Quantitative easing and other unconventional monetary policies: Bank of England conference summary

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In November 2011, the Bank of England held a conference to discuss the lessons learned about quantitative easing and the other unconventional monetary policies used during the global financial crisis. A number of central bank economists and academics presented their research. This article summarises the presentations made at the conference and some of the related discussions. Overall, the research presented broadly supported the emerging consensus that unconventional monetary policies helped to mitigate the macroeconomic effects of the crisis. But there was less agreement about the magnitude of the effects and the main mechanisms through which the policies may have worked, and a number of areas for further research were suggested.

Introduction

The global financial crisis that began in Summer 2007, and intensified in Autumn 2008 following the collapse of Lehman Brothers, led to many central banks cutting policy rates to levels close to zero and adopting a variety of unconventional monetary policy measures. These measures included making large-scale asset purchases (LSAPs) financed by central bank money — sometimes referred to as quantitative easing (QE) — and substantially expanding the availability of central bank credit to the financial sector (these and other measures are discussed further below).

In March 2009, the Bank of England's Monetary Policy Committee (MPC) announced the start of its asset purchase programme at the same time as it reduced Bank Rate to 0.5%, its effective lower bound. In announcing these measures, the Committee said that without them there was a substantial risk that CPI inflation would undershoot the 2% target in the medium term. By purchasing assets, mainly medium to long-term government bonds (gilts), financed by central bank money, the aim of the policy was to create a monetary stimulus large enough to increase nominal demand so that inflation would meet the target in the medium term. By the end of the first round of QE purchases in January 2010, the Bank had acquired £200 billion of assets, equivalent to 14% of annual nominal GDP (see Joyce, Tong and Woods (2011)).

Although other central banks have also used asset purchases to ease monetary policy, notably the Federal Reserve, the Bank of England's QE purchases during March 2009 to January 2010 differed in that they consisted almost exclusively of government bonds. The Bank's QE policy was therefore conceptually distinct from so-called 'credit easing', where the central bank buys private assets containing credit risk.[2] The distinctiveness of the UK experience was part of the initial motivation for holding the conference, as Spencer Dale, the Bank's Chief Economist, pointed out in his opening address.[3] The Bank of England has an obvious interest in understanding how effective its policy actions have been and, for researchers, the UK experience provides a relatively clean policy experiment to investigate the potential effects of QE. To encourage researchers to look at the UK evidence, the Bank published a specially constructed data set on its website a year ahead of the conference containing data on its purchase programme during March 2009 to January 2010 and various financial and economic variables.[4]

At the time of the conference last November, however, events had moved on. The MPC announced an additional £75 billion of asset purchases at its meeting in October 2011, citing the weaker domestic and global outlook, partly associated with the euro-area crisis. This made discussions at the conference of topical, as well as of historical, interest. More recently, the

(1) The author would like to thank Misha Franklin and Evan Wohlmann for their help in producing this article.
(2) The Bank of England also purchased some high-quality private sector assets (corporate bonds and commercial paper), but these purchases were much smaller in size and were aimed at improving market functioning (see Bean (2011)).
(3) The conference was organised in association with *The Economic Journal*, which will publish some of the papers in a special feature in November.
(4) The data set is available at www.bankofengland.co.uk/publications/Pages/events/qeconference/qedataset.aspx.

MPC announced a further £50 billion of asset purchases at its meeting in February 2012.

This article provides a summary of the main papers presented at the conference and some of the issues raised. To set these in context, the next section provides a brief overview of some of the main monetary policy measures introduced by major central banks during the global financial crisis. The following sections turn to the main contributions at the conference, grouping them under four main themes: How do QE and other unconventional monetary policies work? What effects do they have on financial markets and more broadly on the macroeconomy? What can we learn from international comparisons? What are the risks? The penultimate section focuses on lessons for the future, drawing on the contributions made at the panel session. The final section provides conclusions and suggests some possible areas for further research.

