current environment is, for me, some way from being made. One reason not to do so is that, were the downside risks I have discussed to materialise, there could be a need to loosen rather than tighten the monetary reins as a next step to support UK growth and return inflation to target.

Thank you.



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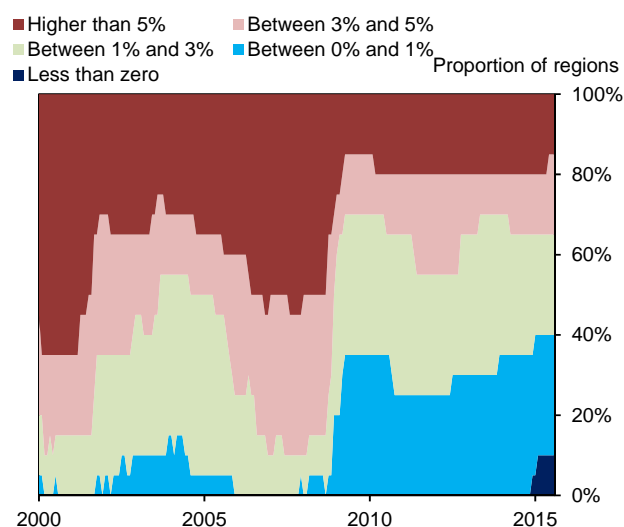
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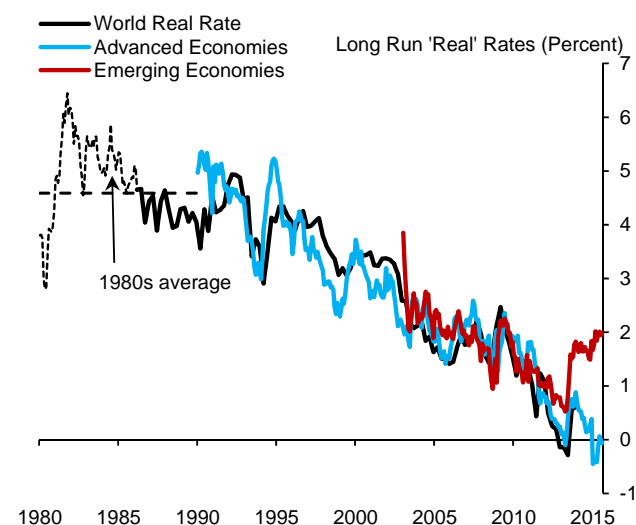
## Appendix

**Chart 1: International policy rates since 2000**



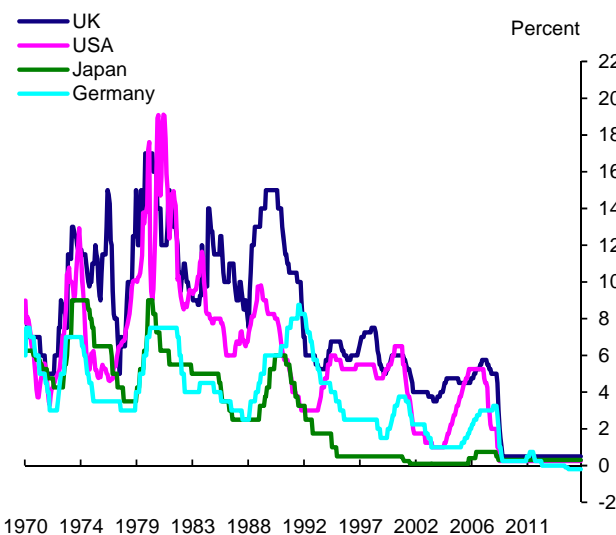
Source: Thomson Reuters Datastream, CEIC and Bank calculations. Note: Included regions are: Australia, Brazil, Canada, China, Euro area, Hong Kong, India, Indonesia, Malaysia, New Zealand, Norway, Philippines, Singapore, South Korea, Sweden, Switzerland, Taiwan, Thailand, UK and US. Together these countries account for approximately 70% of PPP-weighted world GDP. Data are to August 2015.

