Quarterly Bulletin

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Foreword

Maintaining price stability and maintaining financial stability are the two core purposes of the Bank of England. This edition of the *Quarterly Bulletin* discusses a number of considerations important in achieving those two goals. They include: understanding the potential drivers behind the UK economy's need to rebalance; explaining how the Special Surveys carried out by the Bank's Agents were used to explore various puzzles faced by policymakers during the financial crisis; and describing the way in which the Bank of England has responded to funding problems in the banking system during the crisis, and how this influenced the design of the liquidity insurance facilities we have today.

This *Bulletin* begins, as usual, by examining developments in financial markets. The *Markets and operations* article reviews developments in financial markets covering the period between the previous *Bulletin* and 9 March 2012. Financial market sentiment improved considerably over this period amid a range of actions by policymakers, both in the United Kingdom and abroad. This included a further easing of monetary policy, measures designed to mitigate risks to financial stability and agreement on a second IMF/EU assistance programme for Greece. The improvement in sentiment contributed to a rally across a range of asset prices, including both corporate bonds and equities. Activity in primary capital markets also rose and bank funding conditions improved. But concerns about the indebtedness and competitiveness of some euro-area countries persisted and remained a key influence on financial markets. The article also describes the most recent results from the Money Market Liaison Group survey of the sterling money market and examines developments in the market for unsecured floating-rate notes.

The *Inflation Report* and speeches by Monetary Policy Committee (MPC) members often discuss the need for the UK economy to rebalance. This stems from evidence that the size and structure of some trade and financial flows — between different sectors of the UK economy, and between the United Kingdom and the rest of the world — are unsustainable. Low national saving, a persistent current account deficit and the rapid expansion of balance sheets are all potential symptoms of the need for the UK economy to rebalance. The financial crisis appears to have prompted some rebalancing already, but more will be required at some point. This article sets out a framework for thinking about rebalancing and the factors that might give rise to it.

The Bank operates a nationwide network of Agents who act as the eyes and ears of the MPC across the length and breadth of the United Kingdom. The Bank's Agents speak to around 8,000 businesses over the course of each year and report their findings back to the MPC each month ahead of the policy meetings. In addition to their regular intelligence gathering, every few months the MPC commissions the Agents to conduct a Special Survey of businesses to address a particular issue or puzzle. An article in this edition looks at the Special Surveys that

were commissioned by the MPC during and after the financial crisis. It discusses some of the puzzles faced by the MPC during this period and describes how the Special Surveys helped to shed light on these issues — some of which continue to represent significant sources of uncertainty today.

Commodity prices, especially oil prices, have played a very significant role in driving fluctuations in both UK output and inflation in recent years. But trying to predict how oil prices are likely to behave in the future is very difficult. When producing their central projections for GDP growth and inflation, the MPC assumes that oil prices follow the path implied by the market futures curve. In the past, however, oil prices have deviated significantly from that path. Unfortunately, none of the alternative approaches appear to perform consistently better. The article in this edition describes what information the futures curve contains and considers the arguments for and against using it as an assumed path for oil prices in the MPC's central projections.

In November last year, the Bank of England held a conference to discuss the lessons learned about quantitative easing (QE) and the other unconventional monetary policies used during the global financial crisis. A number of central banks, including the Bank of England, and academics presented their research. The article in this edition summarises those presentations and the related discussions. Overall, the papers broadly supported the emerging consensus that QE and other unconventional monetary policies have helped to mitigate the macroeconomic effects of the global financial crisis. There is, however, considerable uncertainty about the precise magnitudes of the effects and the main mechanisms through which the policies operate, and a number of areas for further research were suggested.

In April 2008, the Bank of England introduced the Special Liquidity Scheme (SLS) to improve the liquidity position of the UK banking system. It did so by helping banks finance assets that had got stuck on their balance sheets following the closure of some asset-backed securities markets from 2007 onwards. The SLS was, from the outset, intended as a temporary measure, to give banks time to strengthen their balance sheets and diversify their funding sources. The Scheme terminated in January 2012 when the last SLS transactions expired. During the period in which the SLS was in operation, the Bank undertook a fundamental review of its framework for sterling market operations and developed a new set of facilities to provide ongoing liquidity insurance to the banking system. This article explains the design and operation of the SLS and describes how that experience has influenced the design of the Bank's permanent liquidity insurance facilities.

This edition also contains a summary of the main points made by participants at the most recent Monetary Policy Roundtable hosted by the Bank of England and the Centre for Economic Policy Research, on 15 December 2011.

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Research work published by the Bank is intended to contribute to debate, and does not necessarily reflect the views of the Bank or of MPC members.

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The speeches contained in the *Bulletin* can be found at www.bankofengland.co.uk/publications/Pages/speeches/default.aspx

Except where otherwise stated, the source of the data used in charts and tables is the Bank of England or the Office for National Statistics (ONS). All data, apart from financial markets data, are seasonally adjusted.

PROMISE

Recent economic and financial developments

Markets and operations

This article reviews developments in sterling financial markets, including the Bank's official operations, between the 2011 Q4 *Quarterly Bulletin* and 9 March 2012.⁽¹⁾ The article also summarises market intelligence on selected topical issues relating to market functioning.

Sterling financial markets

Overview

Financial market sentiment improved considerably over the review period amid a range of actions by policymakers in the United Kingdom and abroad. A number of central banks, including the Bank of England and the European Central Bank (ECB), eased monetary policy and announced measures to mitigate risks to financial stability. These measures included co-ordinated actions by central banks to enhance their capacity to provide liquidity support in non-domestic currencies, the announcement of a new contingency sterling liquidity facility by the Bank of England, and the extension of liquidity provision by the ECB through three-year longer-term refinancing operations (LTROs). Agreement was also reached on a second IMF/EU assistance programme for Greece and negotiations on private sector involvement in Greek government debt restructuring were completed.

The improvement in sentiment contributed to a rise in a wide range of asset prices, including corporate bonds and equities. Activity in primary capital markets increased, particularly in corporate debt markets. Bank funding conditions also improved, most notably following the ECB's LTROS.

Concerns about the indebtedness and competitiveness of some euro-area countries persisted, however, with sovereign bond yields in those countries remaining elevated. And measures of bank funding costs remained above the levels that prevailed during the first half of 2011.

Monetary policy and short-term interest rates

The Bank of England's Monetary Policy Committee (MPC) maintained Bank Rate at 0.5%. The programme of £75 billion of asset purchases announced in October 2011 had been completed in early February. The MPC voted on 9 February to increase the size of its asset purchase programme, financed by the issuance of central bank reserves, by a further £50 billion, to £325 billion. The MPC expected these purchases to take three months to complete. The Committee judged that the weak near-term growth outlook and associated downward pressure from economic slack meant that, without further

monetary stimulus, it was more likely than not that inflation would undershoot the 2% target in the medium term. The asset purchase programme is described in the box on pages 8–9.

A Reuters poll of economists released at the end of the review period showed that expectations for further monetary easing had been pared back. The median expectation for total asset purchases was £325 billion, down from £350 billion in a similar survey conducted at the beginning of the review period. The same Reuters poll continued to indicate that the median expectation was for no increase in Bank Rate over the survey horizon, which ended in the middle of 2013. But forward sterling overnight index swap (OIS) rates ended the period a little higher (**Chart 1**). Contacts attributed changes in monetary policy expectations to economic data releases and to policy-related statements by MPC members.





(a) Instantaneous forward rates derived from the Bank's OIS curves.

Overnight sterling secured interest rates remained below Bank Rate for most of the review period (**Chart 2**). Contacts continued to attribute this to elevated demand for

(1) The data cut-off for the previous Bulletin was 25 November 2011.





Sources: Bloomberg and Bank calculations.

high-quality collateral exerting downward pressure on secured interest rates. Contacts had previously noted banks' reluctance to increase the size of their balance sheets as one of the reasons why borrowers had not fully exploited the opportunity to borrow cash secured at below Bank Rate and deposit it on their reserves accounts at Bank Rate. Greater reluctance to expand balance sheets at year-end reportedly amplified these downward pressures on secured interest rates.

Sterling unsecured overnight interest rates fell over the review period, trading at times below Bank Rate. At year-end, this was reportedly exacerbated by the first UK annual Bank Levy on banks' and building societies' liabilities, which contacts suggested had reduced banks' demand for unsecured short-dated wholesale liabilities.⁽¹⁾

Elsewhere, on 8 December, the Governing Council of the ECB cut its main policy rate by 25 basis points to 1%. Forward euro OIS rates fell across all maturities (Chart 1). During the review period, the ECB also extended its liquidity provision to the euro-area banking system by undertaking two three-year LTROs, announced in December.

In the United States, the Federal Open Market Committee announced that it anticipated economic conditions to warrant exceptionally low levels for the federal funds rate at least through late 2014, longer than previously stated. Consistent with that, forward US dollar OIS rates fell at longer maturities. The Federal Reserve continued to extend the average maturity of its holdings of securities, and to reinvest principal payments from its holdings of agency debt and agency mortgage-backed securities in agency mortgage-backed securities.