Central bank responses to the crisis

Following the onset of the financial crisis in Summer 2007, central banks focused on providing liquidity through various **liquidity support operations**.(1) The aim of these policies was to unblock interbank markets and ease funding conditions more generally. A lot of these measures involved extending the scope of existing facilities. Many central banks, including the Bank of England, expanded their normal lending operations to banks by lending at longer horizons and by broadening the eligible collateral accepted. But there were also a large number of new initiatives. The Bank of England, for example, introduced the Special Liquidity Scheme to swap illiquid high-quality assets from banks in return for Treasury bills and later the permanent Discount Window Facility (see John, Roberts and Weeken (2012) on pages 57–66 in this *Bulletin* for further details). The Federal Reserve introduced a variety of new facilities aimed at providing liquidity to a much broader set of counterparties against much wider collateral, including the Term Auction Facility, the Primary Dealer Credit Facility and the Term Securities Lending Facility. The leading central banks also acted together to form a swap facility with the Federal Reserve, in order to provide an additional means for banks to borrow US dollars.

After the crisis intensified following the collapse of Lehman Brothers in Autumn 2008, central banks began intervening more directly with the aim of **improving conditions in specific credit markets**. The Federal Reserve bought commercial paper and asset-backed commercial paper, and introduced measures to support money market mutual funds. The Bank of England began purchasing commercial paper and later corporate bonds through a specially created Asset Purchase Facility. The European Central Bank (ECB) made purchases of covered bonds. More recently, in May 2010, the ECB began buying government bonds as part of its Securities Markets Programme (SMP) in response to the euro-area crisis.

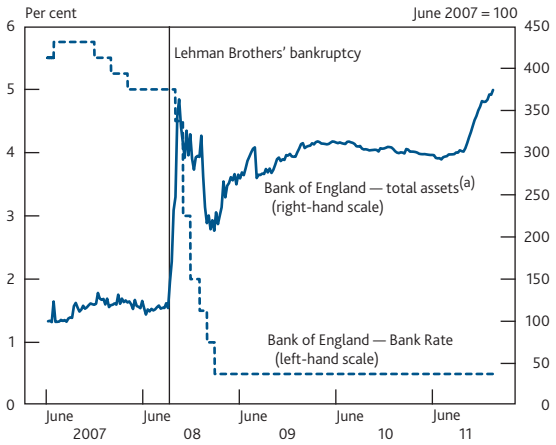
As central banks reduced their policy rates to levels close to or at their effective lower bounds, they turned to various additional **measures to further ease monetary conditions**. For example, in late November 2008, the Federal Open Market Committee (FOMC) announced a policy of large-scale asset purchases. This was initially restricted to agency (that is government-sponsored enterprise) debt and agency-backed mortgage-backed securities, but subsequently it was expanded to include longer-term Treasury securities. As discussed above, the Bank of England's MPC began its own programme of asset purchases, financed by central bank money, in March 2009, consisting almost exclusively of government debt. The ECB instead focused on expanding the provision of credit to banks, as part of its so-called 'enhanced credit support' programme (see Trichet (2009)). As a key element of this, in October 2008, the ECB adopted 'a fixed-rate full allotment' procedure, which allowed its market counterparties to obtain unlimited liquidity for periods that have ranged from one week to one year at a fixed rate. In December 2011 the ECB announced that it would conduct two longer-term operations with a maturity of approximately three years.

The common consequence of all these unconventional measures was a large increase in central bank balance sheets (**Charts 1**, **2** and **3**). Since just before the start of the crisis in mid-2007 to the beginning of 2012, the total assets of the Bank of England and Federal Reserve more than tripled, while the size of the balance sheet of the ECB more than doubled, though from a higher base. At the beginning of 2012, the size of the ECB's balance sheet was a little under 30% relative to euro-area GDP for 2011, while the Bank of England and Federal Reserve balance sheets were about 20% of their respective national GDP measures.