**Chart 2: Global real rates since 1980**



Source: King and Low (2014); Bank Calculations. Note: The 'World' real rate is taken from King and Low (2014) and shows the average 10-year yield of inflation-linked bonds in the G7 countries (excluding Italy) over the period 1985-2013. It has been extended back to the 1980s (dotted line) using a simple regression linking it to movements in UK 10-year nominal yields and RPI inflation. The red and blue lines are calculated as the nominal yield on 10-year sovereign bonds minus 1-year ahead inflation expectations from Consensus Economics. Figures have been GDP-weighted together for 20 advanced economies and 17 emerging markets.

**Chart 3: International policy rates since 1970**



1970 1974 1979 1983 1988 1992 1997 2002 2006 2011  
Source: Datastream; Bank calculations.

**Table 1: Policy rate loosening cycles across countries**

Country	1970-2014		1994-2014	
	Range	Duration	Range	Duration
United Kingdom	5.0	23.8	2.8	16.5
United States	5.4	19.8	3.0	13.8
Germany	4.5	49.8	3.1	48.5
Japan	5.9	77.3	-	-
SUM	5.2	42.7	3.0	26.3

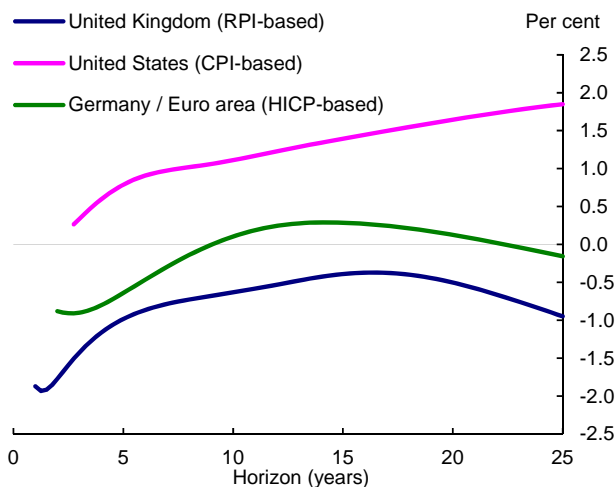
Source: Bank calculations; Bank of England; Deutsche Bundesbank; FRED database at St. Louis Fed. Note: Monthly data. Loosening cycles are assigned to subsamples according to the month of initial trough. Ranges are in percentage points and durations in months.

**Table 2: Cumulative recession probabilities**

Horizon (years)	Cum. recession probability			Probability of interest rate above 3%
	UK 1700-2014	UK 1946-2014	UK,US,DE,JN 1870-2014	
1	29.0%	13.0%	17.4%	0.4%
5	81.9%	50.3%	61.4%	34.9%
10	96.7%	75.3%	85.0%	41.0%

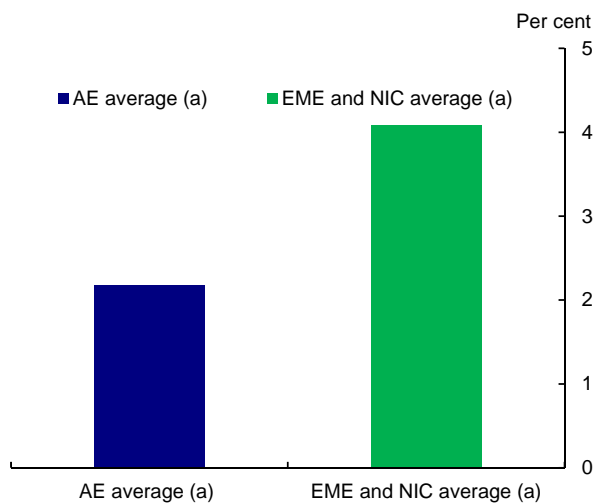
Source: UK: One Bank Three Centuries of Macroeconomic Data. US, Germany, Japan: Maddison, FRED.  
 Note: An annual recession is defined as negative annual growth. The cumulative probability is the probability that there will be at least one annual recession within a given horizon assuming that recessions arrive according to a Bernoulli process. The probabilities that the realised short-term interest rate will exceed 3% at different horizons are estimated from the implied density function from options prices on 3-month LIBOR rates.