Bank funding markets

Conditions in European bank funding markets improved during the review period. Contacts attributed this largely to the two LTROs undertaken by the ECB in December 2011 and February 2012. Across the two operations, the ECB allotted a total of around €1 trillion of central bank reserves. The net injection of reserves was around half of that, reflecting the rolling over of existing borrowing into these LTROs.

In short-term funding markets, the spread of unsecured interbank borrowing costs — as measured by the London interbank offered rate (Libor) — over OIS rates of similar maturity fell in euro and US dollars (**Chart 3**). Forward spreads implied by derivatives settling on Libor were consistent with market participants anticipating a further improvement in short-term euro funding costs.





Sources: Bloomberg, British Bankers' Association and Bank calculations.

(a) Three-month Libor-OIS spreads derived from Libor fixings and OIS rates.
 (b) Forward spreads derived using data as at 9 March. The squares are implied forward spreads using forward Libors derived from forward rate agreements, and forward OIS rates derived from the OIS curve.

Short-term funding conditions in US dollar markets also improved for European banks: the difference between the cost of raising US dollar funding by borrowing in euro and swapping via the foreign exchange market and the cost of direct US dollar borrowing fell by 85 basis points (**Chart 4**). Contacts attributed this both to co-ordinated central bank action to address pressures in global money markets, announced at the start of the review period, and the improvement in sentiment that accompanied the ECB's LTROS.⁽²⁾ US money market mutual funds were also reported to be extending the average maturity of the funding they provided and increasing their exposures to some European banks.

Conditions in longer-term bank funding markets also improved considerably during the review period, with increased issuance by both euro-area and UK banks. Banks continued to issue in secured funding markets. Issuance also rose in unsecured

⁽¹⁾ Further details on the Bank Levy can be found at

www.hmrc.gov.uk/budget2011/tiin6123.pdf.

⁽²⁾ For more information on the co-ordinated central bank action, see the box on pages 286–88 of the 2011 Q4 Quarterly Bulletin.

Asset purchases(1)

During the review period, the Bank completed the purchases of £75 billion of gilts mandated by the Monetary Policy Committee (MPC) in October 2011⁽²⁾ and commenced the purchases of an additional £50 billion of gilts mandated by the MPC in February 2012.⁽³⁾ The additional £50 billion of purchases increased the size of the programme from £275 billion to £325 billion. As of 8 March 2012, outstanding asset purchases financed by issuance of central bank reserves totalled £292 billion.

Purchases of high-quality private sector assets financed by the issuance of UK Treasury bills and the Debt Management Office's (DMO's) cash management operations continued, in line with the arrangements announced on 29 January 2009.⁽⁴⁾

Table 1 summarises asset purchases by type of asset.

Gilts

Following the MPC's decision on 6 October 2011 to increase the scale of the programme of asset purchases from £200 billion to £275 billion, 44 gilt auctions were conducted. Usually, gilts with a residual maturity of 3–10 years were purchased on Mondays, of greater than 25 years on Tuesdays and of 10-25 years on Wednesdays. This cycle was repeated

Table 1 Asset Purchase Facility transactions by type (£ millions)

each week until the operation on 1 February, with the exception of the final two weeks of December, when no purchases were made, and the first week in January, when there was no Monday purchase. The size of each operation was £1.7 billion, except for the final two greater than 25 years maturity operations, which were for £1.8 billion each, to enable the Asset Purchase Facility (APF) to reach the target mandated by the MPC.

Following the MPC's decision on 9 February 2012 to increase the scale of the programme of asset purchases from £275 billion to £325 billion, the Bank announced it would continue to purchase conventional gilts with a minimum residual maturity of greater than three years, divided into three maturity sectors, but that the boundaries between those sectors would be adjusted. Usually, gilts with a residual maturity of 3-7 years would be purchased on Mondays, of greater than 15 years on Tuesdays and of 7–15 years on Wednesdays. The new maturity sectors were the same as those used by the DMO. This operational change was intended to help reduce the risk of undesirable frictions in the functioning of the gilt market arising from the concentration of the Bank's holdings of gilts in certain maturity sectors. Prior to commencing the additional £50 billion of purchases in February, the Bank's holding of the 10-25 year sector, as a percentage of the 'free float' of that sector (the total issue size

Week ending ^(a) C	ommercial	Secured commercial	Gilts		Corporate bond		Total ^(b)
	paper	paper		Purchases		Sales	
24 November 2011 ^{(c)(d)}	0	20	233,973		862		234,855
1 December 2011	0	0	5,100	4		0	5,104
8 December 2011	0	0	5,100	6		12	5,094
15 December 2011	0	0	5,100	7		1	5,106
22 December 2011	0	0	0	0		15	-15
29 December 2011	0	0	0	0		78	-78
5 January 2012	0	0	3,400	0		0	3,400
12 January 2012	0	0	5,100	0		51	5,049
19 January 2012	0	0	5,100	3		19	5,084
26 January 2012	0	0	5,200	3		19	5,184
2 February 2012	0	0	5,200	0		5	5,195
9 February 2012	0	0	0	3		72	-69
16 February 2012	0	0	4,500	3		32	4,471
23 February 2012	0	0	4,500	3		52	4,451
1 March 2012	0	0	4,500	2		105	4,397
8 March 2012	0	0	4,500	0		43	4,457
Total financed by a deposit from the DM	O(q)(6) -	-	-		96		96
Total financed by central bank reserves ^{(d})(e) _	-	291,270		304		291,574
Total asset purchases ^{(d)(e)}	-	_	291,270		400		291,670

(a) Week-ended amounts are for purchases in terms of the proceeds paid to counterparties, and for sales in terms of the value at which the Bank initially purchased the securities. All amounts are on a trade-day basis, rounded to the nearest million. Data are aggregated for purchases from the Friday to the following Thursday.
(b) Weekly values may not sum to totals due to rounding.
(c) Measured as amount outstanding as at 24 November 2011.
(d) In terms of proceeds paid to counterparties less redemptions at initial purchase price on a settled basis.
(e) Data may not sum due to assets maturing over the period.

minus UK government holdings), was 46%, compared with 31% in the 3–10 year sector and 27% in the greater than 25 year sector. By changing to the new maturity sectors, the Bank's holdings, as a percentage of the free float, were more evenly spread across sectors.

As of 8 March 2012, the Bank had purchased £18 billion of the further £50 billion mandated by the MPC. This was split equally across the three maturity sectors via twelve gilt purchase auctions, each for £1.5 billion. The total amount of gilts purchased since the start of the asset purchase programme in March 2009 was £291 billion, of which £74.9 billion of purchases had been in the 3–7 year residual maturity range, £96.2 billion in the 7–15 year residual maturity range and £120.2 billion with a residual maturity greater than 15 years (**Chart A**).



(a) Proceeds paid to counterparties on a settled basis(b) Residual maturity as at the date of purchase.

Cover in the auctions varied. Between 24 November 2011 and 1 February 2012 it averaged 2.5 in the 3–10 year auctions, 2.1 in the 10–25 year auctions and 1.9 in the auctions for gilts with a maturity greater than 25 years. From 13 February to 8 March 2012, cover in the auctions averaged 3.6 in the 3–7 year auctions, 3.4 in the 7–15 year auctions and 2.6 in the auctions for gilts with a maturity greater than 15 years.⁽⁵⁾

In line with previous APF gilt purchases, the Bank continued to exclude gilts in which the Bank holds a large proportion (more than 70%) of the free float.⁽⁶⁾

Gilt lending facility⁽⁷⁾

The Bank continued to offer to lend some of its gilt holdings via the DMO in return for other UK government collateral. In the three months to 31 December 2011, a daily average of $\pounds1,640$ million of gilts was lent as part of the gilt lending

facility. This was below the average of £2,623 million in the previous quarter.

Corporate bonds

The Bank continued to offer to purchase and sell corporate bonds via the Corporate Bond Secondary Market Scheme, with purchases financed by the issue of Treasury bills and the DMO's cash management operations. The Scheme continued to serve a useful role as a backstop, particularly during periods of market uncertainty.

Net sales of corporate bonds increased during the review period. As of 8 March 2012, the Bank's portfolio totalled £400 million, compared to £862 million at the end of the previous review period. The increase in net sales reflected market conditions: the Bank's market contacts reported strong end-investor demand for corporate bonds since the start of the year and a low level of inventories held by dealers resulting in higher demand to purchase bonds from the Corporate Bond Scheme.

Secured commercial paper facility

The Bank continued to offer to purchase secured commercial paper (SCP) backed by underlying assets that are short term and provide credit to companies or consumers that support economic activity in the United Kingdom.⁽⁸⁾ The facility remained open during the review period but no purchases were made.

