



BANK OF ENGLAND

# Speech

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## Unconventional monetary policy

Speech given by

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## Introduction

Thank you for inviting me here today. I would like to talk about unconventional monetary policy. I am speaking to you about this not because I anticipate that the Monetary Policy Committee will have recourse to expand its use of unconventional policy any time soon. As we said in our most recent set of minutes, we collectively believe it more likely than not that the next move in rates will be up. I certainly consider this to be the most likely direction for policy. The UK labour market suggests that medium-term inflationary pressures are building rather than easing; wage growth may have disappointed, but a year of zero inflation does not seem to have depressed pay prospects further.

However, I want to discuss unconventional policy options today because the Committee does not want to be a monetary equivalent of King Æthelred the Unready.<sup>1</sup> It is as important to consider what we could do in the event of unlikely outcomes as the more likely scenarios. In particular, there is much to be said for reviewing the unconventional policy the MPC has already conducted, especially as the passage of time has given us a clearer insight into its effects. Therefore this will be, for the most part, a retrospective view on what was achieved by the policies of quantitative easing and forward guidance which the Monetary Policy Committee has adopted while I have been a member. However, I will also offer some thoughts on two other unconventional policy options that are widely discussed: monetary finance and negative interest rates. The first has been explored in detail by Turner (2015a,b) while the second was considered by the Committee in 2013 (see Bean, 2013).<sup>2</sup>

But to begin at the beginning, if I may borrow from Dylan Thomas.

At the start of the financial crisis in 2008, central banks reduced their policy rates very sharply. In the United Kingdom, the Bank Rate was cut from 5 ½ per cent late in 2007 to ½ per cent in March 2009.

My predecessors on the Committee considered that ½ per cent was an effective floor to Bank Rate – further reductions would risk worsening the profitability of building societies leading to a tightening rather than an easing of credit conditions- and embarked on quantitative easing as a means of providing further support. After I joined the Committee, we undertook two further rounds of this in late 2011 and 2012 as our concerns about the effects of the crisis in the euro area reached their height.

On top of this, to make policy more effective, in August 2013 the Committee adopted a policy of forward guidance- setting out clearly the conditions which would need to be met for an increase in the Bank Rate to be considered. Slightly earlier that year the Committee reviewed the issues which would be raised by negative interest rates. The Committee has not had a discussion of the policy of monetary finance, but I

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<sup>1</sup> In fact Unready means poorly advised rather than unprepared.

<sup>2</sup> I will stay off the topic of the Funding for Lending Scheme because at present there is no indication that banks have difficulties with funding their lending.

must say that, when I look at the millions of reichsmarks I have at home, I find it impossible to believe that it is not an effective way of generating inflation on a grand scale. How well it would work at raising the inflation rate to two per cent is perhaps a different matter.

## **Quantitative Easing**

This consists of purchases of outstanding debt by the central bank. In the United Kingdom the debt purchased was almost entirely government debt while in the United States there were also substantial purchases of asset-backed securities. The European Central Bank started to conduct this sort of policy last year, while the Bank of Japan has been doing so since 2001.

For outside observers, perhaps the easiest way of understanding the implications of this is to think of the Bank of England's balance sheet as part of the broader public sector balance sheet. Any public sector debt held by the Bank of England as an asset against which it issues deposit liabilities is then netted out. So, if the Bank of England buys in, say twenty-year debt, that debt is replaced by a short-term liability- a deposit at the Bank of England- and the effective maturity of the consolidated public sector's liabilities has shortened. Of course, the only institutions allowed to have accounts at the Bank of England are commercial banks and similar bodies, and they are not typically big holders of long-dated government debt. But you can think of the process as being one whereby a holder of long-term debt sells it to the Bank of England in exchange for a cheque drawn on the Bank of England. That holder pays the cheque into their commercial bank account, and the commercial bank sees an increase in the balance that it holds at the Bank of England. Asset prices adjust so that someone is happy with holding more money in their bank account, even if that someone is not the original holder of the debt. But a point I would stress is that this process does not involve the government giving money to the banks or to anyone else. It is a change to the structure of government debt and it is one which policy-makers probably do not intend to be permanent.

Theoretical analysis has had some difficulty in identifying the channels through which asset purchases work. Bernanke (2014) remarked that asset purchases work in practice but not in theory. Miles (2013) suggested that asset purchases may be more effective at times of market paralysis, perhaps because theory has less to say about market paralysis than about normal times.

In fact, three mechanisms have been proposed by which asset purchases might influence economic activity. The first is the portfolio balance model. In a world in which the expectations hypothesis does not hold because different types of investors face different types of risk and as a consequence have preferred habitats at different maturities on the yield curve, a shortening of the maturity of government debt will result in a fall in the yields on long-term debt. To the extent that there is substitutability between government debt and other assets, such as corporate bonds, shares and property, yields on these will also decline. The result will be capital gains which are likely to support consumption, while lower yields on shares and corporate

bonds will make the financing costs of fixed investment lower and thus more appealing. Asset purchases should add to both consumption and investment demand.

The second mechanism proposed is that asset purchases provide a signal that short-term rates are expected to remain low for longer than might otherwise be the case (Bhattarai, Eggertson and Gafarov, 2015). Policy committees would not buy assets if they thought that Bank Rate increases were likely to be appropriate in the near future. In that sense it is a bit like one form of forward guidance, and I will say a bit more about this mechanism later.