In addition to so-called 'balance sheet policies',(2) a further unconventional measure adopted by a few central banks focused on providing 'forward guidance' to markets about the expected future path of policy rates, with the aim of reducing longer-term interest rates. For example, at the end of 2008, the FOMC began indicating that it was likely that economic conditions would warrant policy rates remaining low 'for some time' or 'for an extended period'. The Bank of Canada was even more explicit in announcing in April 2009 that, conditional on the outlook for inflation, policy rates would remain at their current level until the end of the second quarter of 2010. Since its August 2011 meeting, the FOMC has also provided guidance on the likely duration of exceptionally low policy rates.(3)

(1) Measures taken by the fiscal authorities to support specific financial institutions (eg, the injection of capital) came outside the scope of the conference.
(2) Borio and Disyatat (2009) define unconventional monetary policies as those where the central bank actively uses its balance sheet to affect market prices.
(3) Williams (2011) discusses evidence that forward guidance about future interest rates during the crisis had effects on financial markets.

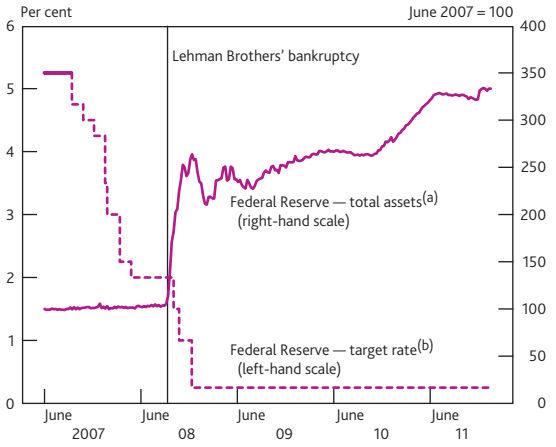
Chart 1 Bank of England: policy rate versus balance sheet



Source: Bank calculations.

(a) Assets are in local currency.

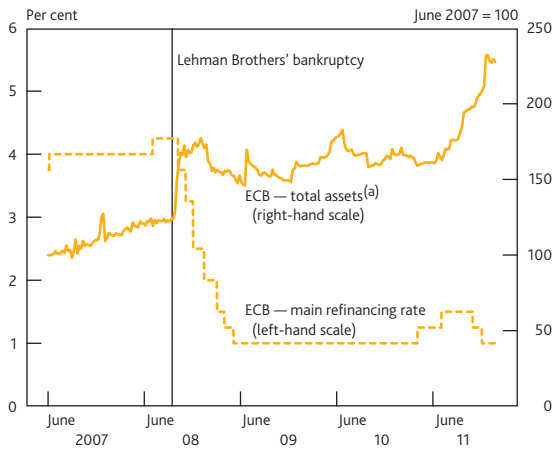
Chart 2 US Federal Reserve: policy rate versus balance sheet



Sources: US Federal Reserve and Bank calculations.

(a) Assets are in local currency.
(b) From 16 December 2008, the US Federal Reserve established a target range for the federal funds rate of between 0% and 0.25%. This is shown on the chart as 0.25%.

Chart 3 European Central Bank: policy rate versus balance sheet



Sources: Bloomberg, European Central Bank and Bank calculations.

(a) Assets are in local currency.

The majority of the papers presented at the conference focused on the unconventional policies that had been used to ease monetary conditions during the crisis.

How QE and other unconventional monetary policies work(1)

One implication of the New Keynesian models popular in modern macroeconomics is that, even when policy rates are at their lower bound, central bank asset purchases can only affect the macroeconomy to the extent that they signal something about future policy, and this then gets incorporated into expectations of future interest rates or inflation (see, for example, Eggertsson and Woodford (2003) and Cúrdia and Woodford (2011)). This result naturally leads to policy recommendations that favour the central bank making a commitment to maintain low policy rates for some defined period of time, rather than making asset purchases.

The so-called 'irrelevance result' of QE in these models (which would apply to purchases of private as well as public assets) relies on some strong assumptions that result in the private sector internalising the effects of changes in the public sector balance sheet. In simple terms, if the central bank buys government debt, the private sector may — under certain conditions — anticipate that their future taxes will be subject to additional interest rate risk and reduce their demand for government debt by exactly the same amount as the reduction in supply. So asset prices do not need to adjust to bring about equilibrium. This result does not hold under more general assumptions, leaving open the possibility for QE to have effects on asset prices through its impact on asset quantities (or portfolio composition).