- (2) For further information, see the 6 October 2011 Market Notice, available at www.bankofengland.co.uk/markets/Documents/marketnotice111006.pdf.
 (3) For further information. see the 9 February 2012 Market Notice. available at
- (3) For further information, see the 9 February 2012 Market Notice, available a www.bankofengland.co.uk/markets/Documents/marketnotice120209.pdf.
- (4) The APF was initially authorised to purchase private sector assets financed by Treasury bills and the DMO's cash management operations. Its remit was extended to enable the Facility to be used as a monetary policy tool on 3 March 2009. All purchases of assets between 6 March 2009 and 4 February 2010 were financed by central bank reserves. All purchases of private sector assets since 4 February 2010 have been financed by the issuance of Treasury bills and the DMO's cash management operations. All purchases of gilts since 10 October 2011 have been financed by central bank reserves. The Chancellor's letter is available at www.hm-treasury.gov.uk/d/chx_letter_090212.pdf.
- (5) Further details of individual operations are available at
- www.bankofengland.co.uk/markets/Pages/apf/gilts/results.aspx. (6) The 8% 2021 gilt was excluded from all operations over the period for this reason.
- (7) For more details on the gilt lending facility see the box 'Gilt lending facility' in the Bank of England Quarterly Bulletin, Vol. 50, No. 4, page 253.
- (8) The SCP facility is described in more detail in the Market Notice available at www.bankofengland.co.uk/markets/Documents/marketnotice090730.pdf.

⁽¹⁾ The data cut-off for this box is 8 March 2012, unless otherwise stated. For further discussion on asset purchases see the Asset Purchase Facility Quarterly Report available at www.bankofengland.co.uk/publications/Pages/other/markets/apf/ quarterlyreport.aspx.





(a) Spread of three-month US dollar Libor implied from foreign exchange forwards over actual three-month US dollar Libor. For more details on the construction of these measures, see Bank of England Quarterly Bulletin, Vol. 48, No. 2, page 134, Chart 26 and BIS Quarterly Review, March 2008, pages 73–86.

markets, which had reportedly been effectively closed to all but the highest-rated European banks in the previous review period (Chart 5).





Sources: Dealogic and Bank calculations.

(a) Commercial and residential mortgage-backed securities

(b) Medium-term notes.
 (c) Asset-backed securities.

(d) Data are up to 9 March 2012

Contacts thought that increased issuance in public markets combined with the ECB's LTROs had relieved much of the funding pressure facing European banks in 2012. But European banks continued to face elevated funding costs: for example, while the cost of issuance for UK senior unsecured funding had fallen since the LTROs, it remained above the levels that prevailed during the first half of 2011. The average maturity of UK senior unsecured issuance was also shorter than in the first half of 2011.

Long-term interest rates

Developments in the euro area remained a key influence on government bond markets. Sovereign bond yields fell for many euro-area countries amid a range of actions taken by policymakers (Chart 6). Contacts attributed some of those falls to the ECB's LTROs, which were perceived to have lessened the potential near-term fiscal risks stemming from banking sector vulnerabilities. Spanish and Italian yields fell in particular at the short end, consistent with reports from contacts that some banks in those countries had invested part of the proceeds from the ECB's operations in their domestic sovereign debt. Agreement was reached on a second IMF/EU assistance programme for Greece and negotiations on private sector involvement in Greek government debt restructuring were completed. At the end of the review period, the International Swaps and Derivatives Association announced that a credit event had occurred with respect to Greece, triggering credit default swaps on Greek sovereign debt.





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(a) Yields to maturity on ten-year benchmark government bonds.(b) Yield to maturity on the nine-year benchmark government bond.

The actions taken by policymakers were reported to have reduced the perceived risk of contagion from a Greek default to other euro-area periphery countries. Concerns about the indebtedness and competitiveness of some euro-area countries have, however, persisted, with sovereign bond yields in these countries remaining elevated.

In the United Kingdom, the gilt yield curve steepened over the review period, with yields falling at shorter maturities and rising at longer maturities (**Chart 7**). According to contacts, investor demand was reported to have persisted for sovereign bonds that were perceived to be more liquid or carrying less credit risk, including those of the United Kingdom, which had acted to bear down on gilt yields. There was little market

reaction to Moody's changing the outlook on the Aaa rating for UK sovereign bonds to negative from stable. Contacts reported that the Asset Purchase Facility gilt purchase announcements in February had also affected gilt yields. These announcements had included an operational change implying a shift in the proportions of gilts purchased at different maturities (for more information, see the box on pages 8–9). Subsequent to the announcements, gilt yields fell at shorter maturities and rose at longer maturities.





(a) Instantaneous forward rates derived from the Bank's government liability curves.

Changes in nominal gilt yields were largely accounted for by changes in real yields (Chart 8). Medium-term measures of breakeven inflation were little changed, albeit that some short-term measures had risen amid sterling oil prices reaching historically high levels.



Source: Bank calculations

(a) Instantaneous real forward rates derived from the Bank's government liability curves.

Elsewhere, US sovereign bonds were also reported to have benefited from investor demand for assets perceived to be carrying less credit risk. But contacts noted that this was

generally outweighed by the market's reaction to stronger economic data (Chart 7).

Corporate capital markets

Having fallen in the summer of 2011, international equity prices rose markedly during the review period (Chart 9). In the United Kingdom, the FTSE All-Share index ended the review period around 15% higher and was close to its level at the start of 2011. One of the largest contributions to this change came from the financial sector, which had underperformed the broader index during much of 2011.





Sources: Bloomberg and Bank calculations

(a) Indices are quoted in domestic currency terms, except for the MSCI Emerging Markets index, which is quoted in US dollar terms

(b) The MSCI Emerging Markets index is a capitalisation-weighted index that monitors the performance of stocks in emerging markets.

Contacts attributed the recovery in international equity markets largely to the improvement in financial market sentiment following the announcement of the ECB's LTROs. In the United States, contacts reported that stronger-than-expected corporate earnings and economic data had contributed to the rise in US equity markets.

The yields on both high-yield and non-financial investment-grade corporate bonds fell relative to sovereign bonds across the major markets. But these spreads remained above their average pre-crisis levels (Chart 10). Contacts reported that the secondary market for corporate bonds had continued to be illiquid, with market makers' inventories remaining at low levels. In the United Kingdom, the low level of inventories, combined with higher investor demand for corporate debt, had reportedly contributed to increased sales from the Bank's Corporate Bond Secondary Market Scheme (see the box on pages 8–9).

Conditions in the UK primary corporate bond markets improved over the review period, allowing companies to refinance maturing bonds more easily. New issue premia were

Operations within the Sterling Monetary Framework and other market operations

The level of central bank reserves continued to be determined by (i) the stock of reserves injected via the Asset Purchase Facility (APF), (ii) the level of reserves supplied by long-term repo open market operations (OMOs) and (iii) the net impact of other sterling ('autonomous factor') flows across the Bank's balance sheet. This box describes the Bank's operations within the Sterling Monetary Framework over the review period, and other market operations. The box on pages 8–9 provides more detail on the APF.

Operational Standing Facilities

Since 5 March 2009, the rate paid on the Operational Standing Deposit Facility has been zero, while all reserves account balances have been remunerated at Bank Rate. Reflecting this, average use of the deposit facility was $\pounds 0$ million throughout the period under review. Average use of the lending facility was also $\pounds 0$ million throughout the period.

Indexed long-term repo OMOs

As part of its provision of liquidity insurance to the banking system, the Bank conducts indexed long-term repo (ILTR) operations. The Bank offers reserves via ILTRs once each calendar month; typically, the Bank will conduct two operations with a three-month maturity and one operation with a six-month maturity in each calendar quarter. Participants are able to borrow against two different sets of collateral. One set corresponds with securities eligible in the Bank's short-term repo operations ('narrow collateral'), and the other set contains a broader class of high-quality debt securities that, in the Bank's judgement, trade in liquid markets ('wider collateral').

The Bank offered \pounds 5 billion via three-month ILTR operations on both 13 December and 10 January, and \pounds 2.5 billion via a six-month operation on 14 February (**Table 1**).

The stop-out spread — the difference between clearing spreads for wider and narrow collateral — reached a new low for three-month operations in the December 2011 ILTR, falling to 9 basis points. In the January 2012 operation there were no bids against narrow collateral, hence the clearing spread for wider collateral — 11 basis points — was the stop-out spread. The cover ratio fell from 0.31 in December to 0.14 in January, the lowest cover ratio in any three-month ILTR operation to date (Chart A).

In the six-month operation in February, the stop-out spread was 17 basis points, the lowest stop-out spread for a six-month operation since May 2011. The cover ratio was 0.24, the lowest cover ratio in a six-month operation to date.

Table 1 Indexed long-term repo operations

	Total	Collateral set summary		
		Narrow	Wider	
13 December 2011 (three-month maturity)				
On offer (£ millions)	5,000			
Total bids received (£ millions) ^(a)	1,548	830	718	
Amount allocated (£ millions)	1,323	830	493	
Cover	0.31	0.17	0.14	
Clearing spread above Bank Rate (basis points)		3	12	
Stop-out spread (basis points) ^(b)	9			
10 January 2012 (three-month maturity)				
On offer (£ millions)	5,000			
Total bids received (£ millions) ^(a)	682	0	682	
Amount allocated (£ millions)	553	0	553	
Cover	0.14	0.00	0.14	
Clearing spread above Bank Rate (basis points)		n.a.	11	
Stop-out spread (basis points) ^(b)	11			
14 February 2012 (six-month maturity)				
On offer (£ millions)	2,500			
Total bids received (£ millions) ^(a)	595	20	575	
Amount allocated (£ millions)	320	20	300	
Cover	0.24	0.01	0.23	
Clearing spread above Bank Rate (basis points)		0	17	
Stop-out spread (basis points) ^(b)	17			

(a) Due to the treatment of paired bids, the sum of bids received by collateral set may not equal total bids

(b) Difference between clearing spreads for wider and narrow collateral.