**Chart 4: Forward real interest rate yield curves**



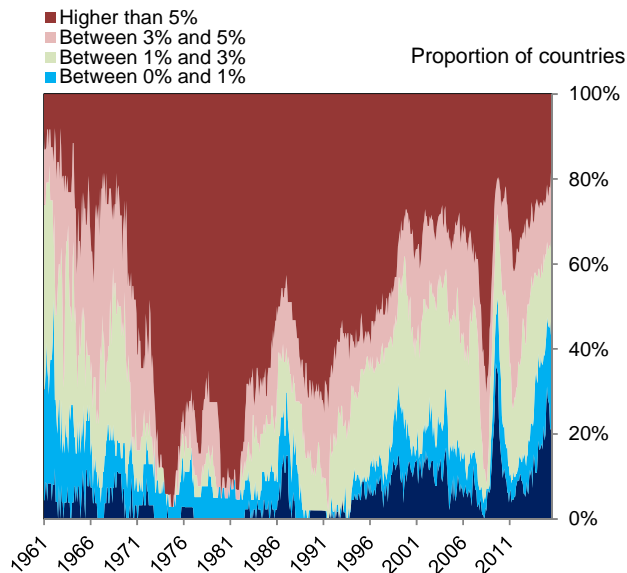
Source: Bloomberg and Bank calculations.  
 Note: Data for the United Kingdom and the United States are derived from nominal bond yields deflated using inflation swaps. The Germany/EA figures are based on nominal Bund yield deflated using euro-area inflation swaps (as a proxy for the euro-area risk free rate). The measure of inflation used is RPI for the United Kingdom and CPI for the United States and the euro area. Data are to 15 September 2015.

**Chart 5: Inflation targets in advanced economies, EMEs and NICs.**



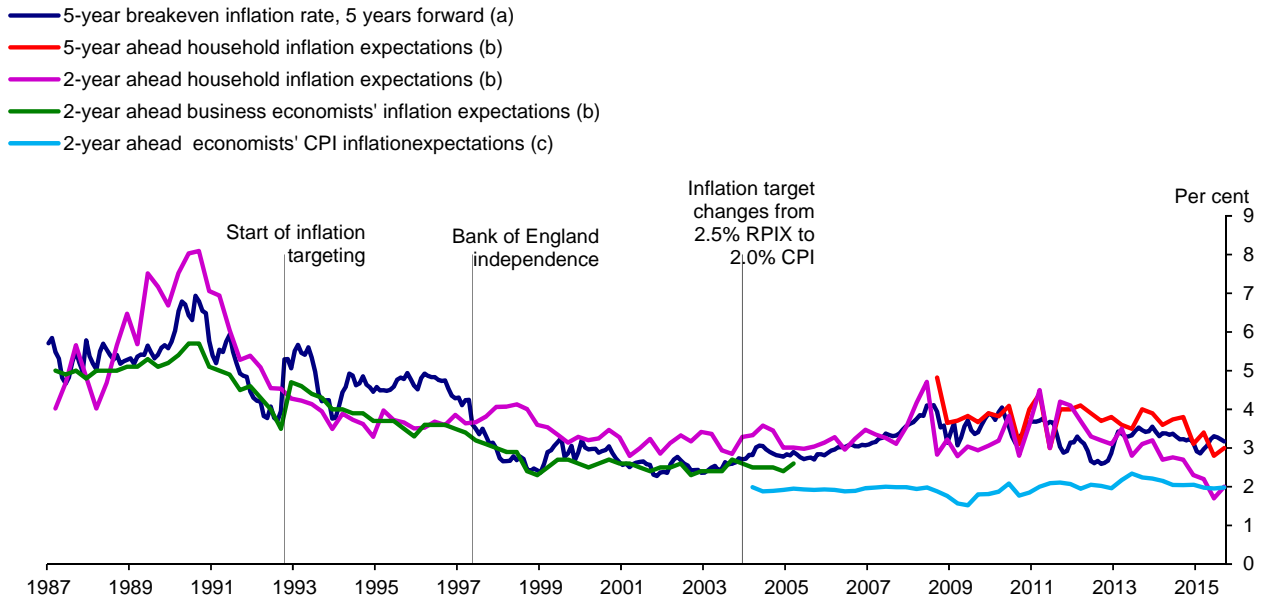
Note: (a) Averages comprise 9 countries in each grouping, each accounting for approximately 34% of world PPP weighted GDP.

