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Bank of England Quarterly Bulletin 2009 Q2: Quantitative Easing

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Quantitative easing

By James Benford, Stuart Berry, Kalin Nikolov and Chris Young of the Bank's Monetary Analysis Division and Mark Robson of the Bank's Notes Division.

The Monetary Policy Committee's recent decision to expand the money supply through large-scale asset purchases (or 'quantitative easing') shifted the focus of monetary policy towards the quantity of money as well as the price of money. With Bank Rate close to zero, asset purchases should provide an additional stimulus to nominal spending and so help meet the inflation target. This should come about through their impact on asset prices, expectations and the availability of credit. However, there is considerable uncertainty about the strength and pace with which these effects will feed through. That will depend in part on what sellers do with the money they receive in exchange for the assets they sell to the Bank of England and the response of banks to the additional liquidity they obtain. The MPC will be monitoring a range of indicators in order to assess the impact of its asset purchases and therefore judge the appropriate stance of monetary policy.

Introduction

On 5 March, the Monetary Policy Committee (MPC) decided to reduce Bank Rate to 0.5% and to undertake what is sometimes called 'quantitative easing'. This meant that it began purchasing public and private sector assets using central bank money. In this way, the Committee is injecting money into the economy to provide an additional stimulus to nominal spending in order to meet the inflation target. This article sets out in more detail how asset purchases are expected to work, building on the information provided in the MPC minutes, the *Inflation Report* and a range of speeches by MPC members.

The conventional way for the MPC to conduct monetary policy is by setting Bank Rate. The introduction of asset purchases has shifted the focus of monetary policy, but the objectives have not changed. The MPC's remit is still to maintain price stability — defined as an inflation rate of 2% on the CPI measure — and, subject to that, to support the Government's economic policy, including its objectives for growth and employment. Asset purchases provide an additional tool to help the Committee meet those objectives. The MPC continues to decide on the appropriate level of Bank Rate each month and is independent of the Government in formulating monetary policy.

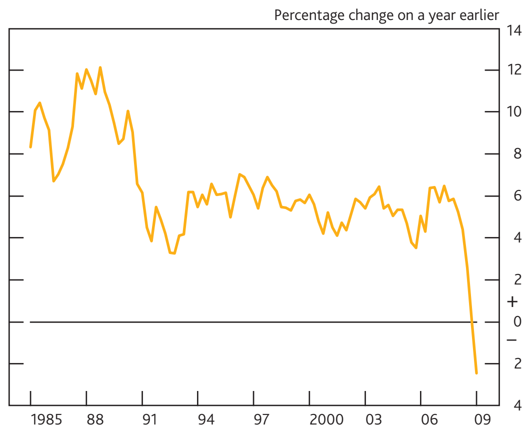
The next section discusses the reasons for undertaking asset purchases, while subsequent sections look at how they are expected to work, and the factors that will determine their effectiveness. The article then briefly considers the framework through which policymakers will decide to expand and unwind asset purchases before concluding. The article does not assess the impact of asset purchases so far. This is covered in policy documents such as the *Inflation Report* and the minutes of the MPC meetings, although the 'Markets and operations' article in this *Quarterly Bulletin* provides some commentary on recent market developments.

Why is the MPC undertaking asset purchases?

The inflation target is symmetric. If inflation looks set to rise above target, then the MPC tightens monetary policy to slow spending and reduce inflation. Similarly, if inflation looks set to fall below 2%, the Bank loosens monetary policy to boost spending and inflation. Indeed, the MPC reduced Bank Rate rapidly in response to the sharp tightening in credit conditions and a global slump in confidence following the collapse of Lehman Brothers in September 2008. By March 2009, Bank Rate was at 0.5%.

Despite the substantial stimulus already in the pipeline from monetary policy and other factors, such as fiscal policy and the sharp depreciation of sterling, the MPC judged at its March meeting that a further monetary loosening was required. In particular, it was concerned that nominal spending in the economy would otherwise be too weak to meet the inflation target in the medium term. Four-quarter growth in nominal GDP fell to -2.4% in 2009 Q1 (**Chart 1**), its lowest level since the quarterly series began in 1955.

Chart 1 Nominal GDP[a]



(a) At current market prices.

Nominal interest rates cannot generally be negative. If they were, there would be an incentive to hold cash, which delivers a zero return, rather than deposit money.[1] So with Bank Rate close to zero, a further stimulus could no longer be provided through a reduction in the policy rate.[2] Instead, it required what King (2009) describes as 'unconventional measures'.

When the MPC sets Bank Rate, it is influencing the price of money. Banks hold central bank money in the form of reserve balances held at the Bank of England and they receive interest on those reserves at Bank Rate. Banks then face the choice of holding reserves or lending them out in the market, and so market interest rates are influenced by the level of Bank Rate. This then feeds through to a whole range of interest rates faced by households and companies which in turn affects their spending decisions.