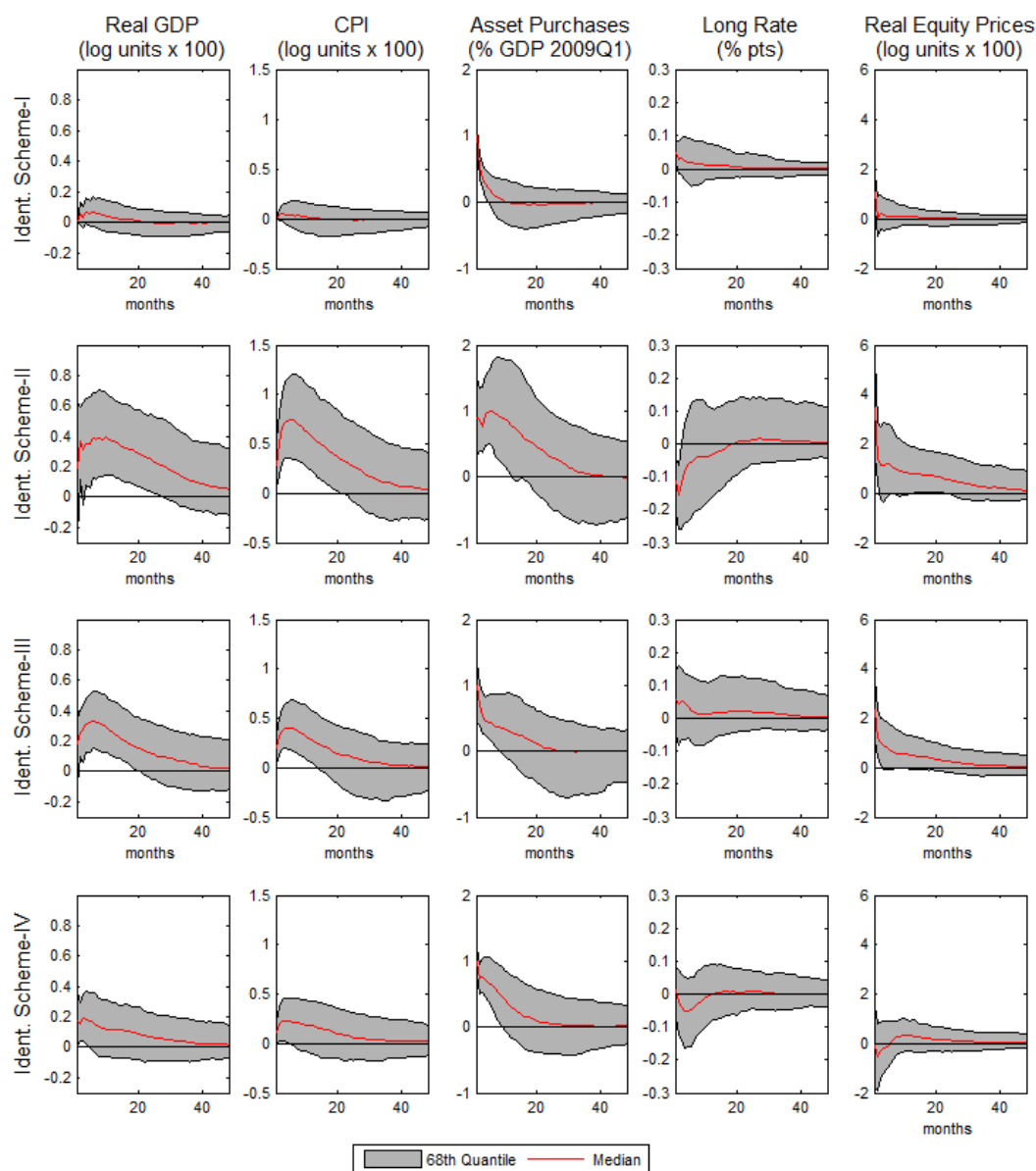
The third route by which asset purchases might support demand is through an uncertainty channel. The effect might not be so much on the average, as in reducing perceived risks of major disasters. For example, asset purchases might be thought to reduce the risk of the sort of stock market crash we saw in 1974. At a time when people are nervous, reducing risks like this is itself likely to add to demand.

But before exploring these mechanisms, it is important to consider the question Bernanke's comment raises. Is it true that the policy works in practice? Early studies of the effects of asset purchases tended to make assumptions about the mechanism and then follow through the consequences of this. For example, Kapetanios, Mumtaz, Stevens and Theodoridis (2012) looked to see by how much long-term interest rates moved following announcements of asset purchases, and then used an existing model to explore the consequences of this for demand and output.

At that time there was probably little else that could have been done, but there is a material concern about this analysis. It is quite likely that the structure of the economy was different in the period after the financial crisis from that before. If that is the case, then the response of the economy to shocks may well be different after the crisis, and a model which is estimated using both pre and post-crisis data may therefore be misleading.

My former colleague, Tomasz Wieladek, and I therefore addressed the issue, looking at both the United Kingdom and the United States but using data only for the period since early 2009. Even with quarterly data there are not many post-crisis observations, and we therefore made use of monthly estimates of GDP. Those for the United Kingdom were provided by the National Institute of Economic and Social Research (Mitchell, Smith, Weale, Wright and Salazar, 2005) while those for the United States were provided by Macroeconomic Advisers. The headline UK inflation rate showed sharp movements in this period as a result of changes in the rate of Value Added Tax. We therefore worked with CPIY, the consumer price index calculated showing goods priced net of indirect taxes. The United States consumer price index was not distorted in the same way.

**Figure 1: The Effects of an Asset Purchase Shock**



Source: Weale and Wieladek (2015)

By using only data from the period in which large-scale asset purchases took place, this means that it is possible to use these purchases, rather than the short-term interest rate, as the indicator of monetary policy. There are, however, a number of important questions about exactly how these are defined. Should we look at announcements or actual transactions? How do we treat open-ended announcements by the Federal Reserve Board? What is the best way of describing the Operation Twist announcement (purchase of long-dated government debt financed by the issue of short-dated stock rather than bank reserves)? Our paper discusses these issues and we explore the sensitivity of our results to a range of different assumptions. Here I would like to focus on our main findings. Our methodology uses vector autoregressions

and, in principle, these allow us to separate out the effects of shocks, i.e. of that component of asset purchases which is a response to past developments from the effects of unexpected asset purchases or purchase announcements.

The way in which this is done merits, however, some discussion. As I mentioned, previous work tended to assume that the effects of unanticipated asset purchases were transmitted through long-term interest rates and perhaps share prices, and the models assumed that movements of these affected GDP and CPI. We use four different ways of identifying the effects of shocks. The first makes assumptions about the sequencing of events, assuming, for example that asset prices react to GDP and CPI instantaneously, but that GDP and CPI react to asset purchases only with a lag. The second and third schemes make assumptions about the signs of responses in the observed variables to different types of shock, but crucially do not make any assumptions about the signs of the responses to asset purchase shocks. The final scheme makes assumptions about both signs and the relative magnitudes of different types of shocks. Again I can refer you to our paper to read about these in more detail. But I show in Figure 1 our estimates of the effects of asset purchase shocks in the UK on real GDP, CPI, asset purchases themselves, long-term (10-year) interest rates and equity prices adjusted for changes in the cost of living.