The older literature on portfolio balance effects, going back to Tobin (1963) and Brunner and Meltzer (1973) among others, motivates quantity effects on asset prices through imperfect asset substitutability. The basic idea is that if assets are imperfect substitutes, then a change in the quantity of a specific asset will lead, other things being equal, to a change in its absolute and relative expected rate of return.(2) The concept of imperfect substitutability is a key element in the more recent literature that tries to provide microfoundations for these kinds of quantity effects. Typically these models appeal to the concept of 'preferred-habitat' investors, who prefer holding particular assets (typically bonds of a particular maturity) to others, with the implication that they regard their preferred-habitat assets as imperfectly substitutable with others.

(1) Some of the possible channels through which QE may affect the macroeconomy are described in an earlier *Quarterly Bulletin*, see Joyce, Tong and Woods (2011).
(2) For more discussion of the literature on money and portfolio balance effects and an application of an explicitly money-based approach to analysing the impact of the Bank's QE policy, see Bridges and Thomas (2012).

One paper that is widely referenced in the recent literature on QE — and was widely cited at the conference — is by Vayanos and Vila (2009), who set out a framework incorporating preferred-habitat investors (who only invest in bonds with specific maturities) and arbitrageurs (who trade between bonds of different maturities). In this setting, providing arbitrageurs are risk-averse — or equivalently credit constrained — shocks to demand/supply are reflected in yield changes. An implication of the model would be that bond purchases by the central bank would also be reflected in yield changes. But the model has nothing directly to say about the pass-through of these yield changes to the real economy.

An influential theoretical paper on the topic that does consider the link between asset purchases and the macroeconomy is by Andrés, López-Salido and Nelson (2004). This paper incorporates asset market segmentation into a general equilibrium model by introducing a set of restricted households who can only invest in long-term bonds (analogous to preferred-habitat investors) and a set of unrestricted households who can invest in both short and long-term bonds. The unrestricted households face frictions in trading long-term bonds, which mean that they regard long-term bonds as imperfect substitutes for money. In this setting QE can affect the term premium on government bonds and bond yields can affect aggregate demand, providing an additional channel that monetary policy can work through.(1) A similar model was used as the basis of a paper presented at the conference by Vasco Cúrdia that tries to quantify the effects of the Federal Reserve's LSAPs, and is discussed later.

A new theoretical model of how QE works was put forward by Joe Gagnon in his contribution to the conference. This was based on a two-period overlapping generations model, though Gagnon claimed that his results would carry through to other models with heterogenous agents. The main insight of the model was that the irrelevance result from New Keynesian models does not hold when there are different classes of agent, even in the absence of market frictions. The key requirement is that the effects of QE purchases on the government budget are not fully passed through to the class of agents who are selling the QE assets, otherwise the profits and losses are recycled to the same people and nothing changes. Gagnon went on to consider the fiscal implications of a proposed further round of asset purchases aimed at returning the US economy back to trend growth and inflation after three years. To investigate this issue, he modelled the purchase of additional long-term bonds worth 13% of GDP (about US$2 trillion), which would be retained for seven years. He then conducted an accounting exercise by tracking each vintage of bond and analysing its impact on the net cash flow of the Federal Reserve and the consolidated government budget deficit. He showed that his QE proposal would not necessarily incur a significant fiscal cost, even under an adverse scenario in which inflation increases rapidly and the Federal Reserve raises its policy rate sharply to push inflation back down to target.