Asset purchases are a natural extension of the Bank's conventional monetary policy operations. In normal circumstances, the Bank of England provides reserves according to the demand from banks at the prevailing level of Bank Rate.[3] When conducting asset purchases, the Bank is seeking to influence the quantity of money in the economy by injecting additional reserves.[4] This does not mean though that the Bank no longer has influence over market interest rates. Market interest rates will continue to be affected both by the level of Bank Rate and, in addition, by the amount of reserves that the Bank is injecting as investors react to the additional money that they hold in their portfolios (as discussed further in the section on economic channels below).

In practice, there are a number of ways of increasing the supply of money in the economy, and a wider range of 'unconventional measures' that a central bank may undertake when interest rates are very low (see Yates (2003) for a review). This is evident in the different approaches taken by central banks in other countries (see the box on page 92). The approaches adopted in different countries will in part reflect the different structures of those economies and in particular how companies and households obtain finance. The next section looks at how quantitative easing is expected to work in the United Kingdom.

How do asset purchases work?

Injecting money into the economy

The aim of quantitative easing is to inject money into the economy in order to revive nominal spending. The Bank is doing that by purchasing financial assets from the private sector. When it pays for those assets with new central bank money, in addition to boosting the amount of central bank money held by banks, it is also likely to boost the amount of deposits held by firms and households. This additional money then works through a number of channels, discussed later, to increase spending.

The Bank of England is the sole supplier of central bank money in sterling. As well as banknotes, central bank money takes the form of reserve balances held by banks at the Bank of England. These balances are used to make payments between different banks. The Bank can create new money electronically by increasing the balance on a reserve account. So when the Bank purchases an asset from a bank, for example, it simply credits that bank's reserve account with the additional funds. This generates an expansion in the supply of central bank money.

Commercial banks hold deposits for their customers, which can be used by households and companies to buy goods and services or assets. These deposits form the bulk of what is known as 'broad money'.[5] If the Bank of England purchases an asset from a non-bank company, it pays for the asset via the seller's bank. It credits the reserve account of the seller's bank with the funds, and the bank credits the account of the seller with a deposit. A stylised illustration of this flow of funds is shown in **Figure 1**. This means that while asset purchases from banks increase the monetary base (or 'narrow money'), purchases from non-banks increase the monetary base and broad money at the same time. The expansion of broad money is a key part of the transmission mechanism for quantitative easing. It should ultimately lead to an increase in asset prices and spending and therefore bring inflation back to target.

(1) Yates (2002) notes that if the storage costs of holding cash were significant, that could reduce the return below zero and so in principle interest rates could be slightly negative.
(2) In the minutes of its March meeting, the Committee highlighted its concerns about further reductions in Bank Rate: there might be adverse effects on bank and building society profits and hence their future lending capacity; and, a sustained period of very low interest rates could impair the functioning of money markets, creating difficulties in the future, when interest rates needed to rise.
(3) For more details see *The framework for the Bank of England's operations in the sterling money markets*, available at www.bankofengland.co.uk/markets/money/publications/redbookjan08.pdf.
(4) Under both forms of monetary policy, the Bank provides banknotes according to demand.
(5) The standard UK measure of broad money is M4. This includes the UK non-bank private sector's holdings of notes and coin, sterling deposits and other sterling short-term instruments issued by banks and building societies, but excludes reserve balances held by banks at the Bank of England.

Asset purchases in other countries

The global nature of the economic slowdown has led to monetary policy being loosened around the world. Policy rates are at very low levels and a number of central banks have moved towards asset purchases. A range of approaches has been taken to easing monetary policy and improving conditions in credit markets, in part reflecting the structure of financial markets in different countries.

In the United States, asset purchases have covered a range of different types of assets, such as commercial paper and asset-backed securities. These purchases have either been undertaken directly by the Federal Reserve or by providing financing to financial companies to facilitate their purchase of private sector assets. The Federal Reserve has also expanded its purchases of US Treasuries, and begun to purchase debt issued by housing-related government sponsored enterprises. Much of the focus has been on intervening in specific markets to improve their functioning. However, the depth of capital markets in the United States has meant that these operations have resulted in a sizable expansion of the monetary base.

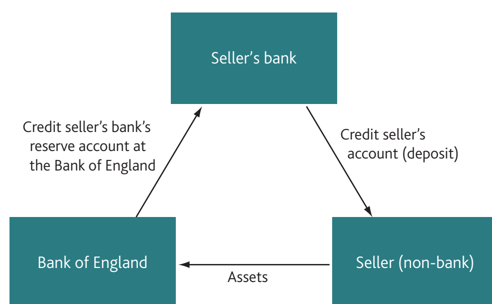
While the European Central Bank's enhanced credit support measures have mainly focused on providing support to banks through its refinancing operations it has also announced that it will begin purchases of covered bonds in the near future.

Since the start of this year, the Bank of Japan has introduced outright purchases of private sector instruments such as commercial paper and corporate bonds.

In March, the Swiss National Bank announced that it would purchase private sector assets and foreign currency to increase liquidity and prevent a further appreciation of the Swiss franc against the euro.