The first two columns show the results of greatest interest- the impacts on GDP and CPI; one unit on each of these graphs is roughly one percentage point. The red lines show the median estimate – the truth is equally likely to lie above it or below it. The grey bands show confidence intervals; just over two-thirds of the possible outcomes are thought to lie within these bands. You might look to certainty from the Monetary Policy Committee, but in fact we can have to describe things as they actually are, and they are rarely certain. Blaming the economy or the data for not being clear enough is no more fruitful than blaming the weather. Anyway, if I take the average of the four medians, that offers some policy-making guidance as to the effects of the policy. In Table 1 I show these averages across all four identification schemes, presenting our estimate of the maximum impact of the first round of asset purchases. I also show estimates produced by two earlier studies.

You can see that the effect on GDP is not very different from what was estimated earlier- at least, although the figures are higher than those of Kapetanios *et al*, it is difficult to say that the difference is material. The impact on CPI is, however, markedly bigger. These estimates of the impact on CPI relative to GDP are nearly three times those of earlier work. No one could say that this is right and the other studies are wrong. I also show, however, the results of studies which looked at the effects of interest rate shocks on CPI and GDP. You can see that the ratio of these two, shown in the third column of the table, estimated by us is much closer to what others have found for the effect of interest rate movements.

**Table 1: Output and Inflation Effects of Monetary Stimulus**

Country	Study	CPI Impact	GDP Impact	Ratio
Asset Purchases*	Weale and Wieladek (2015)	4.2	3.1	1.3
	Kapetanios et al (2012)	1.5	2.5	0.6
	Baumeister and Benati (2013)	1.5	1.8	0.8
Interest Rate**	Liu et al (2011)	-1.15	-0.5	2.3
	Cloyne and Hurtgen (2014)	-1	-0.6	1.7

\* Asset purchases of fourteen per cent of GDP for Weale and Wieladek. For Baumeister and Benati (2013)/Kapetanios et al (2012) we show the peak response to a one percent decline in the long-term to short-term rate spread. These authors estimated that was the impact of QE1 on long rates and assumed that this was the transmission mechanism.

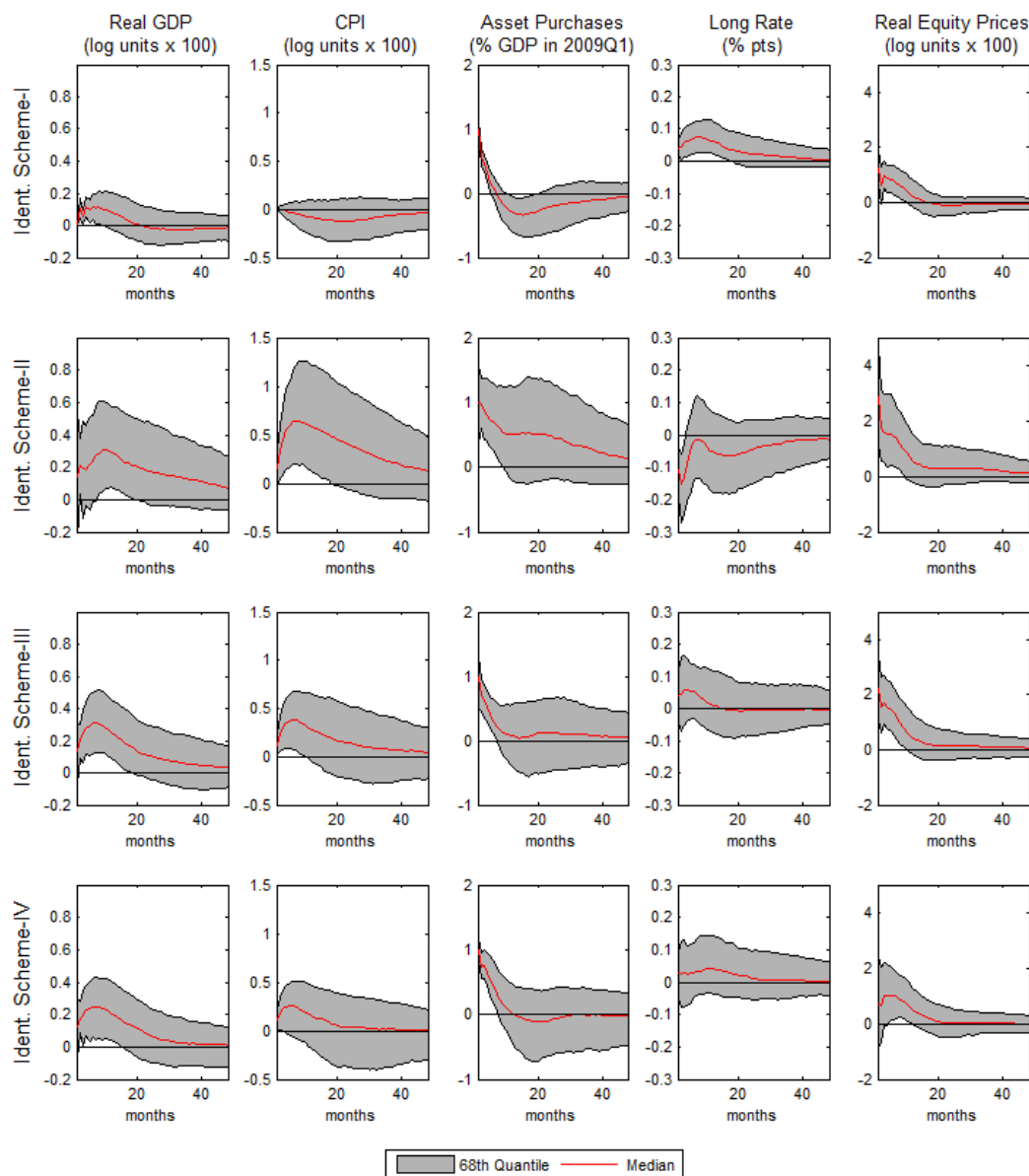
\*\* An interest rate increase of one percentage point