Chart A ILTR allocation and clearing spreads



The low stop-out spreads and cover ratios seen across the period are consistent with lower demand for three and six-month liquidity via the ILTR operations. There are a number of possible reasons for this. First, shorter-term secured market interest rates fell, making private repo markets a cheaper source of liquidity than previously. Second, the APF asset purchase programme and the ECB's three-year longer-term refinancing operations (LTROs) supplied liquidity to the banking system, which may have reduced the need for counterparties to use the ILTR operations to meet their liquidity needs.

Reserves provided via ILTRs during the review period were more than offset by the maturity of the previous ILTR operations. Consequently, the stock of liquidity provided through these operations declined.

Discount Window Facility

The Discount Window Facility (DWF) provides liquidity insurance to the banking system by allowing eligible banks to borrow gilts against a wide range of collateral. On 3 January 2012, the Bank announced that the average daily amount outstanding in the 30-day DWF between 1 July and 30 September 2011 was £0 million. The Bank also announced that the average daily amount outstanding in the 364-day DWF between 1 July and 30 September 2010 was £0 million.

Extended Collateral Term Repo Facility

As discussed on page 287 of the 2011 Q4 *Bulletin*, the Bank announced the introduction of a new contingency liquidity facility, the Extended Collateral Term Repo (ECTR) Facility on 6 December 2011. The ECTR Facility is designed to mitigate risks to financial stability arising from a market-wide shortage of short-term sterling liquidity.⁽¹⁾ As of 9 March 2012, no operations under the Facility had been announced.

Information transparency for liquidity insurance collateral

On 1 December 2011, the one-year transition period began for the new eligibility requirements for residential mortgage-backed securities (RMBS) and covered bonds backed by residential mortgages delivered as collateral against transactions in the Bank's operations, as set out in the Market Notice of 30 November 2010. During this period, securities that do not meet the eligibility criteria will remain eligible, but subject to increasing haircuts. Any securities that do not meet the criteria by the end of the transition period will be ineligible for use as collateral in any of the Bank's operations.

On 20 December 2011, the Bank announced further details of the eligibility requirements for commercial mortgage-backed securities (CMBS), small-medium enterprise loan-backed securities (SME CLO) and asset-backed commercial paper (ABCP) delivered as collateral against transactions in the Bank's operations. These detailed eligibility requirements will come into effect from 1 January 2013. This will be followed by a one-year implementation period during which haircuts on non-compliant securities will increase.

Other operations

Special Liquidity Scheme

The Special Liquidity Scheme (SLS) was introduced in April 2008 to improve the liquidity position of the banking system by allowing banks and building societies, for a limited period, to swap their high-quality mortgage-backed and other private sector securities for UK Treasury bills for up to three years. The SLS terminated on 30 January 2012. All drawings were repaid before the Scheme terminated. The Scheme is described in more detail on pages 57–66 in this *Bulletin*.

US dollar repo operations

On 11 May 2010, the Bank reintroduced weekly fixed-rate tenders with a seven-day maturity to offer US dollar liquidity, in co-ordination with other central banks, in response to renewed strains in the short-term funding market for US dollars at this time. As of 9 March 2012, there had been no use of the Bank's facility.

On 15 September 2011, the Bank announced, in co-ordination with the ECB, the Swiss National Bank, the Federal Reserve, and the Bank of Japan, that it would be conducting three US dollar tenders, each at a term of approximately three months covering the end of the year. There was no use of the Bank's facility in any of these three tenders.

On 30 November 2011, the Bank announced, in co-ordination with the Bank of Canada, the Bank of Japan, the ECB, the Swiss National Bank, and the Federal Reserve, that the authorisation of the existing temporary US dollar swap arrangements had been extended to 1 February 2013, that the 84-day US dollar tenders would continue until this time, and that the seven-day operations would continue until further notice. It also announced that the central banks had agreed to lower the pricing on the US dollar overnight index swap rate plus 50 basis points to the US dollar overnight index swap rate plus 50 basis points. As a contingency measure, the six central banks agreed to establish a network of temporary bilateral liquidity swap arrangements that will be available until 1 February 2013.

Bank of England balance sheet: capital portfolio

The Bank holds an investment portfolio that is approximately the same size as its capital and reserves (net of equity holdings, for example in the Bank for International Settlements, and the Bank's physical assets) and aggregate cash ratio deposits. The portfolio consists of sterling-denominated securities. Securities purchased by the Bank for this portfolio are normally held to maturity; nevertheless sales may be made from time to time, reflecting, for example, risk management, liquidity management or changes in investment policy. The portfolio currently includes around ± 3.4 billion of gilts and ± 0.4 billion of other debt securities. Over the review period, gilt purchases were made in accordance with the quarterly announcements on 3 October 2011 and 3 January 2012.

The Bank's foreign currency reserves

As part of the monetary policy framework introduced in 1997, the Bank holds its own foreign exchange reserves. These reserves can be used by the MPC in support of monetary policy. In December 2006, the Bank announced that its foreign exchange reserves would be financed by issuing

said to have fallen from their historically high levels in the second half of 2011, making it easier for less established issuers to come to the market. Reflecting this, gross issuance by UK private non-financial corporations (PNFCs) in January and February was stronger than in previous years (**Chart 11**).

Chart 10 International high-yield and non-financial investment-grade corporate bond spreads^{(a)(b)}





 (a) Option-adjusted spreads over government bond yields.
 (b) Dashed lines. 1997-2007 averages for investment-grade bonds and 1998–2007 averages for high-yield bonds.



Chart 11 Cumulative gross bond issuance by UK PNFCs

medium-term securities on an annual basis, with a regular timetable, a high degree of transparency, and a group of banks to market and distribute each issue. The first bond was issued in March 2007, followed by issuance each subsequent year. On 27 February 2012, the Bank issued its latest three-year dollar-denominated bond.⁽²⁾

(1) Further details are available at

www.bankofengland.co.uk/markets/Pages/money/ectr/index.aspx. (2) Further details are in the Market Notice available at

www.bankofengland.co.uk/markets/Documents/reserves/marketnotice120227.pdf.

Contacts attributed greater investor demand to the general improvement in market sentiment over the review period.

In net terms, however, capital market issuance had been more muted. PNFCs had, in aggregate, not raised additional bond finance, and share buybacks had outstripped equity issuance. Contacts attributed this to companies' large cash buffers and ongoing reluctance to invest amid an uncertain economic outlook.

Foreign exchange

The sterling exchange rate index (ERI) appreciated by 1% over the review period (**Chart 12**). Sterling appreciated by 2.5% against the euro and 1.3% against the US dollar, but there was an offsetting depreciation against a number of currencies with smaller weights within the index. Changes in relative interest rates could not fully account for these movements.



Sources: Bloomberg and Bank calculations

Information derived from options prices suggested that market participants placed a lower weight on an appreciation of sterling (Chart 13). Contacts attributed this largely to a lessening of concerns about a potentially disorderly resolution to some of the challenges facing the euro area. Investors, however, remained willing to pay historically high prices to buy protection against an unexpectedly large depreciation of the euro against sterling.





⁽a) Returns are defined as the logarithmic difference between the current forward rate and the spot rate at the maturity date of the contract.

(b) Include a the maturity date of the contract.
 (b) The simplified sterling ERI places 70% weight on the euro-sterling bilateral exchange rate and 30% weight on the US dollar-sterling bilateral exchange rate.

Trading volumes in foreign exchange markets were unusually low over the review period. Some trading platforms reported lower average daily trading volumes, which contacts attributed to ongoing investor caution despite the more general improvement in market sentiment.

Market intelligence on developments in market structure

In discharging its responsibilities to maintain monetary stability and contribute to financial stability, the Bank gathers information from contacts across a wide spectrum of financial markets. This intelligence helps inform the Bank's assessment of monetary conditions and possible sources of financial instability and is routinely synthesised with research and analysis in the *Inflation Report* and the *Financial Stability Report*. More generally, regular dialogue with market contacts provides valuable insights into how markets function, providing context for policy formulation, including the design and evaluation of the Bank's own market operations. And the Bank conducts occasional market surveys to gather additional quantitative information on certain markets.

Based on intelligence of this kind, this section describes recent developments in the market for unsecured floating-rate notes. It also reports the most recent results from the Sterling Money Market Survey conducted by the Bank on behalf of the Money Market Liaison Group.

The market for unsecured floating-rate notes

Floating-rate notes (FRNs) are debt instruments that pay regular coupons based on a floating rate of interest. Non-bank financials and PNFCs issue FRNs, but the vast majority of FRN issuance is by banks, for which FRNs are an important source of funding. This section describes the structure of the market for unsecured FRNs and examines recent developments, drawing on intelligence gathered from discussions with market contacts.

Features of floating-rate notes

FRNs can be issued for a range of maturities, though issuance tends to be concentrated between two and ten years. The floating interest rate that determines the coupon that will be paid (the coupon rate) is typically based on a benchmark interest rate, such as Libor. Some FRNs include restrictions on the minimum coupon rate (floored FRNs) or the maximum coupon rate (capped FRNs). FRNs that include both of these restrictions are called collared FRNs.