The Bank of Canada published a report in April that set out how it might provide a further monetary stimulus if required with the policy rate at an effective lower bound. This included purchases of both public and private sector assets, although these tools have not been used so far.

Figure 1 Flow of funds for Bank of England asset purchase from a non-bank company



Assets purchased

In order to inject a large quantity of money over a short period, there needs to be a ready supply of assets to purchase. The bulk of the Bank's purchases to date have been in the gilt market, where there is a large amount of assets with similar characteristics, allowing large quantities to be purchased quickly. However, the Bank is also purchasing private sector assets such as commercial paper and corporate bonds, albeit in smaller amounts. The aim of these purchases is to improve conditions in corporate credit markets by being a ready buyer for such instruments. This should make it easier and cheaper for companies to access credit. The focus of these operations is to improve the functioning of these markets, rather than to purchase a specific quantity of assets.

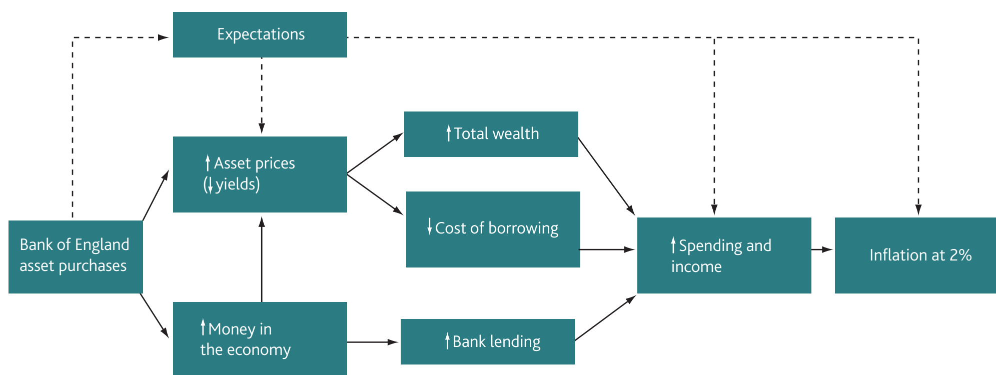
The MPC's choice of a twin-track approach — purchasing both public and private sector assets — is designed to provide a number of different channels through which it can boost spending. The box on pages 94–95 sets out more details on the operational framework for conducting purchases of these different assets. As the box notes, the Bank had begun to purchase private sector assets before the MPC decided to undertake quantitative easing. This was to improve conditions in corporate debt markets. However, those purchases were funded by the issuance of Treasury bills, rather than central bank money, and so did not increase the money supply. Purchases of commercial paper and corporate bonds do not need to be financed by central bank money to influence conditions in those markets, but since quantitative easing began they have been financed by central bank reserves and so contributed to the injection of money.

Economic channels

Injecting money into the economy, in return for other assets, increases the liquidity of private sector balance sheets. This is the fundamental mechanism through which such a monetary expansion influences spending and hence inflation. Money is highly liquid because it can easily be used to buy goods and services or other assets. The increase in private sector liquidity will depend on the liquidity of the assets that are being exchanged for money. There are a number of channels through which greater liquidity can have an impact. Three key channels are set out below. The transmission mechanism is also summarised in **Figure 2**.

- **Asset prices and portfolio effects**. Purchases of assets financed by central bank money should push up the prices of assets. Higher asset prices mean correspondingly lower

Figure 2 Stylised transmission mechanism for asset purchases



yields, reducing the cost of borrowing for households and companies leading to higher consumption and investment spending. Cheaper and easier access to working capital for companies should also help them to maintain output, improving the prospects for employment and hence consumer spending. Furthermore, higher asset prices increase the wealth of asset holders, which should boost their spending. The Bank's asset purchases influence asset prices in a number of ways.

When a financial company sells an asset to the Bank, its money holdings increase (ie it has additional deposits). If the company does not regard this extra money to be a perfect substitute for the assets it has sold, this would imply that it is now holding excess money balances. In order to rebalance the portfolio back to its desired composition, the company may use the money to purchase other assets. However, that just shifts the excess balances to the seller of those assets so that they look to purchase other assets as well. This process should bid up asset prices, in principle to the point where, in aggregate, the value of the overall asset portfolio has risen sufficiently to bring the share of money relative to all assets to its desired level. This is sometimes known as the portfolio balance effect.

More generally, as prices rise for the assets purchased by the Bank, their yield will fall relative to those on other assets. Households and companies may be encouraged to switch into other types of asset in search of a higher return. That would push up on other asset prices as well. Moreover, by injecting more money into the economy, the Bank is making liquidity cheaper and easier to obtain. That should make households and companies more willing to hold other illiquid assets on their balance sheets.