**Chart 6 International inflation rates since 1960**



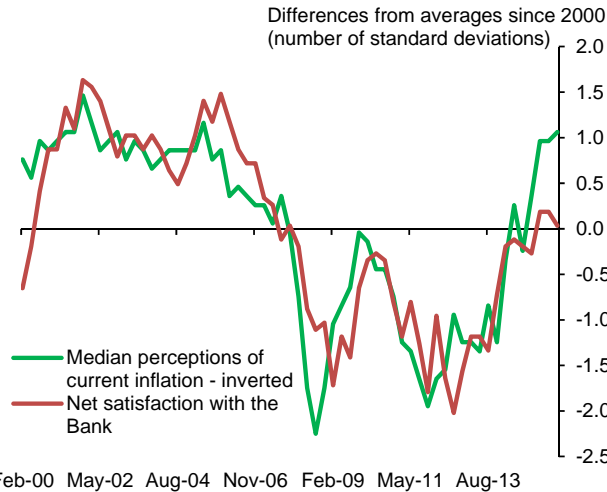
Source: Datastream and Bank calculations.  
 Note: Sample varies over time. Average sample sizes are: 30 countries between 1960 and 1980, 55 between 1980 and 2000 and 110 from 2000 onwards. Data are to July 2015.

### Chart 7: Inflation expectations



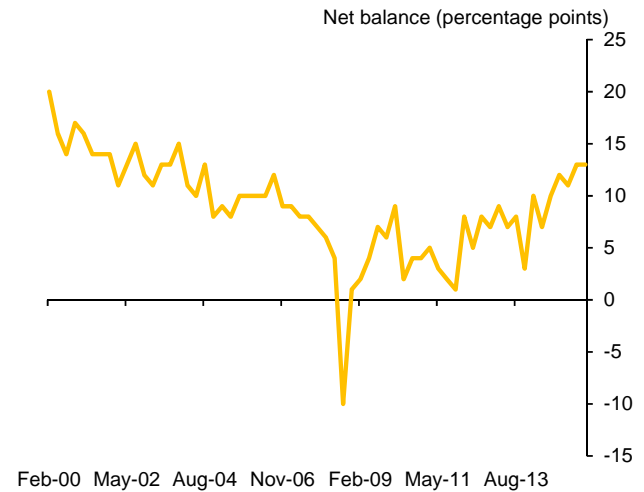
Source: Barclays, Bloomberg and Bank calculations.  
 Note: (a) Derived from index-linked gilts referenced to RPI. (b) Barclays Basix survey. Data do not refer to a specific inflation index. (c) Bank of England Survey of External Forecasters. Financial markets data to 14 September 2015, survey data are to 2015Q3.

### Chart 8: Satisfaction with the Bank and median perceived inflation rate



Source: Quarterly Bank of England GfK Inflation Attitudes survey.  
 Note: (a) "Overall, how satisfied or dissatisfied are you with the way the Bank of England is doing its job to set interest rates in order to control inflation?" (b) "Which of these options best describes how prices have changed over the last 12 months?" Data are to August 2015.