In another mainly theoretical contribution, Marcus Miller (in a paper written jointly with John Driffill, see Driffill and Miller (2011)) presented a model of QE based on a modified version of the Kiyotaki and Moore (2008) model of liquidity, business cycles and monetary policy. Rather than assuming that prices are flexible as in the original model, the authors take prices and wages to be sticky, so that a demand failure can emerge after a liquidity shock. The authors also reduce the model to a two-equation system that can be represented diagrammatically. The model is then calibrated using data for the United States, in order to investigate the effects of unconventional monetary policy. The authors found that what they describe as a QE policy (which in their model implies the authorities purchase equity using money) can be effective in reducing the effects of a liquidity shock. They also report that, with credit-rationing, targeted revenue-neutral fiscal transfers can have similar effects on aggregate demand.

Moving away from QE, Ricardo Reis gave a presentation focused on where liquidity should be injected during a financial crisis. He started off with a frictionless real model of financial markets (with households, entrepreneurs and fiscal policy) and then successively added various frictions and different agents (the central bank, ordinary banks and shadow banks). A model with two types of banks (making either short-term or long-term loans) suggested that, if the monetary policy authorities are faced with a transitory financial shock, they should only inject liquidity into the market with problems. Persistent financial shocks, on the other hand, spread quickly, and central banks therefore needed to intervene in all markets, even if the problem was only in one. Reis concluded that unconventional policy can be necessary in a complex financial system and that this could justify a range of policies, including buying securities and lending to firms and shadow banks.

The economic impact of unconventional monetary policy

The impact on government bond markets

Most of the empirical literature on QE to date has focused on government bond yields (and to a lesser extent on other financial prices), where the effects of asset purchases are most likely to be apparent and susceptible to event study analysis. There are three main channels that are usually proposed to explain the link between asset purchases and yields: (a) the signalling channel — the impact of purchases through changing market expectations of future short-term interest rates; (b) the scarcity or local supply channel — which hinges on there being some investors who have a special demand for

(1) Harrison (2012) uses a similar approach to incorporate imperfect asset substitutability into an otherwise standard New Keynesian model and shows how this provides a channel through which QE can affect aggregate demand.

a certain class of bonds, which makes them imperfectly substitutable for others; and (c) the duration channel — where the removal of aggregate duration from the market leads to investors requiring lower compensation for holding interest rate risk. Channels (b) and (c) are sometimes both described as portfolio balance channels. Most empirical evidence on asset purchases has concluded that they mainly affect long rates through reducing term or risk premia (see, for example, Gagnon *et al* (2010) and Joyce *et al* (2011)), which has been taken to suggest that the main channels have been through scarcity or duration (though in principle signalling effects may also affect term premia). The conference added two papers to this literature, both of which appeared to confirm the importance of the local supply and duration channels.

In her contribution, Stefania D'Amico presented a paper (written with co-authors Bill English, David López-Salido and Edward Nelson) on the effects of the Federal Reserve's LSAPs on Treasury yields. Using data pre-dating the start of the LSAPs, the authors first estimate equations relating Treasury yields and term premia estimates to measures of aggregate duration and local supply, as well as to other controls. They find significant effects from both their scarcity and duration variables, with the results suggesting that the main impact on yields through LSAPs comes through movements in the real term premium component of yields. Using their preferred estimates, they then calculate the effects of the Federal Reserve's asset purchases. They estimate that the first round of Federal Reserve asset purchases that ended in March 2010 (LSAP1) depressed long-term yields by about 35 basis points, of which around two thirds was due to local supply, with the other third due to duration. For the additional US$600 billion of Treasury purchases announced in November 2010 and completed in June 2011 (LSAP2), they estimate a total effect on long-term yields of 55 basis points, with most of the impact coming through scarcity effects, reflecting the fact that LSAP2 had a more modest impact on aggregate duration than LSAP1.