The Bank's purchases of commercial paper and corporate bonds are aimed at improving conditions in corporate debt markets more directly. In the current stressed financial environment, investors are likely to be concerned that they will not be able to find buyers for these assets if they need to sell quickly unless they accept a substantial discount on the price. That has made it difficult or costly for some companies to raise finance in the capital markets, as investors demand an additional return (or liquidity premium) to compensate them for that risk. By offering to be a ready buyer for commercial paper and corporate bonds, the Bank should make investors more confident that they can sell such assets if required, and hence lower the yield required to hold the asset back to more normal levels. More investors should also be encouraged to participate in the market, increasing the amount of financing available.

- **Bank lending and quantity effects**. As noted earlier, banks end up with higher reserve balances held at the Bank of England as the result of asset purchases. These injections of reserves may make it easier for banks to finance a higher level of liquid assets. Banks gain both new reserves and a corresponding new customer deposit when assets are purchased from non-banks. A higher level of liquid assets could encourage them to extend more new loans than they would otherwise have done. Banks need to keep a stock of liquid assets in order to be able to meet payment demands arising from customers or financial transactions. As that stock increases, banks should also be more willing to hold a higher stock of illiquid assets in the form of loans as they have the funds to cope with the potentially higher level of payments activity, unless they are constrained by other factors (see below). More bank lending to households and companies should help to support higher consumption and investment. And, even if banks do not choose to expand their lending to households and corporates, the extra reserves may contribute to a decline in the interest rate that banks pay to borrow from each other.[1]

(1) Before the start of quantitative easing, the Bank used its open market operations (OMOs) to lend sufficient reserves to banks to meet their aggregate reserves target. However, while the system as a whole will be supplied with sufficient reserves in this way, individual banks may need to borrow from each other (at different terms to the Bank's OMOs) to acquire the reserves they need to meet their reserve targets. Injections of additional reserves through asset purchases may reduce the extent to which banks have to borrow on the market to maintain a given level of reserves.

Implementation of asset purchases

Injections of money are implemented through the Asset Purchase Facility (APF). The facility was announced in January (**Table 1**) and details were set out in a subsequent exchange of letters between the Governor of the Bank of England and the Chancellor of the Exchequer.(1) The APF initially began purchases of private sector assets funded by the issuance of Treasury bills. Its purpose at that time was focused solely on improving the availability of credit to companies, by improving the liquidity in certain capital markets. However, once the MPC decided that it wished to purchase assets financed by the creation of central bank reserves, the APF was then used for monetary policy purposes, and purchases of gilts were also introduced.

Table 1 Timeline for asset purchases

Date	Event
19 January	Announcement of Asset Purchase Facility (APF) by Chancellor.
29 January	Exchange of letters on details of APF.
13 February	Launch of commercial paper facility.
5 March	MPC decision to use APF for monetary policy purposes.
11 March	First APF purchases of gilts.
19 March	Market notice for corporate bond and Credit Guarantee Scheme facilities.
25 March	First APF purchases of corporate bonds.

The overall level of purchases is decided by the Monetary Policy Committee, with the choice of assets to purchase delegated to the Bank executive. The Bank is currently purchasing three different types of high-quality assets through the APF: investment-grade commercial paper; investment-grade corporate bonds; and UK government bonds (gilts). Other assets, such as paper issued under the Credit Guarantee Scheme, syndicated loans and certain types of asset-backed securities are also included on the list of assets that are eligible for purchase by the APF, and could be considered in due course. Furthermore, the Bank can ask for the Chancellor's approval to add other assets to the eligible list if it deems that appropriate.

Asset purchases are being conducted through a separate wholly-owned subsidiary of the Bank of England, with an indemnity provided by HM Treasury to cover any losses that might be incurred. The MPC is independent of the Government in making its decisions on the level of purchases. Details of the transactions are published through the Bank's statistical publications, operational announcements and a quarterly report on the APF. The mechanisms through which the purchases are currently being made are described below.(2)

Commercial paper facility. A window is provided each business day in which companies can issue commercial paper to the Bank directly or market participants can sell paper previously acquired from issuers. A fixed spread to risk-free interest rates is charged, depending on the credit rating of the paper. Market participants selling previously acquired paper must pay an additional fee. To be eligible, commercial paper should be of up to three months maturity, subject to minimum credit ratings (equivalent to investment grade) and issued in sterling by non-bank companies that make a material contribution to economic activity in the United Kingdom.

The aim of this facility is to improve the liquidity in the commercial paper market by being a ready buyer of such assets, making issuers and investors more confident that they can raise funds if necessary. This should encourage a return to more normal market conditions and lower interest rates being charged to hold such paper. The sterling non-bank commercial paper market is relatively small in the United Kingdom, at around £6–£8 billion. As of 21 May, the APF held around £2¼ billion of commercial paper, about a third of the eligible stock.