According to contacts, the market for FRNs is dominated by issuance from medium-term note (MTN) programmes. Such programmes enable issuers to issue a number of FRNs based on the same legal documentation. Such standardisation allows easy access to public markets, but retains sufficient flexibility to allow issuers to tailor transactions efficiently to meet the requirements of specific investors.

Market structure

According to contacts, the decision on whether to issue fixed or floating-rate debt is primarily driven by the all-in cost of issuance. However, the ability to better match floating-rate assets with floating-rate liabilities is also said to be a key consideration. Issuance of FRNs in addition to fixed-rate debt can also lead to greater funding diversification and provides issuers with access to a broader range of potential investors.

FRNs generally pay regular coupons based on three-month or six-month Libor. This means that they tend to trade like money market instruments despite their longer maturity. This makes them attractive to both money market investors (including banks and money market funds) and those with demand for longer-maturity instruments (including insurance companies and pension funds). Banks have been significant investors in FRNs. But contacts suggest that higher capital charges resulting from forthcoming regulatory changes are likely to make it less attractive for banks to invest in debt issued by other banks.

FRNs are particularly attractive to investors during times when interest rates are expected to be more likely to rise than to fall. The floating-rate coupon on FRNs is reset at regular intervals, which means that when interest rates rise, FRNs tend to exhibit smaller price falls than fixed-rate instruments with otherwise similar characteristics. Investors may also invest in FRNs in order to gain credit exposure to a particular issuer without assuming the same degree of interest rate risk inherent in investing in an equivalent-maturity fixed-rate instrument.

Recent developments

Deal structures for unsecured FRNs have reportedly become less complex over the past few years. According to contacts, this has been largely at the request of investors who are said to be seeking greater clarity around the instruments in which they are investing.

Contacts report that issuers continue to see investor demand for structured FRNs that more closely match investors' preferences. With interest rates generally perceived to be at historic lows, contacts have highlighted an increase in issuance of notes that are fixed rate, but switch to a floating rate as interest rates increase (known as 'flippers'). This structure offers investors protection against increases in interest rates.

According to contacts, demand for puttable FRNs has also increased over the past year. Puttable FRNs contain a put option that gives the investor the right (but not the obligation) to sell the FRN back to the issuer prior to its original maturity date. Investors therefore have the option to reduce their credit exposure to an issuer should their perception of the issuer's creditworthiness change.

Recent months have also seen the issuance of several FRNs secured against covered bond collateral. The collateralised nature of such a structure offers investors additional credit protection in the event of an issuer default.

Results from the November 2011 Money Market Liaison Group Sterling Money Market Survey

The Bank of England has recently initiated a regular, six-monthly survey of the sterling money market on behalf of the Money Market Liaison Group. The survey is described in more detail in the 2011 Q3 *Quarterly Bulletin*. This box presents a selection of results from the November 2011 survey, the second such survey since its official launch in May 2011.

The sterling money market is where short-term wholesale borrowing and lending takes place. It plays a central role in the Bank's pursuit of its monetary and financial stability objectives. Market participants include banks, other financial institutions and non-financial companies that use the money market to manage their liquidity positions.

The survey supplements the Bank's long-standing gathering of market intelligence and will increase public understanding of the market. Over time, it is expected to help identify emerging structural trends in the market, helping policymakers assess the impact of their actions on the behaviour of market participants.

Coverage and content

The survey sample comprises 33 commercial banks, building societies and investment banks. Selection is based on data on the scale of these institutions' involvement in the sterling

money market, combined with market intelligence about which banks are most active in the market.

For the purposes of the survey, sterling money market transactions are defined as having a maturity of no longer than one year. Participants are asked to exclude any retail business, along with any non-sterling and intragroup trades. Participants are also asked to exclude trades with the Bank of England and the UK Debt Management Office.⁽¹⁾

The survey comprises both quantitative and qualitative questions that are designed to ascertain how well market participants perceive markets to be functioning and how market liquidity and efficiency is evolving. The quantitative questions ask survey participants to record the value, volume, type and maturity of sterling money market activity conducted in their own name over the month-long survey period, on a daily average basis. The qualitative questions ask respondents to record their perception of market functioning in both the unsecured and secured money markets, as well as how different aspects of market functioning have changed since the previous survey.

Survey results

Key features of the sterling money market

The results of the sterling money market surveys conducted to date highlighted certain features of the sterling money market. First, around 70% of transactions by value were conducted on a secured basis (Chart 14).⁽²⁾

Chart 14 Reported daily average flows in the sterling money $market^{(a)}$



(a) Daily average flows are reported as the value of sterling money market transactions in the survey month divided by the number of working days during that period.

- (1) Survey respondents may not be able to identify the ultimate counterparty when using an automated trading system to transact via a central counterparty in the secured market. So to the extent that DMO activity in the secured market is conducted using an automated trading system and settled via a central counterparty, survey respondents may not be able to exclude it. For more details on the DMO's money market activity see www.dmo.gov.uk.
- (2) These figures are adjusted to take account of estimated double counting. Double counting occurs because respondents are asked to record both borrowing and lending, so where survey participants record transactions between each other, the same transaction will appear as lending in one participant's return and as borrowing in another participant's return.

Second, recorded transactions were dominated by overnight deals, with little lending or borrowing occurring at maturities beyond three months (Chart 15). However, were the maturity distribution of flows recorded in the November 2011 survey to be replicated each month, around 10% of banks' outstanding money market transactions, by value, would have maturities of three months or longer.



Third, banks reported that they were net borrowers from the non-bank sector, particularly in the unsecured segment of the market. Non-bank financial institutions, such as money market funds, were reported to have provided around half of the cash lent unsecured to banks, with non-financial corporates providing around 20% (Chart 16).

Chart 16 Unsecured activity split by instrument, destination of lending or source of borrowing^{(a)(b)}



(a) Since survey participants are banks and building societies, sales of corporate commercial paper (CP) would not be captured by the survey. Hence, purchases of sterling CP issued by other financials are omitted from the results to avoid capturing only one portion of the corporate CP market.

(b) Commercial paper and certificates of deposit issuance are not split by type of purchaser because these instruments may be traded, making the identity of the 'lender' difficult to verify. Fourth, around two thirds of the transactions in the secured market were interbank, with the majority of trades settled via a central counterparty. Little secured business was transacted on a tri-party basis.⁽¹⁾

Fifth, the assets that were used to back the vast majority of secured transactions were gilts or UK Treasury bills (Chart 17).

Chart 17 Secured flows split by collateral type



(a) Includes sterling, euro, US dollar and Canadian dollar denominated securities issued by the governments and central banks of Canada, France, Germany, the Netherlands and the United States.

Recent market developments

The results of the May 2011 and November 2011 surveys indicate how the growing strains in financial markets during the second half of 2011 affected sterling money markets. Overall flows recorded in the May and November 2011 surveys were broadly similar, at around £120 billion on a daily average basis. But the share of reported overnight transactions rose by 5 percentage points in the November survey, to around 75% of daily flows, and the average tenor of trades fell slightly.⁽²⁾ Contacts attributed at least part of the fall in tenors to rising risk aversion leading cash providers to lend for shorter periods. They noted, however, that this had been exacerbated by market participants being less willing to enter into longer-term transactions maturing after the end of December due to the impact this would have on the size of their year-end balance sheets (see, for example, pages 6–7).

The share of secured transactions backed by gilts or UK Treasury bills rose by 10 percentage points in the November 2011 survey, to 90% (Chart 17). Market contacts reported that the increased desire to use gilts had been driven in part by greater uncertainty about the credit quality of other types of collateral. The credit rating downgrade of some

In a tri-party arrangement, a third party acts as agent, holding associated collateral in a custodian capacity.

⁽²⁾ A shortening of average tenors will tend to push up recorded daily average flows because shorter-dated transactions are more likely to be rolled over within the survey period and, hence, be captured as additional activity.

peripheral euro-area sovereign debt had rendered that debt ineligible for regulatory liquid asset buffer ratios, which, according to contacts, had also boosted investor appetite for using gilts.

According to the responses to the qualitative questions in the November 2011 survey, there was a broadly held perception among respondents that unsecured market functioning had deteriorated since the previous survey (Chart 18). That deterioration was most apparent in a reduction in the depth of the market and a widening in bid-ask spreads (Chart 19). Perceptions regarding secured market functioning were more positive and little changed since the previous survey.





Market contacts cited a number of possible reasons for the deterioration of unsecured market functioning between

Chart 19 Indicators of change in unsecured market functioning relative to six months earlier^(a)



(a) For bid-ask spreads: Better (worse) = Tighter (wider). For number of dealers quoting: Better (worse) = Higher (lower). For average size of trades: Better (worse) = Larger (smaller).

May and November 2011. In particular, market participants were reported to be less willing to act as market makers given the perceived increase in banking sector risk and balance sheet constraints. With more cash providers only willing to lend for short periods, survey respondents reported that market functioning at maturities of three months or more was particularly poor.