Matthew Tong presented research (from a paper with Martin Daines and Michael Joyce, see Daines, Joyce and Tong (2012)) that examined the impact of the Bank of England's first round of asset purchases on the gilt market. The research suggested that market reactions to individual announcements about QE took time to be fully priced in and varied significantly across the term structure, though the evidence confirmed earlier research that had suggested the overall fall in gilt yields had been around 100 basis points.(1) The authors also found evidence of both local supply effects (yields on gilts being purchased by the Bank fell by more) and duration effects (there were larger yield falls for bonds with longer maturities). In addition, panel regressions using data from the Bank's auctions showed that yields fell in response to the actual purchases, particularly during the early stages of the programme. Some of the effects on auction days were quite persistent and might be consistent with participants learning about the effects of QE from the auctions themselves. Over the period of the purchases, gilt yields were broadly unchanged, but this might be because fiscal or wider macroeconomic developments had offset the initial impact of QE. Results from panel regressions, which controlled for changes in expected government borrowing and expectations of inflation and GDP, suggested that the effects of QE on gilt yields were quite persistent — though these results were sensitive to the precise specification used.

The subject of how persistent the effects of QE might be was also addressed in a paper by Jonathan Wright (see Wright (2011)). Wright attempted to measure the effects of US monetary policy on financial variables during the crisis using a structural vector autoregression (VAR). In his model, monetary policy surprises are identified by assuming the variance of policy shocks is larger on days that seem likely to contain policy news. The main result from the VAR analysis was that, although unconventional policy has significant effects on financial variables beyond Treasury rates, those effects die out very quickly, having a half-life of a few months. A monetary policy shock has twice as much effect on Treasury rates as it does on corporate yields, so that corporate bond spreads actually rise in response to an expansionary shock. To check the robustness of the results, Wright also used an event study method based on using intraday data to isolate monetary policy shocks. When yield changes were regressed on these monetary policy surprises, he found that there were spillovers from US monetary policy to other countries. US policy surprises also lowered UK, Canadian and German government bond yields by one third to one half of the corresponding change in US Treasury yields. Using the same method, he estimated that LSAP2 had lowered ten-year Treasury yields and corporate bond yields by 15 and 10 basis points respectively. But Wright's analysis did not allow him to say whether these effects were short-lived because they were either offset by other factors (eg improvements in the macroeconomic outlook) or because financial markets initially overreacted.

The impact on the macroeconomy

There has been much less research to date on the wider macroeconomic effects of unconventional policies. Here event studies are not appropriate, as there are likely to be long lags before any effects get fully reflected in macroeconomic variables and there are a host of other factors that need to be controlled for. Analysis therefore has to be based on constructing model-based policy and no-policy counterfactuals, but that is especially difficult given the atypical nature of recent policy interventions. This makes the results from this sort of exercise even more uncertain than usual. There were two main approaches taken at the conference to get at the wider macroeconomic effects. One

(1) See Joyce *et al* (2011).

approach involved estimating VAR models of varying complexity to construct conditional forecasts under policy and no-policy scenarios. A second approach involved estimating a general equilibrium model, incorporating preferred-habitat effects.

In his contribution, Michele Lenza presented research findings from a study (written jointly with Domenico Giannone, Huw Pill and Lucretia Reichlin, see Giannone *et al* (2012)) of the impact of the unconventional policy measures taken by the ECB to support wholesale funding markets after the collapse of Lehman Brothers. The paper uses a new data set on bank balance sheets that captures, among other things, the volumes of interbank lending and of Eurosystem loans to banks. Using a large Bayesian VAR containing macro and financial variables, the authors produce forecasts for lending to banks over the crisis period, conditional on realised outturns of industrial production and unemployment. They find that central bank lending was much higher than would otherwise have been expected. Taking the additional central bank lending as a measure of the ECB's policy intervention, the authors construct further scenarios where they look at the impact of the policy on the macroeconomy. They find significant positive effects, with euro-area industrial production 2% higher than it would otherwise have been and the unemployment rate 0.6 percentage points lower.