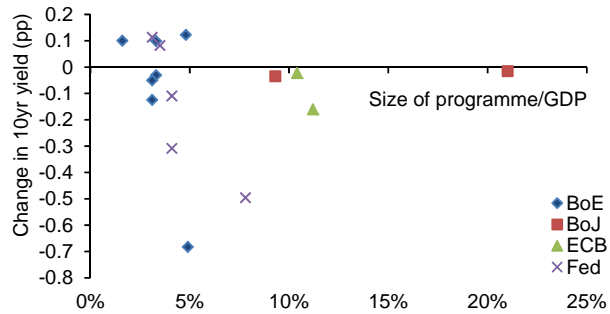
### Chart 9: Balance of public opinion about the level of the inflation target



Source: Quarterly Bank of England GfK Inflation Attitudes survey.  
 Note: Respondents were asked the following question "The Government has set an inflation target of 2%. Do you think this target is too high, too low or about right?" Respondents who answered 'about right' and 'no idea' are not shown on the chart. Data are to August 2015.

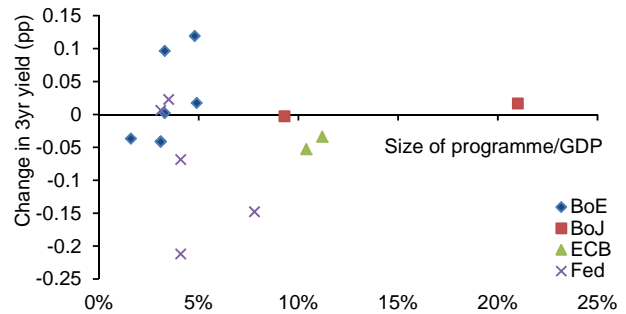


**Chart 10a: Change in long rates around selected QE announcements**



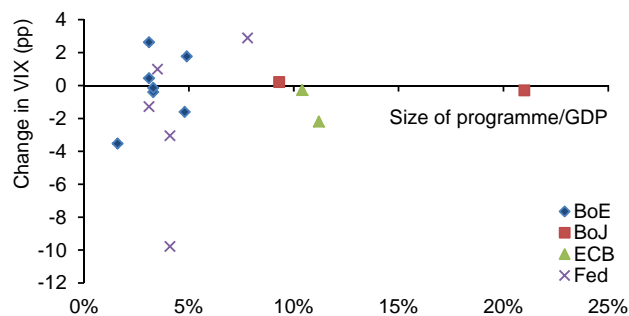
Source: Bloomberg and Bank calculations.  
 Note: Change in 10 year spot market interest rates over two day windows around QE events, against size of announcement relative to that economy's GDP at the time. Does not control for expectations of QE announcements.

**Chart 10b: Change in short rates around selected QE announcements**



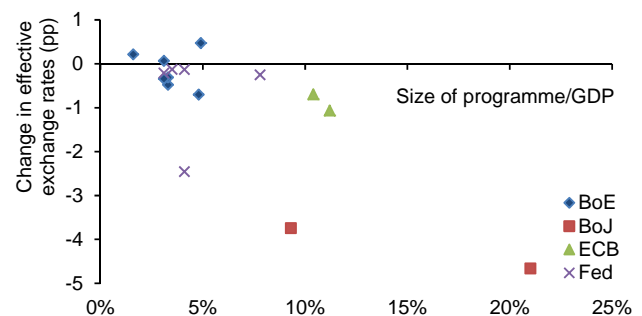
Source: Bloomberg and Bank calculations.  
 Note: Change in 3 year spot market interest rates over two day windows around QE events, against size of announcement relative to that economy's GDP at the time. Does not control for expectations of QE announcements.

**Chart 10c: Change in VIX around selected QE announcements**



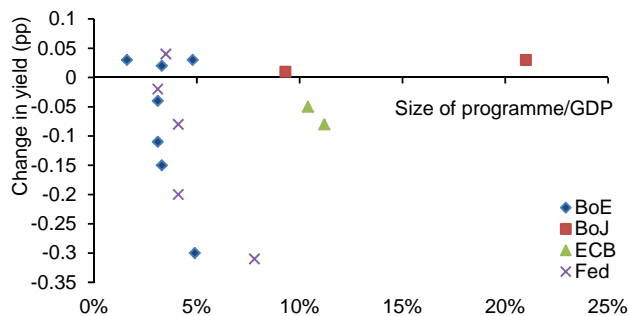
Source: Bloomberg and Bank calculations.  
 Note: Change in VIX over two day windows around QE events, against size of announcement relative to that economy's GDP at the time. Does not control for expectations of QE announcements.