Source: Weale and Wieladek (2015)

This raises an interesting question. The Monetary Policy Committee has taken the view that the high inflation in the period 2010-2012 was largely the result of external factors, but perhaps more of it may have been home-grown than we thought. Of course recently the UK has been a bit low on inflation and the Committee has also attributed this largely to external effects. But you can see from the graphs that, after some months the effects of asset purchases on the price level start to fade; this means that the inflation rate – the growth of the price level- is depressed below what it would have been in the absence of the asset purchase shock. So perhaps we have overstated the effect of the strong exchange rate in pushing down on inflation over the last couple of years, and should attribute more of that to the fading effects of asset purchases as the historic purchases stop pushing up on the price level. The same might be true of GDP growth, although to a lesser extent. I should add that the results in our paper suggest that the policy worked through reducing uncertainty rather than through significant reductions in either the long rate of interest or expected future short-term rates of interest.

You might wonder whether these results all hinge on the power of asset purchases in 2009. As previously mentioned, Miles (2013) suggested that they might be more effective when financial markets are very disrupted than when these markets are functioning normally. We therefore re-estimated our model using data only for the period from March 2010 to May 2014. The effects of asset purchase shocks on the key variables are shown in Figure 2. Comparing these with Figure 1 you can see that the patterns are not very different, suggesting that asset purchases were indeed effective from 2011 to 2013. That does not, of course, prove that they would be as effective if used once more. But the best evidence I have suggests there is good reason to think that they would be. Indeed this has been one reason why I have perhaps been closer to supporting a rate increase than some of my colleagues over the past couple of years. There is less reason to delay policy tightening if you are confident that you have a means of providing material further support should it be needed.

Figure 2: The Effects of Asset Purchases estimated over the Period March 2010 to May 2014



Source: Weale and Wieladek (2015)

I would like to make one further point on the question of asset purchases. The UK's purchases were almost entirely of gilts, while the United States Federal Reserve Board also bought mortgage-backed securities. While there were, at that time, very good reasons why the Bank of England did not want to make substantial purchases of private-sector assets, it is not clear to me how far those are necessarily an insuperable obstacle. The Bank of England has three hundred years of history of buying private sector bills of exchange, stretching up to the closure of the bill market shortly before the crisis. In 1983 it held private sector assets to the value of about five per cent of GDP. That does not automatically provide a template for purchases of private-sector assets, but it may indicate that the difficulties seen in the past could be resolved.



## Forward Guidance

If the answers as to the effects of quantitative easing are imprecise, then that is all the more true of forward guidance. Depending on how you look at it the effects can seem very powerful, or they can seem relatively weak. Forward guidance comes in a number of different shapes and sizes. The Monetary Policy Committee (2013) made an important distinction between time-dependent forward guidance and state-dependent forward guidance. In this section I would like to explore a form of state-dependent guidance, albeit one which is simpler, and therefore easier to model, than that adopted by the Monetary Policy Committee. Time-dependent forward guidance is a policy of providing a commitment to a particular path for Bank Rate. In the particular context of trying to provide a stimulus to the economy when an easing of monetary policy seemed desirable, but the Bank Rate was constrained at its floor, the Committee would promise to hold the Bank Rate at that floor for longer than might otherwise seem desirable. This means, of course, that the Committee is promising that its future self will keep Bank Rate fixed whatever the circumstances of the time – a promise that might seem difficult to keep given the unpredictable nature of the British economy. Early analysis of the effects of this type of guidance was made in a world of complete certainty.

In these circumstances, it turns out that a commitment to keep interest rates low in the future has a powerful immediate effect on both output and inflation, at least if people's current decisions are influenced by expectations about the future. Furthermore, promises to set Bank Rate at a low level a long way out have more of an impact on the present than do promises to hold Bank Rate low in the near future (Blake, 2015). The scepticism with which this finding was observed led to the result being described as the forward guidance puzzle. I certainly find it hard to believe that, were I not near the end of my term on the Committee, a promise to vote with my colleagues for some particular outcome say two years ahead could have such a powerful impact now.

Of course, one reason why the promise might not be effective is that it would not be believed. Who knows what the future will bring and what interest rate will be appropriate to the circumstances; the Committee might be reluctant to stick to a policy which had become quite inappropriate. A simple variant of the implications of this was examined by Carlstrom, Fuerst and Paustian (2014). They considered a situation where the guidance was that Bank Rate would be held constant, but there was a known probability that this policy would come to an end. With a suitably high probability of terminating the policy, the impact was, not surprisingly, rather smaller than when a promise was going to be kept with certainty.

Nevertheless, a form of guidance structured round the toss of a coin hardly seems a satisfactory means of analysing something as important as monetary policy. In any case, there is a problem with analysing a policy on the assumption that, once it is ended, it will never again be re-introduced. If circumstances have arisen which make forward guidance a good idea now, they may happen again. Furthermore, the feature of the

models which makes forward guidance powerful, the impact of the future on the present, means that those future circumstances should be having a very powerful impact on the present. So analysis of time-dependent policies in a world of certainty creates more problems than it solves. Perhaps time-dependent policies of the type adopted by the US Federal Reserve Board had less impact than this certainty-based analysis suggests because people did not believe that the circumstances justifying them would endure.

A natural way of recognising this is to adopt a state-dependent policy rather than a time-dependent policy, and this is what the Monetary Policy Committee did in 2013. We said that we would not consider raising Bank Rate while unemployment was above seven per cent. However this constraint would be "knocked out" if one of three eventualities arose. First, if inflation appeared to be  $\frac{1}{2}$  percentage point or more above target at eighteen to twenty-four months, or, secondly if inflation expectations rose materially, the policy would be knocked out. Finally we said that the constraint would be knocked out if the Financial Policy Committee said that a Bank Rate increase was needed to ensure financial stability. In fact, as you know, unemployment has fallen well below our threshold of seven per cent but inflationary pressures have remained weak and the Committee has in fact not changed Bank Rate. The Committee described this framework as intended to make policy more effective rather than to provide any change in the underlying policy stance (MPC Minutes, August 2013, paragraph 31).