In his contribution to the conference, Ibrahim Stevens presented a paper (written jointly with George Kapetanios, Haroon Mumtaz and Konstantinos Theodoridis, see Kapetanios *et al* (2012)) on the impact of the Bank of England's QE asset purchases on GDP and inflation in the United Kingdom.(1) In this paper three VAR models, each incorporating structural change in different ways, are used to produce counterfactual forecasts — assuming that QE acted to reduce gilt spreads. The counterfactual scenarios are constructed by conditioning the model on actual gilt spreads and Bank Rate (the policy scenario) and on a gilt spread that was 100 basis points higher than actual outturns (the no-policy scenario), taking as given the finding from previous Bank of England research that QE reduced medium to long-term gilt yields by about 100 basis points.(2) There is considerable uncertainty and variation across the models used. But taking the preferred average estimates from the three models implies that QE had a peak effect of 1½% on the level of real GDP and a peak effect of 1¼ percentage points on annual CPI inflation.

Taking a general equilibrium modelling approach, Vasco Cúrdia reported research (produced jointly with co-authors Han Chen and Andrea Ferrero, see Chen, Cúrdia and Ferrero (2011)) that attempted to quantify the effects of the Federal Reserve's LSAP2 using a model incorporating asset market segmentation (similar to Andrés, López-Salido and Nelson (2004) discussed above). The model assumes there is a set of restricted households that can only invest in long-term bonds and a set of unrestricted households who can invest in both short and long-term bonds, but face transaction costs on their purchases of long-term bonds. Asset purchases in this framework can have effects on the macroeconomy through changing the long-term interest rate. The model is estimated using Bayesian techniques using quarterly data from 1987 to 2009. Under the assumption that there is a commitment to remain at the zero lower bound (ZLB) for four quarters (which it was argued mirrored the Federal Reserve's 'extended period' language), the authors find that a simulated LSAP2 policy increases GDP growth by 0.4% on impact (though this effect dies out after eight quarters) and has a minimal impact on inflation. The authors conclude that the macro impact of LSAP2 was slightly smaller than a 50 basis points cut in the federal funds rate, but with more uncertainty around the eventual impact on the economy. If the authors do not impose the ZLB, however, the effects on GDP growth halve. The authors attribute these relatively weak effects to the low estimated degree of asset market segmentation.

International comparisons

With many countries engaging in various types of unconventional monetary policy, it seems natural to try to draw on their experiences to estimate the effectiveness of these policies. Given the different approaches pursued by different central banks this poses obvious problems. One way of trying to get round these idiosyncracies is to compare countries by measuring the impact of their policies through the size of their respective central bank balance sheets.

Boris Hofmann presented a paper (written jointly with Leonardo Gambacorta and Gert Peersman, see Gambacorta, Hofmann and Peersman (2011)) that looked at the effectiveness of unconventional monetary policy by modelling it in terms of shocks to the central bank balance sheet. Using data from eight advanced economies over the crisis period (January 2008 to June 2011), the authors estimate a four-variable panel SVAR. As well as their proxy for unconventional monetary policy, the authors include GDP, inflation and the VIX measure of stock market volatility — a proxy for financial risk — which they find is a key driver of the central bank reaction. Simulations from the estimated models suggest that unconventional monetary policies had a temporary but significant impact on both inflation and output. Compared with conventional monetary policy shocks, the findings are similar for output but the impact on inflation is less persistent. The authors use an econometric estimator that allows for cross-country heterogeneity and find that the individual country results are on the whole similar to the panel results.

(1) This was one of the background papers that was summarised in Joyce, Tong and Woods (2011).
(2) See Joyce *et al* (2011).

The risks

The use of unconventional monetary policy may have a number of unintended consequences. These include, for example, financial market distortions, exit problems, and the potential loss of central bank independence and credibility (see, for example, Kozicki, Santor and Suchanek (2011)).

One risk sometimes highlighted about QE and other unconventional monetary policies is that they might lead to the central bank losing control of inflation. Michael McMahon presented a simple three-period monetary model to analyse the effects of QE and other unconventional monetary policies on price level determinacy. The paper (written with Herakles Polemarchakis, see McMahon and Polemarchakis (2011)) finds that unconventional monetary policy leads to an indeterminacy of the distribution of inflation rates across states of the world. This reduces the central bank's control of inflation, which McMahon suggested was consistent with the observed increase in UK inflation uncertainty suggested by surveys and options data. The indeterminacy result stems from the assumption that the composition of the central bank's balance sheet becomes unknown when it shifts to unconventional monetary policy. To the extent, however, that the implications of unconventional monetary policy for the central bank's balance sheet can be communicated and understood, this indeterminacy is reduced.