According to market participants, unsecured market functioning had improved somewhat since November 2011. Contacts attributed this in part to the passing of year-end reporting requirements and the perceived impact of the ECB's LTROs on European banking sector credit risk.

Research and analysis

PROMISE

What might be driving the need to rebalance in the United Kingdom?

By Stuart Berry, Matthew Corder and Richard Williams of the Bank's Monetary Analysis Directorate.⁽¹⁾

Low national saving, a persistent current account deficit and the rapid expansion of balance sheets are potential reasons why the UK economy needs to rebalance. Global factors are likely to have been an important driver of these developments, but domestic factors have played an important role in the longer-term trends. This article looks at how the potential drivers of the need for rebalancing have evolved and how they fit together.

Introduction

The implications of macroeconomic imbalances have been an important feature of the outlook for the global economy for some time.⁽²⁾ One aspect that is often highlighted is the emergence of a widening dispersion of current account deficits and surpluses across countries in the run-up to the financial crisis (Chart 1). The United Kingdom has been a part of those global imbalances, running a persistent current account deficit. The presence of such imbalances implies that an adjustment is required at some point. But current account positions are only one manifestation of imbalances. Low national saving, the emergence of large surpluses and deficits across different sectors of the economy, and a rapid expansion of balance sheets could also be associated with a need for rebalancing.



Chart 1 International current account balances

rce: IMF September 2011 World Economic Outlook

(a) 'East Asia excluding China' includes Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan and Thailand.
 (b) 'Oil exporters' includes OPEC members, Norway and Russia.

A rebalancing of the UK economy could have important implications for monetary policy. It will mean changes in the pattern of spending, which could affect the overall outlook for output and inflation. But the timing and impact of any rebalancing will depend on the factors driving it. This article considers some of the potential reasons why the UK economy needs to rebalance. The aim is to provide a broad narrative of how different drivers for rebalancing fit together.

The following section sets out a simple framework for thinking about the need for rebalancing. Subsequent sections then look at where the drivers for rebalancing may have arisen, both at an aggregate level and in different sectors of the economy, why they might have arisen, and how they may have been affected by the financial crisis. A simple metric of the potential adjustment required to stabilise balance sheet positions at different levels is presented in the next section, followed by a brief discussion of how any adjustment might take place and the potential implications for monetary policy. The article then concludes.

What do we mean by the need for rebalancing?

In a strict sense, financial imbalances cannot exist. That is, the flow of funds between different households and companies must be in balance, because they must add up. But rebalancing may be necessary if the current network of financial arrangements between different parties is unsustainable in the long run. The need for rebalancing can take a number of different forms. For example, it can reflect unsustainable financial flows or unsustainable stock (or balance sheet) positions. Rebalancing may be required

⁽¹⁾ This article draws on work from a number of other economists in the Bank's Monetary Analysis and Financial Stability areas: Alan Castle, Robert Gilhooly, Alan Mankikar, Jeremy Martin, Katharine Neiss, Tom O'Grady, Varun Paul, Kate Reinold, Kate Stratford, Jamie Thompson and Rob Wood

⁽²⁾ See for example de Rato (2006), King (2000, 2011) and Lipsky (2010).

domestically, between different sectors of the economy, or externally, between the United Kingdom and the rest of the world.

At an aggregate level, it may be sustainable for the United Kingdom as a whole, or specific sectors within it, to continue to hold some level of debts or assets almost indefinitely. While households and companies are typically subject to a budget constraint — over their lifetimes, they can only spend what they earn — the economy continues to produce output and income as new households replace older ones. So aggregate borrowing and financial balances do not need to be zero even in the long run. The key issue is what level of assets and debts can be maintained.

Furthermore, some level of borrowing and lending is desirable. The ability of different households and companies to postpone or bring forward their spending is an important part of how the economy works. It allows people to smooth their spending over time to maximise the benefit they derive from it. And some degree of borrowing and lending is required to finance investment, to build and maintain the productive capacity of the economy.

Some movements in the amount of borrowing and lending over time will be entirely appropriate responses to changes in the underlying economic drivers. For example, demographic factors could mean that it is optimal for a country to borrow or lend abroad for a period to smooth its consumption. A rebalancing would be required at some point but the initial period of borrowing or lending may persist for some time and the subsequent adjustment may occur only gradually.

Unsustainable financial positions may, however, build up due to unrealistic expectations or frictions in the economy. And these may be of more concern in the short run. For example, households may underestimate the amount they have to save for their retirement, or a system of fixed exchange rates might prevent an adjustment in trade positions for a period. There is a risk that the rebalancing required in these circumstances could occur more abruptly.

Where might a need for rebalancing have emerged in the UK economy?

A useful starting point for thinking about rebalancing is to look at the relationship between flows of national saving, investment and the current account. National income is used either to finance current (private or public) consumption or is saved and used to finance investment either domestically or abroad. To the extent that national saving is insufficient to finance domestic investment, the United Kingdom must borrow from abroad to make up the shortfall. That would manifest itself in a current account deficit. Conversely, if national saving is higher than domestic investment, the United Kingdom lends that money abroad and there would be a current account surplus. That flow of funds is captured in the following identity:

(National income – $C_{private} - C_{public}$) – Domestic investment = Current account balance

National saving

National saving — the difference between national income and consumption — as a share of national income, has been on a declining trend since the 1970s (**Chart 2**). And over the past 25 years it has been insufficient to finance domestic investment. The decline in national saving is surprising given the demographic changes over that period. National saving might have been expected to rise given that increasing numbers of the 'baby-boom' generation were entering their peak saving years of their 40s and 50s (**Chart 3**). UK saving has also been lower than in most other developed economies over the past 20 years. That might suggest that the United Kingdom has been saving too little for some time.







(a) Projections are the ONS 2010-based principal projections

One approach to assessing the adequacy of national saving is to derive a comprehensive balance sheet for the household sector. This attempts to capture all the resources the household sector has to draw on, including current and future income and claims on financial or real assets (such as land or machinery). It then looks at whether those resources can support current levels of public and private consumption into the future. Weale (2011) provides some illustrative calculations of the comprehensive balance sheet for the United Kingdom and suggests that current consumption is unsustainably high. Such calculations are sensitive to assumptions about future productivity growth and the return on saving. But for a plausible range of assumptions, national saving appears to be too low (see the box on page 24).

Low saving in the past typically implies that consumption will need to be weaker relative to incomes in the future, or that households will need to work longer to finance their retirement. Over the past fifteen years or so, saving may have stayed low because the current generation of households have benefited from large capital gains on their assets. In the comprehensive balance sheet calculations such capital gains are not assumed to continue, leaving future generations needing to save more.

Increases in the value of land in particular (seen, for example, in the rise in house prices) have boosted household net worth as a share of GDP, despite low saving rates. In principle, increases in house values should not increase current spending power because they simply reflect higher housing costs in the future. But increases in house and land prices benefit current generations at the expense of the future generations that will face those higher housing costs. If current households choose not to pass on those gains to later generations, they may be able to spend more and save less. Future generations, however, will need to save more for their retirement or work longer. In these circumstances, individual households would not necessarily need to change their behaviour, but aggregate saving would increase gradually as those households which had not benefited from capital gains make up an increasing share of the population.

Investment

Ultimately, saving is a means of paying for future consumption and can either be invested at home (domestic investment) or overseas (as a net acquisition of foreign assets). Like saving, domestic investment has fallen as a share of nominal GDP since the early 1980s, but it is less clear whether it has been too low or too high. The decline in the cost of investment goods relative to other goods and services over that period means that in real terms the ratio of investment to GDP in the United Kingdom has been rising since the 1970s (**Chart 4**).⁽¹⁾ The returns on overseas assets, however, have been higher than those on UK assets, which might suggest that more domestic saving should have been used to invest in foreign assets rather than domestic ones — although the difference in returns may just reflect different levels of risk associated with such investments.





The current account

The counterpart to the persistent shortfall between national saving and investment has been a current account deficit. The deficit has averaged around 2% of GDP over the past 25 years (Chart 5). Despite this, the United Kingdom's net international investment position — the difference between the assets it holds overseas and its liabilities to other countries — has been little changed (Chart 6). That is because the additional debt taken on each period has been offset by capital gains on its existing assets.





(a) Annual data. The data point for 2011 is based on the outturns for the first three quarters of the year.

Balance sheet expansion

The fact that stock positions have not deteriorated might suggest that little adjustment is required to them, even if flows need to adjust to prevent them deteriorating in the future (absent further sharp increases in asset prices). But the size and composition of both sides of the balance sheet can also be important.

Over the past fifteen years, increases in asset values have been accompanied by sharp increases in debt in the

⁽¹⁾ For more on trends in business investment see Bakhshi and Thompson (2002) and Ellis and Groth (2003).

Chart 6 UK net international investment position (NIIP) with foreign direct investment (FDI) at book and market value



Sources: OECD, ONS, Thomson Reuters Datastream and Bank calculations.

(a) Foreign direct investment at book value in each country is revalued using equity indices for that country. For more details see Kubelec, Orskaug and Tanaka (2007).