**Chart 10d: Change in effective exchange rates around selected QE announcements**



Source: Bloomberg and Bank calculations.  
 Note: Change in effective exchange rates over two day windows around QE events, against size of announcement relative to that economy's GDP at the time. Does not control for expectations of QE announcements.

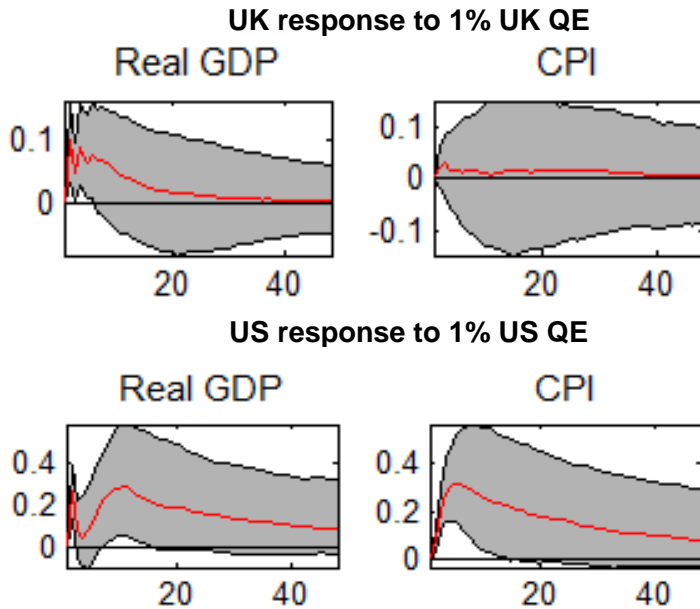
**Chart 10e: Change in corporate bond yields around selected QE announcements**



Source: Bloomberg and Bank calculations.  
 Note: Change in investment grade corporate bond yields over two day windows around QE events, against size of announcement relative to that economy's GDP at the time. Does not control for expectations of QE announcements.



**Chart 11: Estimated impacts of UK and US QE on UK GDP and inflation**



Source: Weale and Wieladek (2015)

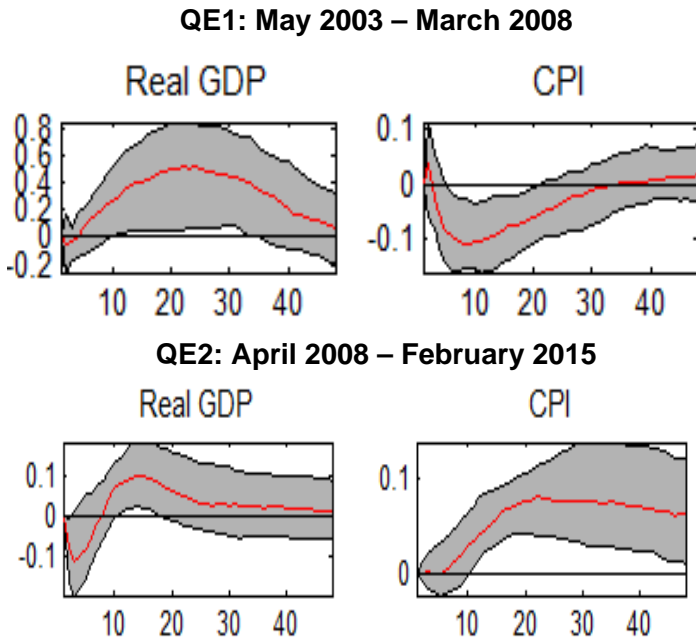
Note: The chart shows VAR impulse responses of real GDP and CPI in response to a one percent asset purchase announcement shock in terms of 2009Q1 GDP. The shock has been identified with a Choleski identification scheme. As there is currently no consensus identification scheme to identify QE shocks, this is only one out of four possible identification schemes proposed in Weale and Wieladek (2015). Due to this identification uncertainty, they report an 0.3% average impact across these four different identification schemes.