Corporate bond facility. Reverse auctions are undertaken three times a week to buy a wide range of sterling bonds from financial institutions that act as market makers for such bonds. Participants submit bids for the price (spread) at which they are willing to sell particular bonds, with the cheapest bids being accepted by the Bank up to a maximum amount. The Bank privately sets a minimum spread (equivalent to a maximum price) at which it is prepared to purchase a bond, and so not all bonds will be bought at each auction, even if bids are received for each bond. Each auction is for a relatively small amount of each bond (up to £5 million), but the frequency of the auctions should make participants more confident that they can sell bonds if necessary. That in turn should reduce the interest rate they charge for holding them. The auctions also provide a regular source of information on the pricing of individual bonds, helping to reduce uncertainty over their market value. The focus of these purchases is to facilitate market-making by banks and dealers and so remove obstacles to corporate access to capital markets.

The eligibility criteria for corporate bonds are very similar to those for commercial paper. Bonds must be of investment grade and issued in sterling by non-bank companies that make a material contribution to economic activity in the United Kingdom. The portfolio of corporate bonds held under the APF is likely to grow over time as more auctions are held. As of 21 May, the APF held around £0.6 billion of corporate bonds.

Gilt purchases. Conventional gilts in the maturity range of 5 to 25 years are purchased through twice-weekly reverse auctions. The Bank will accept the cheapest bids (relative to market prices) for the gilts offered to it up to the total amount to be purchased at that auction. Although the bidders in these

auctions are banks and securities dealers, they can submit bids on behalf of their customers. And the auctions also allow non-competitive bids to be made by other financial companies, whereby they agree to sell their gilts at the average successful price in the competitive auction.

The aim of the gilt purchase programme is to allow the MPC to inject large quantities of money into the economy over a relatively short time scale. The nominal value of the stock of gilts in the maturity range covered by the auctions is currently around £270 billion. The purchases are not aimed at particular maturities within that range. As of 21 May, the APF had purchased around £64 billion of gilts.

Changes to the Bank's other operations. Before quantitative easing began, the Bank implemented the MPC's decisions on Bank Rate through a system of voluntary reserves targets. Banks would choose what level of reserves they wished to hold on their accounts at the Bank of England on average each month, and the Bank would supply just enough central bank money in aggregate to meet those targets. Each bank's reserves were remunerated at Bank Rate provided they were close to their target. The terms on which central bank money was provided helped to ensure that short-term market interest rates were in line with Bank Rate. But once the focus switched to the quantity of money supplied, with the MPC deciding to inject additional money into the economy, those reserves targets became redundant and were suspended. Banks simply earn interest at Bank Rate on any reserves they hold. The Bank's other open market operations that supply and withdraw central bank money have continued, so that the injection of additional reserves is broadly equal to the amount of assets purchased under the APF.

(1) These are available on the Bank's website at www.bankofengland.co.uk/monetarypolicy/assetpurchases.htm.
(2) Full details are set out in the Market Notices issued by the Bank. These are available at www.bankofengland.co.uk/markets/apf/index.htm. A box on pages 70–71 of the 'Markets and operations' article in this *Quarterly Bulletin* also discusses the Bank's purchases of private sector assets. The Credit Guarantee Scheme facility has not been activated, but the Bank stands ready to do so if market conditions deteriorate. A consultation paper was published on 8 June containing proposals for possible extensions to the APF to cover a broader range of instruments that are used to finance working capital.

The additional deposits created by bank lending will be passed on to other households and companies as they are spent.[1] In an analogous way to the portfolio effect discussed earlier, if their money balances are pushed above the desired level, they may respond by buying more goods and services. This will further boost nominal spending and should ultimately bid up the prices of goods and services leading to higher inflation. Higher money balances may also provide working capital for companies, making it easier for them to maintain employment levels.

- **Expectations**. Asset purchases could have an important impact on expectations. By demonstrating that the MPC will do whatever it takes to meet the inflation target, expectations of future inflation should remain anchored to the target when there was a risk that they might otherwise have fallen. Even with nominal interest rates fixed at very low levels, this would imply that real interest rates are kept at a lower level, which should encourage greater spending. Higher inflation expectations could also influence price-setting behaviour by firms, leading to a more direct impact on inflation. More generally, a perceived improvement in the economic outlook is likely to boost confidence and make people more willing to spend. The article on public attitudes to inflation and interest rates in this edition of the *Quarterly Bulletin* provides a discussion of recent developments in household inflation expectations.

What factors are likely to influence the strength of these channels?

To motivate a discussion of the likely strength of the above channels, we first review the past empirical evidence of the effects of asset purchases. We then discuss a number of key drivers of the strength of the economic channels set out above: first, the response by sellers of assets to the additional money they receive (most relevant to the effect of purchases on asset prices); second, the response of capital markets to purchases of corporate debt; third, the response by banks to the additional reserve balances they hold (relevant to the bank lending and quantity effects); and finally the wider response of households and companies.

Empirical evidence

Increases in money should eventually lead to a rise in prices. There is a well-established long-run empirical relationship between broad money growth and inflation across a variety of countries and monetary regimes (see for example Benati (2005) and King (2002)). However, there is considerable uncertainty about the pace with which injections of money will feed through to prices.