The purpose of this framework was, of course, to make clear that economic policy would adapt to circumstances as they evolved, while time-dependent guidance inhibits its adaption to developments. It was criticised for, among other things, not being clear about how long Bank Rate would stay at a low level, while of course this was the very point of the approach. Stuff happens and policy settings need to respond. They cannot simply carry on regardless. So some way is needed of setting this out formally.

Much academic work on economic policy is set out with reference to the Taylor rule (Taylor, 1993). This is a development of a pre-war idea that policy instruments should be set with reference to major economic variables (see for example Meade, 1937); i.e. that they should be state-dependent. The Taylor rule summarises how the interest rate can be set with reference to the inflation rate, relative to its target, and also with reference to the output gap. On top of this, the evidence also suggests that the current level of the interest rate is a strong influence on the future level; central banks are reluctant to make sharp moves in interest rates. Woodford (2003) suggested that this is not an affectation- or a dislike of so-called policy reversals, but that it can enhance the effectiveness of monetary policy. In essence, the argument is a relative of the time-dependent forward guidance argument. When Bank Rate is set at any particular level, the knowledge that it will be slow to move enhances the impact of any adjustments that are made. Indeed, my representation of forward guidance is a development from this insight.

The Taylor rule may suggest that Bank Rate should be below what is regarded as a practical minimum. Practical analysis of monetary policy has to take account of the so-called effective lower bound.<sup>3</sup> This means that models of monetary policy should ideally be solved using dynamic programming methods, as Adam and Billi (2007) show. These methods are purely numerical and, depending on the particular parameter values, they may or they may not converge to a stable solution.

Using these methods, Boneva, Harrison and Waldron (2015) have looked at the actual guidance of the Monetary Policy Committee, but with the assumption that the need for forward guidance never recurs. Alternatively, without this assumption, a form of state-dependent forward guidance can be specified by working from the Taylor rule. Katagiri (2015), in an accomplished piece of work, sets out estimates of the influence on the United States' economy of an approach to monetary policy of the form proposed by Reifschneider and Williams (2000). This involves a systematic departure from a Taylor (1993) type rule; during periods when the Taylor rule would point to an interest rate below the lower bound, the gap between the actual rate and the Taylor rule rate is cumulated. Once the Taylor rule rate rises above the lower bound, the actual rate is held below the Taylor rule until the cumulated gap is unwound.

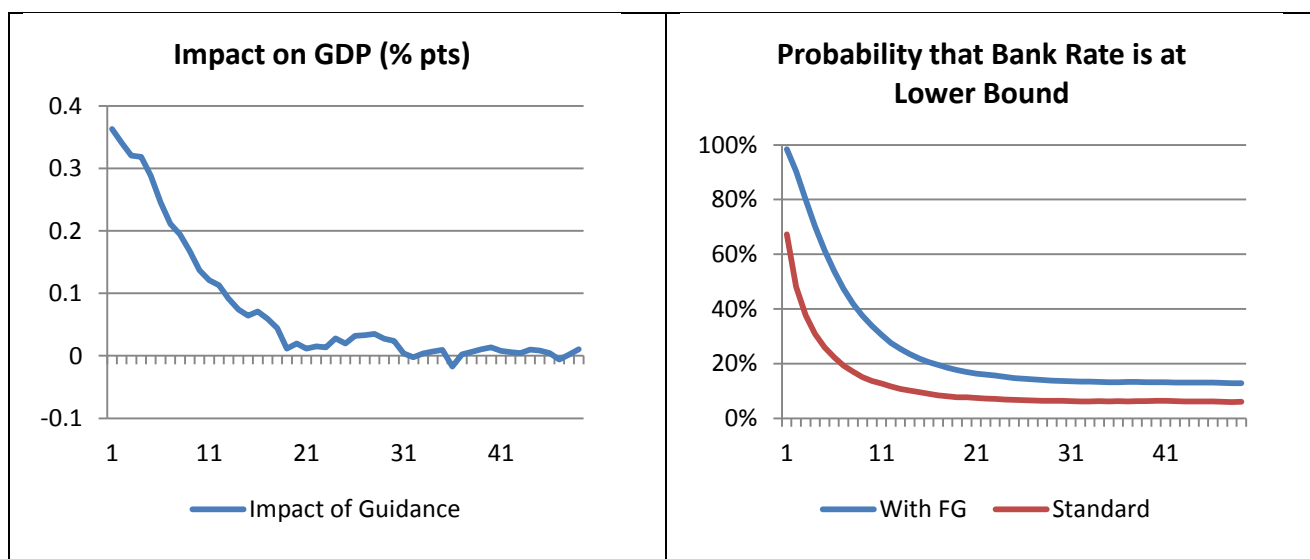
Let me now discuss a form of forward guidance closer than is Katagiri's framework to what the Monetary Policy Committee actually did, but which would provide a clear stimulus rather than just make existing policy more effective. Once the Taylor rule gives a Bank Rate of below, say, 1¼ per cent (the threshold Bank Rate), Bank Rate is in fact set to its lower bound, and that it is not raised until the Taylor rule once again gives a Bank Rate of at least 1¼ per cent. Dynamic programming methods make it possible to compute the path of the economy on the assumption that people know that this arrangement is permanently in place. So, if, for example, the economy revives sufficiently for the Bank Rate to be set at 1¼ per cent, everyone knows that, should things turn down, the Bank Rate will revert to ½ per cent. The framework does imply that at some time the Bank Rate will jump from ½ per cent to 1¼ per cent, while the Monetary Policy Committee has stressed the importance of gradual changes; an approach I supported. But it does offer a means of exploring what the effects of a state-dependent policy might be. Compared with guidance as the MPC set it out, the question of state-dependence is simplified, because the focus is on one composite variable, the interest rate generated by the Taylor rule.

The working of this form of forward guidance can be easily understood. If there were no lower bound to the interest rate, then downside risks might largely balance upside risks. But a floor to the interest rate means that there is some probability of the economy finding itself in a region where the interest rate is "too high" given the circumstances. The sort of state-dependent guidance that I have described creates another region in which the interest rate is "too low" given the circumstances. In expectation, when output is above the guidance region, the expected impact of these two effects might largely cancel out; indeed with careful calibration, which I have not been able to do so far, it might do exactly, at least for an economy in a normal

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<sup>3</sup> I mentioned in the introduction that in the past the Committee had thought this to be ½ per cent, which I have used in my analysis.