Lessons for the future — panel discussion

In the panel discussion, four distinguished economists from academia and central banks were asked to give their views on the main lessons for the future from recent experience with QE and other unconventional monetary policies.

Glenn Rudebusch felt that there were lessons for the present, as well as for the future, from recent experience. He thought that QE was largely about communication, and warned about the difficulties in separating signalling and portfolio balance channels. He also felt there was more to be done to think about how portfolio rebalancing actually works. Much of the existing research had looked at the effect of falling long-term interest rates on the macroeconomy, but the results might be different for changes in risk premia rather than for changes in expected future short rates. In general, uncertainty about its effects, how to exit, and the policy strategy issues meant that QE was not necessarily a reliable instrument for all times.

David Miles emphasised the importance of providing a credible story behind the estimates of QE's impact. He also thought that it was a mistake just to focus on the impact of asset purchases on government bond yields: the effect on the spreads of other asset yields to government bonds was at least as important. He felt that QE in the United Kingdom had mainly worked through portfolio rebalancing and believed there had been important effects on corporate financing conditions, both by reducing corporate bond spreads and by encouraging new issuance. Turning to the likely impact of the Bank of England's latest asset purchases, he thought that many of the conditions that had made purchases in 2009 effective had returned, including stressed bank funding conditions.

Oreste Tristani spoke about how the ECB's balance sheet had evolved since May 2010. Although the SMP has been a factor, its quantitative impact has been relatively small. Longer-maturity liquidity measures implemented as part of the enhanced credit support policy have been more important. He then set out some analysis supporting the ECB's recent intervention in peripheral European government bond markets. He outlined the results of one of the models under development at the ECB which attempts to separate the change in government bond yields into the role of fundamentals at the country level and the role of systemic risk.

Andrew Scott talked about the circumstances under which QE should be used again. His view was that there were likely to be limits to how useful QE could be, unless central bank intervention contained significant elements of fiscal transfer. A possible role for QE might be to extend it to target specific assets aimed at specific sectors, but this would be introducing a very different and non-aggregate approach to monetary policy. He further cautioned that the Bank was in a difficult situation — it needed to be careful that it did not create a sense that the current stance of fiscal and monetary policy would be sufficient to restore trend growth in the near term.

Conclusions

Overall, the papers presented at the Bank's November conference broadly supported the emerging consensus that QE and other unconventional monetary policies have helped to mitigate the macroeconomic effects of the global financial crisis. Evidence presented at the conference suggested that asset purchases by the Bank of England and the Federal Reserve had led to significant falls in government bond yields. There was also evidence that asset purchases and other balance sheet policies resulted in significant effects on the wider economy. That said, there was less agreement about the magnitude of the effects and the main mechanisms through which the policies may have worked. Nor was there agreement on whether there was scope to use these policies in normal times. As with any good conference therefore, this one left many areas for further research.

In terms of QE, there is still a need for more theoretical work that models the way policies have been implemented in practice by central banks. Many of the more theoretical papers presented at the conference assumed for convenience

that central banks purchase risky private debt rather than risk-free government debt, or government-guaranteed debt in the case of the Federal Reserve's agency debt purchases. Many participants discussed the links between asset purchases and fiscal policy, but there has been little theoretical work to date that looks at the interactions between the fiscal and monetary authorities in periods where the latter is making asset purchases.

On the empirical front, there is room for additional research looking at how persistent the effects of unconventional monetary policy are on asset prices — in particular, to distinguish between the possibility of market overreaction and the influence of other factors. There also seems scope to do research on the impact of asset purchases on asset quantities, which none of the conference papers touched on.

Finally, there was little work presented at the conference on the costs and risks of unconventional monetary policies. As the use of unconventional monetary policies continues, it seems inevitable that there will be an expansion of the literature on this topic.

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