Quantitative easing has been used on few occasions in the past, so there is little empirical evidence on which to draw. One obvious international example is the experience of Japan earlier this decade. Bernanke *et al* (2004) found some evidence of an impact on long-term interest rates from quantitative easing. However, Baba *et al* (2005) concluded that the Bank of Japan's commitment to keep policy rates low was more important for reducing long-term interest rates than its use of quantitative easing. Asset purchases have also been used to influence government bond yields in the

(1) The deposits created directly by the Bank's asset purchases are likely to flow to financial companies, but they could end up with non-financial companies, for example, if the money is used to buy corporate bonds. The money could then flow elsewhere as the company issuing the bonds spends the money.

United States in the past. Bernanke (2002) highlighted that the Federal Reserve was successful in maintaining a ceiling on long-term Treasury bond yields in the 1940s. However, studies suggest that an attempt in the United States in the 1960s to raise short-term interest rates while lowering long-term interest rates, the so-called 'Operation Twist', was less successful (though this may have been due to the small size of the operation).

Recent announcements of asset purchases by central banks provide further evidence that such purchases can influence asset prices. Kohn (2009) highlighted that the Federal Reserve's announcements of purchases of mortgage-backed securities and Treasury bonds reduced mortgage and other long-term rates in the United States appreciably — by some estimates by as much as a percentage point. And the Bank of England's announcement on 5 March that the Bank would be purchasing £75 billion of assets financed by central bank money also appeared to have an impact on UK government bond yields. Gilt yields in the 5 to 25 year maturity range eligible for purchase fell around 40–90 basis points by the end of the day following the announcement.

Evidence on the impact of money injections on output and inflation is sparser. For the Japanese episode, Kimura *et al* (2003) found the effect to be small but highly uncertain. It is difficult to know how important quantitative easing was in the case of Japan without knowing how much worse the recession would have been without it.

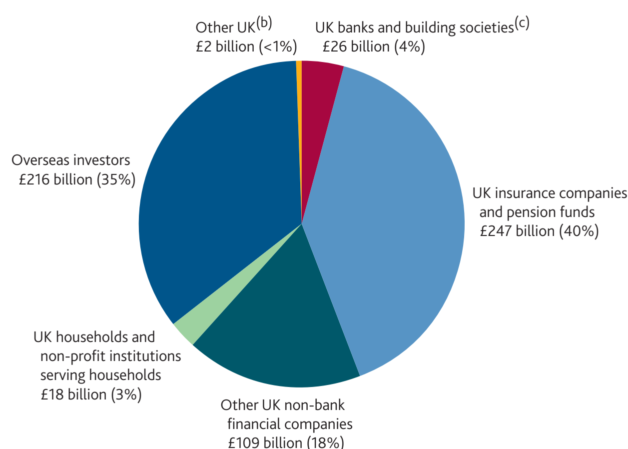
The remainder of this section looks at the factors that will influence the strength of the economic channels set out above.

Response by sellers of assets

In order for the portfolio rebalancing effect to work, sellers of assets need to purchase other assets with the money they receive, thereby bidding up asset prices. As gilts have made up the bulk of purchases, an important consideration is who typically own gilts and what they are likely to do with the money. Looking at the final seller of the gilts purchased by the Bank could be misleading. For example, some financial institutions may have bought gilts in anticipation of selling them to the Bank. In that case, it is the original seller that ends up with extra money as a result of the asset purchase programme. The distribution of gilt holdings before the announcement of the Bank's asset purchases may therefore be more informative. At the end of last year, the bulk of gilt holdings were accounted for by UK insurance companies and pension funds, other UK non-bank financial institutions and overseas investors (**Chart 2**).

For these UK non-bank financial companies, gilts represent a relatively small proportion of their overall asset portfolios, with these companies holding a range of other types of assets (**Table A**). That suggests that those companies might be

Chart 2 Distribution of total gilt holdings as at the end of 2008[(a)]



(a) Data are not seasonally adjusted.
(b) Non-financial corporations and local government.
(c) Includes Bank of England holdings.

Table A End-2008 asset holdings of UK non-bank financial companies[(a)]

Percentage of total financial assets

	Insurance companies and pension funds	Other non-bank financial companies[(b)]
Cash/deposits	7	32
Gilts	12	4
UK bank and building society bonds	4	1
Other UK bonds	7	4
UK and foreign equities	41	28
Other	29	30

(a) Data are not seasonally adjusted. Sum of components may not add up to 100 due to rounding.
(b) This measure excludes the bank deposits of intermediate other financial corporations (OFCs), which are unlikely to be related to asset prices and spending. For more details, see the box on page 13 of the May 2009 *Inflation Report*.

prepared to reinvest the money from gilt sales into other types of assets given that they already hold such assets. The speed of any adjustment will depend on how quickly portfolio reallocation decisions are made. Overseas investors might choose to invest the additional money in foreign rather than UK assets. However, in order to do so, they would still need to exchange the sterling they are holding for foreign currency. That would mean that the money is then passed on to someone else, who may decide to use it to buy other sterling assets.