**Table 3: Estimates of QE impact from the empirical literature**

Study	Episode	Real GDP	CPI
Baumeister and Benati (2012)	UK/US QE1	1.8% / 1.08%	1.5% / 0.84%
Kapetanios, Mumtaz, Stevens and Theodoris (2012)	UK QE1	2.5%	1.5%
Weale and Wieladek (2015)	UK/US QE1	3.08% / 1.12%	4.2% / 1.2%
Giannone, Lenza, Pill and Reichlin (2014)	ECB Liquidity policy 2008/2009	2% in IP	N/A
Altavilla, Giannone and Lenza (2014)	ECB OMT Impact on Spain/Italy	2% / 1.5%	0.74% / 1.21%
Schenkelberg and Watzka (2013)	Japan QE1	0.5% in IP	No impact
Bank of Japan (2015)	Japan QE2	1-3%	0.6-1%
Chen, Curdia and Ferrero (2012)	US QE2	0.39%	0.12%
Del Negro, Eggertson, Ferrero and Kiyotaki (2015)	Fed MBS + Liquidity policies	5%	3%
Gertler and Karadi (2013)	QE1 – MBS Purchases	3.5%	4%
Gertler and Karadi (2013)	QE1 – Sovereign Purchases	2.2%	3%

Note: This table shows the impact of unconventional monetary policies on real GDP and CPI estimated by various SVAR (the first seven) and DSGE model (last four) studies.

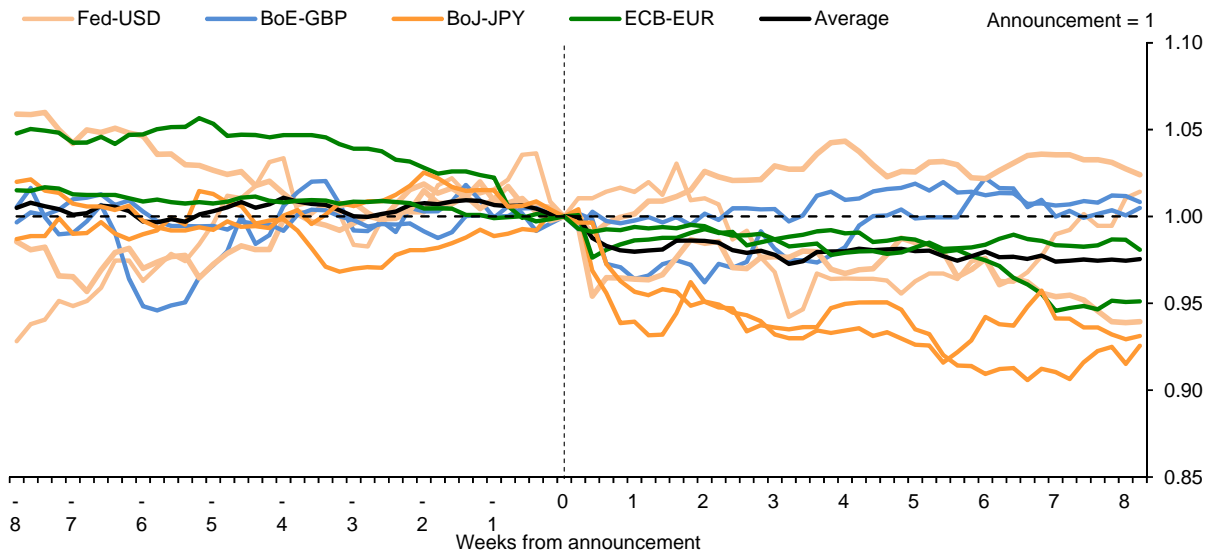
**Chart 12: Estimated impacts of BoJ QE on GDP and inflation**