**Figure 3: The Effects of State-Dependent Guidance over Time (Quarters)**



Source: Author's calculations

state of health. In that sense the forward guidance that I have described is similar to the observation made by Evans, Fisher, Gourio and Krane (2015), that, when the interest rate is close to its floor, an optimising policy-maker will be slow to increase it.

Of course, this story does not say how the economy gets into the range at which forward guidance is needed in the first place. The simplest way of describing this is to assume that the economy is affected by headwinds, and I have modelled these as risk premia-people behave as though the perceived interest rate is equal to the actual interest rate plus a random and time-varying risk premium. This premium may be negative, depressing the perceived interest rate below the actual interest rate and turning the headwind into a tailwind, but it is a positive headwind which, if strong enough, will create the case for forward guidance.

I explore this using the simple model described in the Appendix. The dynamics of the headwind – its expected path and the nature of the shocks to it, together with the lagged value of the interest rate – fully determine the state of the economy and thus the state on which forward guidance is dependent. I have assumed that 85% of any headwind persists from one quarter to the next, but on top of this a random shock with a standard deviation of four percentage points is added to it. Shocks tend to die away but new shocks are added all the time; there is no shortage of “events”. In Figure 3 I show the expected effects of introducing forward guidance of this type, averaging over fifty thousand simulations for an economy facing an initial headwind of about twelve percentage points.<sup>4</sup> These suggest that this form of guidance has a relatively modest effect on output. I also show the probability that the interest rate is held at its floor, and you can see that, when the policy is in place, Bank Rate is at its lower bound much more often than with standard policy.

<sup>4</sup> 0.12 log units at an annual rate.

Of course more powerful effects could be obtained by setting the threshold at a higher level but these results certainly do not leave me worrying about a guidance puzzle. Equally, a tentative conclusion is that the guidance adopted by the Committee was less expansionary than this, because it was designed only to make existing policy more effective. But these conclusions are only tentative; the results I show relate only to one set of model parameters.

A further, equally tentative, conclusion would be that, to have a powerful stimulus, the threshold Bank Rate would have to be set appreciably higher than 1¼ per cent.

If this is a form of forward guidance which satisfies the requirement that the policy should be modelled as though it is always a possibility, it nevertheless suffers from clear draw-backs. It is unlikely that the Monetary Policy Committee will ever be comfortable with the idea of setting policy by means of rules; we have seen them as a useful reference point but not more than that. Without a rule-based system, however, it is hard to be clear about the circumstances in which this sort of state-based guidance will be used. Even if any particular Committee did agree to something, future members might not regard it as appropriate. This means that the full capacity of this sort of guidance to support the economy is therefore unlikely to be realised.

## **Monetary Finance**

Asset purchases and forward guidance are two policies that the Bank of England has pursued in the past. What about monetary finance as a means of supporting inflation? As I mentioned in the introduction, anyone who has souvenirs of Weimar Germany or who has seen pictures of the banknotes being swept up as rubbish in the streets of Budapest would, on the one hand, find it difficult to believe that the world is, for the first time in its history, permanently condemned to stagnant prices or deflation. At the same time they will be aware, to say the least, that it is possible to have too much inflation.

Turner (2015a,b), following Buiter (2014) provides an account of the working of monetary finance. He says, quite rightly, that the helicopter drop discussed by Friedman (1969) is a fiscal expansion. The government borrows by giving banknotes to whoever receives the helicopter drop. People can use them to buy things, so demand is higher than it would have been without the fiscal expansion. The effect is likely to be at its strongest if people do not assume the drop will subsequently be recalled- i.e. that their future tax bills will be increased. This has the particular implication that they do not expect that the money will subsequently be converted into interest-bearing debt- i.e. that the government will subsequently fund its borrowing. If the borrowing were subsequently funded, then taxes would be needed to pay the interest bill, which is not very different from collecting taxes to withdraw the drop. In fact Buiter provides three conditions which, if met, are sufficient for the policy to work. First, the increase in the money stock must be irreversible. Secondly, people see benefit in holding money even if it does not pay any interest, and thirdly, money is valuable (its price is

positive). It seems to me that there may be some impact even if the first condition is not met; a fiscal expansion would still have happened.

As it stands, however, the first requirement is slightly more complicated than is often assumed, and the impact will depend on how far it is true. People who receive money may pay it into bank accounts instead of spending it; indeed that is quite likely if the money is a one-off windfall. This means that the banknotes accrue as bankers' reserves at the Bank of England. But reserves at the Bank of England are remunerated at Bank Rate so the debt becomes interest bearing, and needs to be serviced somehow.<sup>5</sup> Of course, this problem can be avoided if the Bank Rate is set to zero, but to guarantee that the policy would work it would need to be at zero permanently- a state which no one believes is compatible with stable prices. Turner is very aware of this problem and he suggests that, to make the policy work, bank reserves, or at least the major part of them, should not receive interest. As he acknowledges, that policy is equivalent to a tax on banks, something which he suggests might mitigate the risks of overbanking. It does, however, also mean that future dividends on bank shares will be lower than if the banks held only interest-bearing assets on their balance sheets and thus future spending will be lower. In that sense, people's future tax bills will be increased when compared with what would have happened otherwise. This "debt service" means that the monetary expansion would become closer to any standard fiscal expansion.

With bank reserves remunerated, I struggle to see a clear difference between monetary finance and asset purchases of the type described earlier, undertaken at the same time as an expansion of the fiscal deficit. The former is supposed to be permanent while the second we have always described as temporary. But, since it is not possible for a government to commit its successor, it is not possible for the government to say that the extra money issued will never be retired by means of over-funding, while Buiter (2014) requires irreversibility as one of his conditions to be sure that the policy will work. That is not to say that asset purchases are monetary financing as Buiter (2014) and Turner (2015a,b) have described it, but rather that an attempt at monetary financing may blur into something not very different from asset purchases, in that both shorten the maturity of public sector debt. There is no reason to be alarmed about that, or to think that it implies monetary financing cannot be used to stimulate demand. My earlier results suggest that it can. If one says that a shortened maturity is to be used to deliver the inflation target and will be unwound only when that is consistent with maintaining the inflation target, then the world of monetary finance is one in which unwinding is a possibility. This would, however, presumably happen only if inflation were expected to return to its target; once again policy is state-dependent.