United Kingdom. The ratios of both household and corporate debt to GDP have increased by more than half during that period (Chart 7). Debt can be used to finance current spending, or it can be used to finance the purchase of assets. And it is likely that increased demand for assets, financed by debt, put upward pressure on asset prices. The expansion in both sides of household and corporate balance sheets has made stock positions more risky. Net wealth is more vulnerable to changes in asset values as the stock of assets becomes large relative to net wealth. And spending becomes more vulnerable to changes in financing costs with higher debt levels.





(a) Public sector net debt (excluding the effects of temporary financial sector interventions) The diamonds are annual data for the end of O1 each year.

If households and companies decide that they are no longer comfortable with the risks associated with such large balance sheets, this could be a further reason for a rebalancing in the economy. Households and companies may look to reduce debt levels in order to protect themselves against potential declines in asset prices or their income. Debt levels can be reduced actively by using current income or assets to pay down debt. But debt levels can also fall in a more passive way. The quantity of household secured debt, for example, will be affected by the number of new mortgages taken out and the value of those mortgages — meaning falls in home sales and prices both put downward pressure on overall debt levels.⁽¹⁾

The United Kingdom's external balance sheet also expanded rapidly in the period leading up to the financial crisis (Chart 8). Continued global integration is likely to have led to rising cross-border ownership of companies, which boosted gross external balance sheets. And the return on overseas assets was high relative to the cost of borrowing from overseas, making debt-financed purchases of foreign assets attractive. Much of the increase in the UK external balance sheet reflected asset and liability accumulation by the banking sector. The increased interconnectedness of the global financial system will have increased cross-border financial transactions, either between different financial institutions or within international financial groups. A larger external balance sheet increases the risk of disruption if overseas investors decide to withdraw their funds, unless UK companies can sell their overseas assets easily. As in the case of domestic balance sheets, the UK external balance sheet is also more vulnerable to asset price falls, or changes in the cost of funding.



(a) Foreign direct investment measured at market value. See Chart 6. Derivatives are excluded as the data only began in 2004.

Sectoral developments

So far, the focus has been on aggregate developments, but it is also useful to consider how these have affected different sectors of the economy. Rebalancing may be required between different sectors as well as in aggregate. Perhaps one of the surprising aspects of the decline in national saving in the decade leading up to the financial crisis is that it did not involve a period of very rapid growth in household consumption. Nominal household consumption rose sharply as a share of GDP in the 1980s and early 1990s but was the same in 2007 as it was in the mid-1990s. Over that period, the

⁽¹⁾ See Hamilton (2003) and Reinold (2011).

The comprehensive balance sheet(1)

The comprehensive balance sheet is an extension of the traditional national balance sheet and shows the net present value of all assets and liabilities of current and future generations. Assets include current and future labour income (human capital), natural and produced capital, and net foreign assets, while the liabilities consist of estimated future private and public consumption. A negative balance for the nation implies that the planned use of resources exceeds that which is actually available, and, hence, indicates that economic behaviour is unsustainable in its broadest sense.

Any estimate of the comprehensive balance sheet of the nation requires projections of income and consumption in the future, and it is therefore sensitive to assumptions about productivity growth, rates of return and economic behaviour. The central case in Chart A assumes a trend rate of productivity growth of 1.5% per capita and a discount rate of 4.4% — this rate of return is just below the real return observed for the United Kingdom from 1986 to 2006, while the productivity growth rate is notably lower than the pre-crisis average. The calculations also assume that the pattern of consumption and income by age remain constant over the future. In other words, income and expenditure by age moves in line with per capita productivity growth for all ages. Therefore the income and consumption of individuals in the future will be higher in real terms than for the current population, but the ratio of, for example, 50 year olds' consumption to that of 25 year olds will be unchanged.



A plausible estimate of the comprehensive balance sheet suggests that UK net worth is negative — implying current economic behaviour is unsustainable. Under the assumptions described above, it is likely that the current generation can cover lifetime spending only by using some of the natural capital (including land) they hold: they have a net deficit of income relative to consumption. If expenditure patterns initially remain unchanged a sharp adjustment in consumption would eventually be required. A higher growth rate of productivity makes the balance worse. Faster productivity growth increases both future income and consumption increasing both sides of the comprehensive balance sheet but with the assumptions made, it raises the latter more than the former. Higher productivity therefore increases the absolute size of any deficit. Conversely, a higher rate of return improves things.

Choosing plausible alternative assumptions about productivity and rates of return does not alter the main conclusion that the United Kingdom is currently in an unsustainable position. The swathe in **Chart A** shows the range of estimates of the UK comprehensive balance sheet based on different assumptions about productivity growth and interest rates. These all point to negative net worth. A trend productivity growth rate of less than 1% combined with a real interest rate greater than 5.5% would be required to show the economy in balance. These are very different from the averages seen over the past 20 years.

This result does not hold if economic behaviour is modified so that the pattern of income and consumption of future generations does not match that of the current generation. Extending individuals' working lives, as implied by recent changes to retirement ages, will increase income in later life relative to current generations and will help close the net deficit. The scale of the adjustment required makes it unlikely that all the adjustment can come through later retirement. This implies that at some point consumption will have to fall relative to income. But this could happen through either a sudden large cut in spending, or as a gradual change if future generations' spending grows more slowly than in the past.

(1) This box is based on work presented in Weale (2011).

decline in national saving came largely from the public sector. Government consumption as a share of GDP rose by around 3 percentage points in the decade to 2007 (**Chart 9**).

Chart 9 Changes in UK nominal expenditure shares since 1970



(a) Includes non-profit institutions serving households.

Although household consumption growth was not particularly strong, imbalances may still have been building in the household sector. The household saving rate fell gradually during much of the 1990s and in the 2000s up to the start of the financial crisis, as the ratio of household disposable income to GDP declined. Combined with the strength of households' nominal investment in housing over the period, that pushed down the household financial balance (**Chart 10**). A widening financial deficit implies that households were running down their net financial assets (either by acquiring debt or selling financial assets) at an increasing rate. In the long run, this is unsustainable, although as discussed above, increases in asset prices can offset these outflows for a period.





The decline in the household financial balance was largely offset within the private sector by a rise in the corporate financial balance. These movements reflected a redistribution of income from households to companies, in part through income flows associated with holdings of assets and liabilities — known as net property income. Net property income received by the household sector fell by over 4% of GDP in the decade to 2007 (Chart 11). In particular, net interest payments from the household sector to financial companies rose as debt levels increased, and dividend payments from companies to households declined as a share of household income.





(a) Annual data. The data point for 2011 is based on the outturns for the first three quarters of the year. Property income includes interest payments and receipts as well as dividends and other income from assets

Financial decisions in the household, corporate and public sectors do not take place in isolation. It is possible that the rising corporate financial surplus can help to explain the decline in the household financial balance. Ultimately, the UK household sector owns a significant proportion of the corporate sector anyway and so they will eventually receive the income retained by the corporate sector (although rising cross-border ownership of companies blurs this link).

Households may also factor in changes in the public sector fiscal position. The move from a public sector surplus between 1998 and 2001 to a deficit might also have been expected to boost household saving if they anticipated higher taxes in the future as a result.⁽¹⁾ Taking the offsetting influences of the corporate and public sectors together suggests that the household financial balance may have been unsustainably low leading up to the financial crisis, consistent with the apparent shortfall in national saving noted earlier.

Why has the need for rebalancing emerged?

A number of potential drivers for rebalancing have been identified in the sections above. As well as a longer-run decline in national saving, and an associated persistent current

⁽¹⁾ See Berry, Waldron and Williams (2009).

account deficit, there has been a rapid expansion in domestic and external balance sheets over the past fifteen years. A range of factors could potentially explain these movements.

International factors could explain many of these developments. A key part of many of the explanations of global imbalances is that the current account surpluses of commodity exporters and many East Asian economies (EAEs) needed to be offset by deficits in other countries, as occurred in the United Kingdom. The adoption of managed exchange rate policies by some EAEs may have prevented or delayed the adjustment in relative prices that might otherwise have been expected to limit the build-up of such imbalances. As Astley, Smith and Pain (2009) note, the continued strength of sterling in the years leading up to the financial crisis was perhaps surprising.⁽¹⁾ In order to ensure that output did not fall in response to a weakening net trade position, domestic demand would have needed to be stronger, leading to a fall in national saving.

Global factors may also help to explain the rapid growth in domestic debt. Over and above the direct impact of increased capital inflows from overseas to finance the current account deficit, the presence of large surpluses being invested in global capital markets is likely to have pushed down global interest rates. That in turn will have increased the demand for credit in the United Kingdom and elsewhere.

There appears to have been an additional spur to credit growth, arising within the banking sector itself. Haldane (2009) points to competition within the banking sector over return on equity, and argues that this left individual banks with little option but to increase the size of their balance sheets. If that were true, banks would have had to offer more attractive terms to generate demand for loans, and this was seen in a reduction in the spread charged on loans over risk-free interest rates and the relaxation of restrictions on the quantity of credit offered. The incentives driving both the bank and non-bank sector to increase debt levels could be thought of as a key element of the so-called 'search for yield' that accompanied low global risk-free interest rates.

Cheaper debt finance will have encouraged households and companies to increase their borrowing, creating additional funds which boosted the demand for assets, pushing up their prices. That could help to explain the rapid expansion in both sides of the balance sheet.