Source: Bank of England

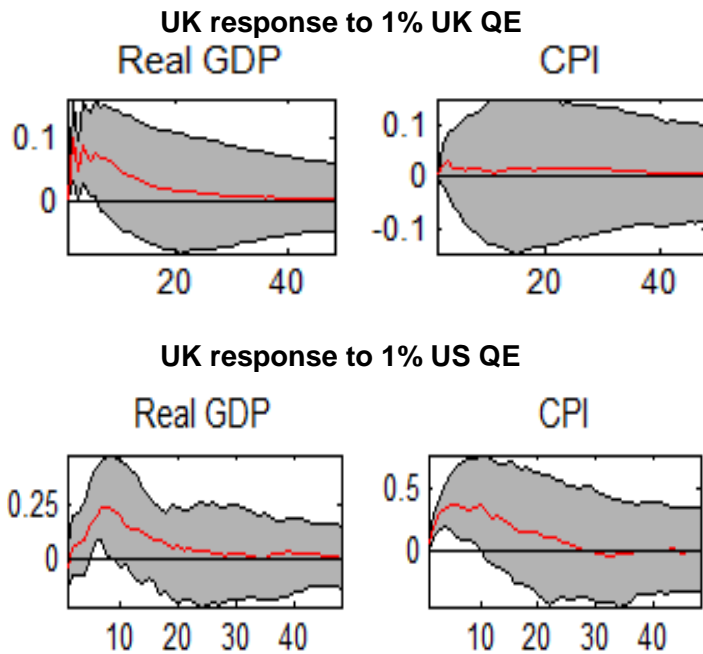
Note: The impulse responses shown above are from a VAR model estimated on the series of actual JGB asset purchases by the Bank of Japan, identified with a Choleski decomposition, where the variables were ordered CPI, monthly activity index (as proxy for GDP), asset purchases as a fraction of Q2 2003/2008 GDP, the yield on the 10-year government bond and share prices divided by the CPI. The first panel suggests that QE1 in Japan had an impact on real activity, but not prices, which is roughly in line with the survey in Ugai (2007). The multipliers in the second panel suggest, once the total size of purchases is taken in account, a similar total impact as found in Bank of Japan (2015).

**Chart 13: FX dynamics around selected QE announcements**



Source: Bank of England, ECB, Federal Reserve, Bloomberg, Bank of Japan, Bank Calculations

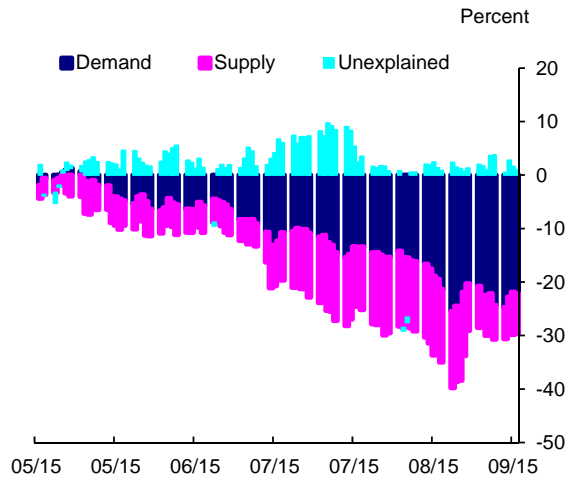
**Chart 14:** Estimated impacts of UK and US QE on UK GDP and inflation



Source: Bank of England

Note: The first panel is taken from Weale and Wieladek (2015) as in chart 11. The second panel is the result from a 10 variable VAR model containing the following variables: US CPI, US real GDP, US Asset purchase announcement scaled by 2009Q1 US GDP, the 10- year yield on US government debt, US share prices scaled by US CPI, UK CPI, UK real GDP, UK Asset purchase announcement scaled by 2009Q1 UK GDP, the 10- year yield on UK government debt, UK share prices scaled by UK CPI. We then apply a choleski decomposition to the variables listed in that order and examine the impact of a one percent shock to the US asset purchase announcement on real GDP and CPI.

**Chart 15:** Decomposition of oil price movements



Source: Datastream, Bank of England calculations.

Note: This decomposition of the Brent oil price is based on over 200 financial time series, mostly sector equity indices for major oil producing and consuming countries. The pattern of price movements is used to identify supply or demand shocks, e.g. if consumer and oil equities rise simultaneously this would be indicative of an increase in demand for oil.