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<sup>5</sup> I am assuming that the cost would be financed by taxation. An attempt to finance it in perpetuity by further borrowing would not, if the rate of interest is eventually higher than the money rate of growth, be sustainable.

## Negative Interest Rates

Negative rates have reappeared in a number of countries after a long gap, and they are now more widespread than they were in the early 1970s. The Committee discussed the question of negative interest rates in 2013 (although not more recently), and Charlie Bean summarised our views in a letter to the Treasury Committee (Bean, 2013). Many of the issues that he identified remain. First of all, if the effects are passed on by banks to their customers, then people are likely to withdraw cash, and banks will lose some of their intermediation functions.

If, on the other hand, banks do not pass the effects on to their depositors, then there are likely to be adverse effects on banks' incomes. This is likely to squeeze rather than support bank lending. Indeed it was considerations of this type which led to the Monetary Policy Committee being unwilling to cut Bank Rate below ½ per cent between 2009 and 2012. At home, banks' balance sheets have improved since the early part of this decade and we now take the view that there is room to reduce Bank Rate below ½ per cent should that become appropriate. Nevertheless, I am sure that if at some time in the future the Committee did wish to consider negative rates, it would need to be very clear that they were not going to have a contractionary effect. This view is of course quite consistent with the principle that the Committee sets monetary policy to deliver the inflation target. I do not vote with reference to the interests of bank shareholders.

This issue is very real. Last month it was suggested that one of the factors behind the weakness of bank shares was the possible effect of negative interest rates on banks' incomes, and in Switzerland mortgage rates have risen since the Swiss National Bank reduced its rate on sight deposits below zero: perhaps we are seeing a perverse response. A particular concern would, however, be the possibility that the effect might build up materially over time. The implication could then be that negative rates might be damaging if they were held in place for any length of time, which could then create the risk that the Monetary Policy Committee might feel the need to bring the Bank Rate back above zero again even if prospective inflation were still well below target. It is easy to think that such a situation is best avoided. While I would normally stress that it is the level of Bank Rate and not the change in Bank Rate which matters, an increase at an inopportune time might have a particularly damaging effect on confidence.

There is a separate issue of how the banks react. At present, commercial banks have accounts at the Bank of England, and these are similar to bank accounts anywhere else except that they are not available to individuals. Banks can draw cash on demand. If they expected materially negative rates to persist for any length of time they would store cash rather than keep money at the Bank of England. One means of limiting this "problem" is to make bankers' deposits at the Bank of England at least partially inconvertible; a material charge for withdrawing cash would be a less extreme way of limiting banks' willingness to hoard cash. These are obviously possibilities but at the same time they represent quite a big change. Instead of

having one form of money we would have two. Cash would start to stand at a premium relative to bank deposits in much the same way as, with exchange control, convertible currency stood at a premium relative to inconvertible currency. It would certainly be quite a big step if obstacles were put in the way of drawing Bank of England notes from accounts at the Bank of England. Negative interest rates work only while people think the two forms of cash are the same as units of account, even while they differ for other purposes. It is possible that this difficulty might be circumvented by setting a rate on marginal bank reserves different from that on intra-marginal reserves. There is, however, a risk that if the impact of negative rates is mitigated so far that it affects largely wholesale deposits, then the main impact of negative interest rates is on the exchange rate and, unlike other forms of monetary easing, their use can become a form of beggar thy neighbour policy (Carney, 2016).

None of this can, of course, rule out the possibility that negative interest rates may seem a desirable policy on some occasion. Nevertheless, it is important to be aware of the risks associated with such an approach. That I think remains the case even if the Bank of England were to introduce digital currency, at least provided paper currency also remained in existence. Haldane (2015), following Rogoff (2014) and Buiter (2009), has discussed the abolition of paper money. Of course gold currency was abolished in 1925, having been withdrawn from circulation during the First World War, and people have got used to the change. Nevertheless, it is likely to be many years before a government feels comfortable about saying to pensioners that their state pensions can be drawn only in digital form and that they have to stop using cash. Digital currency may have its merits, as Broadbent (2016) has just discussed, but it is unlikely materially to influence the desirability or practicality of negative interest rates over the next few years.<sup>6</sup>

## Conclusions

I have reviewed here four forms of unconventional monetary policy. I suppose I am subject to the criticism of saying most about quantitative easing, the measure on which I have worked the most. Ahead of this work, I was sceptical that the effects could be as large as Bank of England studies (e.g. Kapetanios, Mumtaz, Stevens and Theodoridis, 2012) showed. While it is clear that the effects cannot be estimated with any real degree of precision, I do now think that the policy was highly effective, and indeed that it may have contributed more than previously thought to the rate of inflation in 2010-2012. Furthermore, it seems to me that the second and third rounds of asset purchases were as effective as the first round. That is not to say that any new purchases would remain as stimulative to the economy, but it does give grounds for optimism. The logic of state-dependent guidance is clear. When there is a floor to the interest rate, there will be occasions when the interest rate is too high for the state of the economy; with no adjustment to interest rates otherwise, this means that expected interest rates will be too high. This can, in principle, be offset by creating a range where the interest rate is lower than it would be in the absence of any distortions. Implementing such a policy is, however, much less practical. The Monetary Policy Committee does not follow a rule for interest

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<sup>6</sup> Indeed, students tell me that bitcoins are no longer 'cool'.



rates and it therefore cannot amend such a rule. It can, of course, do what it did in August 2013, but it is not clear how such a policy can be transformed into a general part of the policy armoury in a way which makes it possible to assess its effects. While state-dependent guidance probably does have an impact, any Committee might well have difficulty in deciding what form that guidance should take as a means of providing a particular stimulus to the economy.

Monetary finance, while bank reserves remain remunerated, does not seem to me to be very different from asset purchases in combination with a fiscal expansion, given that it is not possible for any government to promise that the money thus created will never subsequently be withdrawn. Indeed, selling long-term bonds to holders of money might, at some point in the future, be an important way of limiting inflationary pressures. Negative interest rates may provide some support, but the extent of this depends on how banks behave, and whether they are able to pass on the full amount of the rate reduction to borrowers. That said, there is a risk of adverse side-effects, and it would be wrong to introduce negative interest rates without being confident that these side-effects were going to be small. Equally, measures designed to protect the domestic economy from the effects of negative interest rates mean that the policy becomes close to one of beggar-my-neighbour exchange rate management.