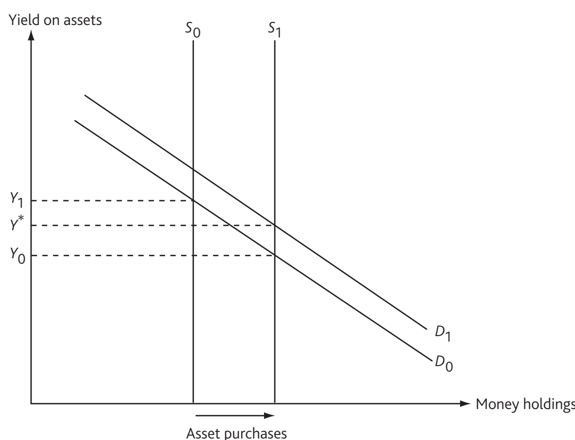
The extent to which the impact of the Bank's asset purchases feeds through to a wider range of asset prices will depend in part on the substitutability of different types of assets. Each has its own characteristics in terms of risk and return, and asset holders may require more of a difference in the relative yield to open up before they attempt to switch into particular higher-yielding assets to increase their overall returns.

If markets are efficient, all asset prices might be expected to adjust quickly to news about the Bank's asset purchases.

However, if financial markets are impaired or if there is uncertainty over how asset sellers will adjust their portfolios following the purchases, some asset prices may only adjust gradually as transactions take place.

The overall impact on asset prices (and market yields) will depend on the sensitivity of the demand for money to changes in asset returns. This is illustrated in **Figure 3**. Money provides benefits in the form of liquidity, but also imposes an opportunity cost because the return on holding money is typically lower than on other assets. So the demand for money should rise as the yields on other assets fall (shown by the downward-sloping demand curve, D_0). An increase in the supply of money (from S_0 to S_1) will only be willingly held if the yield on other assets falls (from Y_1 to Y_0).

Figure 3 Changes in money demand and money supply



Money demand will also be affected by other factors, such as activity in the economy (given the need for money to conduct transactions). As asset prices rise, nominal spending should increase and the demand for money should shift upwards (from D_0 to D_1). That will reduce the change in asset prices and yields required to bring money demand and money supply back into line (from Y_0 to Y^*).

Two key factors affecting the asset price channel, therefore, are the response, or elasticity, of money demand to changes in yields (the slope of the demand curve) and the elasticity with respect to changes in spending (the extent of the shift in the demand curve). One risk is that at low levels of yields the elasticity of money demand to changes in yields may be high, and so sellers are prepared to accept a higher proportion of money holdings and not seek to buy other assets. While this could reduce the impact on asset prices, it seems unlikely that it would negate it altogether.(1) If that is the case, the injection of money should still have a significant effect on asset prices provided it is large enough.

Response of capital markets

The Bank's purchases of high-quality private sector assets should make it easier and cheaper for companies to raise finance in corporate debt markets. However, their impact will depend in part on what has driven the increase in the spread between yields on corporate and government bonds over the past two years. An illustrative decomposition of the spread on investment grade corporate bonds in the February 2009 *Inflation Report* suggested that the pickup had been driven by both increased compensation for illiquidity and increased compensation for default losses. The Bank's facility is targeted at reducing illiquidity premia, although credit risk premia may be influenced indirectly through the general increase in collateral values and nominal spending that arises through money-financed asset purchases.

The impact on the availability of credit to companies will also depend on the willingness of investors to expand the finance they provide in corporate debt markets. Due to the financial risk involved, the Bank's purchases are focused on high-quality debt, but they could still make it easier for companies with lower-quality debt to raise finance if greater use of the capital markets by investment-grade companies leaves banks with more capacity to lend to non-investment grade companies.

The Bank's commercial paper and corporate bond facilities need not require large quantities of assets to be purchased by the Bank in order to be effective, and so their success should not be measured by the quantity of purchases. The aim is to be a ready buyer if needed, so even if actual purchases are relatively small, the knowledge the Bank stands ready to purchase assets should give confidence to investors to hold such assets.

Response by banks to additional reserves

The impact of the additional reserves on banks' overall liquidity positions will depend on how the other components of banks' balance sheets change. If banks' holdings of gilts fall (as would be the case if gilts are purchased from the banks) then banks' overall holdings of liquid assets will be relatively little changed, but if gilts are bought from non-banks, the stock of liquid assets held by banks should increase relatively more. The extent to which any improvement in the liquidity of banks' balance sheets will encourage them to increase their lending will be driven by a number of considerations, including whether they have sufficient capital to support such an expansion of their balance sheet, whether they have access to funding for the loans, and whether there is demand for the loans in the first place.

Given the financial stresses that banks are currently facing, this channel may be impaired, at least in the near term. However, over the past year a range of measures have been introduced by the authorities to support the banking sector and bolster

(1) An extreme version of this is the so-called 'liquidity trap' where people are indifferent between holding money and other assets, and so the demand for money is infinite, and yields cannot be pushed down any further.

lending. These have included capital injections, guarantees on debt issued by banks to obtain funding, and insurance against losses on some assets held by banks. As the impact of these measures feed through, they should interact with the additional liquidity provided by the Bank of England's asset purchases to make the effect of higher reserves on lending (the bank lending channel) more powerful.