Let me conclude by repeating that, as far as I can see, it is appreciably more likely that monetary tightening rather than monetary easing will be needed in the United Kingdom over the next two years. Financial markets can go up as well as down; they have risen sharply over the last month. Commodity prices are also higher while disappointing figures for productivity in the fourth quarter of last year mean that unit wage costs are firmer than the headline wage figures might indicate. Nevertheless, should the need for further easing arise because of a sharp weakening in the outlook for inflation, the scope for further asset purchases is substantial, while the obstacles we saw to reducing Bank Rate below  $\frac{1}{2}$  per cent are no longer material. These observations should, I hope, allay any concerns that it will be difficult to bring inflation back to target.

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## Appendix

The model used to study forward guidance is specified as follows:

$$(1) y_t = -\frac{1}{\sigma}(i_t + z_t - E_t\pi_{t+1} - \bar{i} + \bar{\pi}) + E_t y_{t+1}$$

$$(2) \pi_t = \beta\pi_{t+1} + \kappa y_t$$

$$(3) i_t^* = \rho(\varphi^\pi(\pi_t - \bar{\pi}) + \varphi^y y_t + \bar{i} + v) + (1 - \rho)i_{t-1}$$

$$i_t = i_t^* \text{ if } i_t^* > \bar{i}$$

$$i_t = 0.5\% \text{ if } i_t^* \leq \bar{i}$$

$$(4) z_t = \gamma z_{t-1} + \varepsilon_t^z \quad \varepsilon_t^z \sim N(0, s_z^2)$$

$$\kappa = \frac{(1 - \alpha)(1 - \alpha\beta)(\omega + \sigma)}{\alpha(1 + \omega\theta)}$$

**Table A1: Parameter Values**

$\alpha$	0.77	Price stickiness
$\beta$	1	Coefficient on expected inflation
$\omega$	2.08	Frisch elasticity of labour supply
$\theta$	7.63	Elasticity of substitution
$\sigma$	3.56	Reciprocal of intertemporal elasticity of substitution
$\varphi^\pi$	0.14	Coefficient on output in Taylor rule
$\varphi^y$	1.99	Coefficient on inflation in Taylor rule
$\rho$	0.2	Weight on current terms in Taylor rule
$\gamma$	0.85	Persistence of headwind
$s_z^2$	1	Variance of headwind shock
$v$	1	Constant in interest rate equation- see text

Equation (1) is a standard Euler equation in which output (measured as a deviation from equilibrium) depends on the real rate of interest and expected future output. The real interest rate term is, however, augmented by the inclusion of a headwind; the evolution of this headwind is described by equation (4). Equation (2) is a standard New Keynesian Phillips curve. In order to keep the model simple it is assumed that the only shocks affecting the model are the consequence of the headwind; thus shocks do not enter this equation. Equation (3) is an interest rate rule which sets the interest rate as the weighted combination of the interest rate given by a Taylor rule and the lagged interest rate. Thus, relative to a simple Taylor rule, the interest rate is slow to change. There is an additional term,  $v$ , required to ensure that in the steady state the inflation rate is brought back to its target,  $\bar{\pi}$ .

The actual interest rate is set by the interest rate rule if  $i_t^*$  is equal to or greater than the threshold,  $\bar{i}$ , and set equal to the effective lower bound if  $i_t^*$  is below the threshold. If, therefore the threshold is set equal to the

effective lower bound, then the model reduces to that discussed by Adam and Billi (2007) while the policy of forward guidance is one of setting a threshold higher than the effective lower bound. The policy of guidance therefore says that the rate will be held at its lower bound unless the linear combination of inflation, output and the past interest rate given by (3) take it above the threshold. This in turn is dependent on the two state variables, the headwind and the lagged actual interest rate.

In a linear variant of this model, i.e. one where there is no threshold and no effective lower bound, the interest rate rule, with  $v = 0$ , ensures that output and inflation jump to values from which, in the absence of further shocks, they would converge, with inflation going to its target and output going to its steady state value, set here to zero. With a non-linear interest rate rule that is no longer the case; in the terminology of Phillips (1954) there is a steady state offset; the interest rate rule is proportional, not integral and proportional rules do not normally return variables to their targeted values. They do so only if the model has appropriate properties, as the linear New Keynesian model does.

In fact there are two issues. The Phillips curve does not, on its own, ensure a unique equilibrium for output unless  $\beta=1$ . With any other value there is a trade-off of some sort between output and steady-state inflation. The Euler equation can accommodate this; output is stable at any value provided the real interest rate takes its equilibrium value of  $\bar{i} - \bar{\pi}$ . If one takes the view that there is no long-run trade-off between output and inflation, and that this is a property of the economy, not of the policy rule, it is necessary to set  $\beta = 1$ . In fuller models the issue might be addressed by introducing also a term in lagged inflation and ensuring that the coefficients on lagged and expected future inflation sum to 1. That would, however, introduce an extra state variable and complicate the model.

While a unique equilibrium for output is a desirable property of the model, it is the job of the Monetary Policy Committee to return inflation to its target, at least in expectation. This means that, in the context described here, it must adopt a policy rule which does that; the non-linearity in the interest rule means that, on its own, that will not happen. It might be desirable, once again, to introduce an integral term (i.e. to change the interest rate with reference to the level of the inflation rate) but here I adopt the simpler approach of inserting a constant  $v$ . This is chosen so that when the lagged interest rate is at the steady state value and the headwind is zero, the current value of the interest rate is also at its steady state value. The condition on the real interest rate implied by the steady state nature of the Euler equation then also implies that the inflation rate will be at its target value. So far I have found that  $\alpha=-0.065$  works in the absence of forward guidance while  $\alpha=0$  works with my threshold of 1 ¼ per cent. The convergence is not, however, exact and there is more work to do to improve the simulations. Nevertheless, I am confident that the simulations shown in Figure 3 will not change materially.