One measure that is sometimes used to analyse the creation of broad money through lending by commercial banks is the 'money multiplier' — the ratio of broad money to central bank money. Given that the level of broad money is many times larger than that of central bank money, this might suggest that a small injection of reserves could have a substantial impact on broad money. However, this is not a direct causal relationship. The level of broad money reflects all the factors discussed above. In current conditions, the marginal impact on broad money of a change in reserves is likely to be much smaller than implied by the current ratio. And indeed, the money multiplier has fallen sharply since the onset of the financial crisis in the middle of 2007.

Even if banks do not increase lending at all, broad money will still rise to the extent that the Bank's asset purchases create deposits by buying from non-banks. The asset purchases should therefore boost broad money regardless of the response of the banks, but the impact could be much larger if banks increase lending as well.

Wider response of households and companies

The overall impact of asset purchases on spending will also depend on how households and companies respond to changes in their money holdings and asset prices. The impact of higher money holdings will depend, for example, on the extent to which households and companies choose to pay down debt or increase spending.

Companies facing a lower cost of borrowing, as yields fall, are likely to spend more on investment projects, for example, but the impact will also depend on the expected demand for their products. The extent to which the policy stimulus contributes to an improvement in confidence is therefore likely to be important.

The impact on household spending of an increase in asset prices will depend in part on whether it is perceived to be persistent. If households expect asset prices to remain higher, the impact on spending is likely to be stronger. Alternatively, additional wealth may be used to provide a precautionary buffer against future income shocks, and so have a more limited impact on current spending. Some wealth will be tied up in pension pots or other funds. Increases in the value of these assets may be less visible, or more difficult to access, so households may be slower to respond. Such examples illustrate the uncertainty surrounding the impact of asset purchases on aggregate spending.

Asset purchases and the monetary policy process

At its March meeting, the MPC decided to purchase £75 billion of assets over the following three months. At its May meeting, the Committee decided to purchase an additional £50 billion of assets. This will leave the level of reserves held by banks at the Bank of England more than four times higher than it was prior to the asset purchases. The injection of central bank money will be equivalent to around 8% of broad money (or 8¾% of annual GDP).(1)

As discussed in the minutes of the MPC's March meeting, the full impact of this stimulus is likely to take some time to come through. There is also a considerable lag between Bank Rate changes and their final effect on nominal spending. Ultimately, asset purchases will have been successful if they have helped the Committee return inflation back to target in the medium term. In practice, though, it will be difficult to assess the marginal impact of those purchases given the wide range of other policy measures and economic developments that will be affecting the economy. Nevertheless, a range of indicators are likely to be useful in assessing the effects of the Bank's asset purchases at different stages. Early indicators include developments in financial markets and assets prices. The 'Markets and operations' article in this *Quarterly Bulletin* provides some commentary on recent market developments. Over time, the impact on bank lending and broad money should become clearer, with the effects finally feeding through to nominal spending and inflation. MPC judgements on the impact of asset purchases and the outlook for the economy will continue to be set out in the minutes of its monthly meetings and in quarterly *Inflation Reports*.

Exit strategy

As the economy recovers, the medium-term outlook for inflation will improve. As in normal times, the Committee will be guided by the medium-term outlook for inflation relative to the inflation target. Given that the inflation target is symmetric, if inflation looks set to rise above the 2% target, then the Committee will want to tighten monetary policy to slow spending and reduce inflation.

Monetary policy could be tightened in a number of ways. It could involve some combination of increases in Bank Rate and sales of assets in order to reduce the supply of money in the economy. Alternatively, the supply of reserves could be reduced without asset sales, through the issuance of short-term Bank of England bills. The MPC will decide on the

(1) Broad money is based on a measure of M4 that excludes the holdings of intermediate other financial corporations (OFCs) which are unlikely to be related to asset prices and spending. For more details on this measure, see the box on page 13 of the May 2009 *Inflation Report*.

most appropriate way to withdraw the policy stimulus based on the circumstances prevailing at the time.

Conclusion

The introduction of large-scale asset purchases using central bank money, or 'quantitative easing', shifted the focus towards the quantity of money as well as the price of money. Injecting more money into the economy should boost spending, helping the MPC to bring inflation back to target in the medium term. The stimulus is likely to occur through a number of channels, and the responses of those who receive the additional money balances will be key to its overall effectiveness. The more that households and companies use the new money to buy goods and services or other assets, the more it will raise spending. If banks use the additional reserves to expand their lending, the impact could be even stronger.

It is too soon to say how powerful the stimulus will ultimately be. There is considerable uncertainty about the strength and timing of the effects. Standard economic models are of limited use in these unusual circumstances, and the empirical evidence is extremely limited. However, the monetary policy framework will ensure that the appropriate measures are taken over time so that the inflation target is met in the medium term.

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