Domestic factors, however, may also have played a role. The longer-run decline in saving could reflect unrealistic assumptions about the return on saving, or about the amount of retirement spending that needed to be funded, given increases in longevity. Alternatively, it could be simply that households have placed less importance on future consumption relative to current spending. Furthermore, if households and companies expected their incomes to rise rapidly in the future, that may have boosted their spending relative to the output of the economy at the time. Sterling would then need to be strong to ensure that overall demand for UK products was in line with output. But the trade deficit would be largely the result of domestic drivers rather than external factors.

These domestic factors cannot explain why both sides of domestic and external balance sheets have expanded over the past fifteen years. But there could be other domestic influences contributing to the rises in asset prices and debt levels, and therefore an expansion of balance sheets. The decline in UK long-term real interest rates (Chart 12) may have reflected domestic factors such as greater monetary policy credibility and lower macroeconomic volatility.

Chart 12 UK ten-year spot real interest rates^(a)



(a) Based on yields of index-linked government bonds.

The increase in the corporate financial balance over the past fifteen years is more difficult to explain through the domestic and international channels outlined so far. It is unclear why companies chose to retain profits in the run-up to the financial crisis, rather than pass them back to the households that own the companies, particularly given that the corporate sector was taking on more debt at the same time. There are likely to be a number of factors at work. Companies may have wanted to use the funds for other reasons, such as the acquisition of foreign-owned companies or to build up a buffer against potential pension fund shortfalls. And globalisation has meant that more companies have international links, so that funds may have been transferred between different parts of the group. Distributional issues are also likely to have been important: the companies enjoying high profits are unlikely to have been the same as those taking on the debts.

Another suggested part of the story on global imbalances is a dearth of high-quality liquid assets in surplus countries. Deep financial markets in the United Kingdom are likely to have made it a popular destination for capital flows. See Caballero, Farhi and Gourinchas (2008).

The impact of the financial crisis

Over the past few years, the financial crisis has been associated with a number of important factors in the evolution of stocks and flows in the United Kingdom. Both national saving and investment fell sharply. This mainly reflected the economic downturn as falling tax revenues and higher benefit payments pushed up the fiscal deficit (and pushed down on public sector saving), and companies cut back on investment in the face of tighter credit conditions and weaker demand.

Demand for goods and services fell sharply across the world as the crisis unfolded. Weaker demand at home depressed imports, but weaker demand overseas also depressed exports. So there were offsetting effects on the trade deficit. Sterling also depreciated by around 25%. Kamath and Paul (2011) highlight evidence that this has encouraged a shift towards UK exports and away from imports. Overall, the trade deficit has been volatile, but there has been some narrowing since the start of the crisis (**Chart 13**).





The financial balances of both households and companies have increased (Chart 10), and the public sector deficit has widened. This divergence of public and private sector balances during the financial crisis highlights the need for some internal rebalancing. A substantial fiscal consolidation is under way in order to stabilise public sector debt levels which have increased sharply during the financial crisis.

The financial crisis is also likely to have encouraged households and companies to improve their balance sheet positions. Greater uncertainty about the macroeconomic outlook may have boosted saving as households and companies look to build up precautionary buffers of assets. And the sharp tightening in credit conditions that accompanied the crisis has made debt more difficult to obtain. For example, the typical loan to value ratios on new mortgages have fallen, particularly for first-time buyers. The recent volatility in asset prices may also have prompted households and companies to reassess the appropriate level of debt. Household and corporate debt ratios to GDP have fallen back a little since the start of the crisis.

Overall, the financial crisis has been associated with a number of factors that are likely to have encouraged some rebalancing. But it is difficult to judge at this stage how persistent some of these effects will be, and therefore how much of the rebalancing that has already taken place will be sustained. As the cyclical influences unwind, stock and flow positions may look more or less sustainable than they do currently. Furthermore, estimates of stocks and flows are subject to revision, and future vintages of data could paint a different picture. It seems likely, though, that some further rebalancing will be required.

A simple metric of rebalancing

It is difficult to assess how large any further rebalancing might need to be. The equilibrium levels of stocks and flows will depend on a range of factors, and are likely to vary over time. As noted earlier, for example, demographics can change the optimal level of national saving. The interaction between stocks and flows is also important. The longer that unsustainable flows persist, the larger the impact on the stock position as the flows cumulate up over time. And that can mean that a larger or more protracted adjustment is needed to bring stock positions back to sustainable levels. Indeed, flows may need to 'overshoot' for a period. For example, a period of unusually low saving might need to be followed by a period of unusually high saving to rebuild wealth before saving could then return to normal.

In the absence of robust measures of equilibrium stocks and flows, we can at least look at the consistency between the stocks and flows. This can highlight whether current flows are consistent with stabilising stock positions at their current levels or at historical averages.

If households and companies care about their wealth relative to their overall income, then they may seek to maintain a particular wealth to GDP ratio. To do that, wealth needs to grow at the same rate as GDP. Maintaining a positive net wealth ratio would typically imply that households and companies need to accumulate more and more assets over time. But the composition of the existing balance sheet is also important. Equities will typically rise in value over time, while debt does not. If assets and liabilities that are expected to rise in value over time are assumed to grow in line with nominal GDP and others are assumed to remain fixed in nominal terms, then it is possible to compute the financial balance — the net addition or subtraction from the stock of wealth each period that will stabilise the net wealth to GDP ratio at different levels. **Table A** sets out the results for a number of these experiments, with nominal GDP assumed to grow at an arbitrary rate of 5% per year. It uses three illustrative levels of stock positions across different sectors: the current level; the level prevailing prior to the financial crisis; and the historical average. For example, in order for households to maintain their current level of net financial wealth (172% of GDP), they would need to run a persistent financial surplus of around 3½% of GDP.

 Table A Financial balances required to stabilise stock positions^(a)

Per	cent	of	GDP

	Curren (2011	Current levels (2011 Q3)		Pre-financial crisis (2007 Q2)		Historical average (1987–2011)	
	Net financial wealth	Financial balance required	Net financial wealth	Financial balance required	Net financial wealth	Financial balance required	Current financial balance
Households	172	31⁄2	185	2¾	179	21⁄2	0.8
Private non-fina corporations	ncial -98	-11⁄2	-128	-1¾	-122	-11⁄2	3.2
Public sector ^(b)	-63	-3	-37	-1¾	-38	-13⁄4	-8.3
UK external ^(c)	1	-11/2	1	-1½	3	-1	-3.7

(a) Assuming that nominal GDP grows by 5% per year and the value of equity-type assets and liabilities rise in line with nominal GDP, while other assets and liabilities remain fixed in nominal terms. Surpluses/deficits are assumed to increase/reduce assets fixed in nominal terms.

(b) Calculations based on public sector net debt (excluding the effects of temporary financial sector interventions).

(c) Calculations based on the UK net international investment position, excluding derivatives, with foreign direct investment measured at market value. See Chart 6. The historical average for this series covers the period 1988–2011.

One striking feature of these calculations is that the United Kingdom can potentially maintain a positive stock of net external assets by running a current account deficit. That is because the amount of equity-like assets the United Kingdom holds, which are assumed to increase in value over time, is high relative to the United Kingdom's equity-like liabilities and the reverse is true for debt-like assets and liabilities that are fixed in value. GDP growth therefore tends to boost the net external asset to GDP ratio.⁽¹⁾ The present ratio of net external assets to GDP, for example, could therefore be maintained with a persistent current account deficit of around 11/2% of GDP. That still implies that an adjustment would be required relative to recent levels of the current account to stabilise the net international investment position. And the sustainability of even a small current account deficit depends heavily on the United Kingdom being willing and able to maintain such a large, debt-financed, external balance sheet.

In recent years, the United Kingdom has also benefited from a net surplus of income on its overseas assets and liabilities. That has boosted the current account balance, partly offsetting the large trade deficit. But it is not clear whether this will persist. For example, the financial crisis could lead to a persistent increase in the cost of debt from overseas. In that case, a larger adjustment in the trade balance may be required.

Households' net financial wealth has varied significantly over time, as asset prices have changed, but the three measures presented here are all fairly similar. A substantial financial surplus would be required to maintain net wealth at the levels shown in **Table A**, and that would require a significant increase relative to current levels. But these calculations also highlight the importance of the composition of assets and liabilities. For example, households need to run a larger financial surplus to maintain their current balance sheets than they did to maintain their pre-crisis balance sheets, despite the fact that net wealth is now slightly lower. As more net wealth is held in assets that are fixed in value, a larger financial surplus is needed to keep them growing in line with nominal GDP.

By contrast, companies typically have net debt and so could run a deficit, rather than the large surpluses currently being recorded, which suggests that companies are currently rebuilding their balance sheets. A substantial reduction in the public sector deficit is required to stabilise public sector net debt. If the public sector were to reduce its net debt to the historical average of 38% of GDP, for example, an even smaller deficit, of around 1¾% of GDP, would be needed to keep it there. The latest projections from the Office for Budget Responsibility suggest that the public sector deficit will fall below that level by 2016/17.

Such calculations are only illustrative — they are a very simple benchmark. The levels of wealth used in **Table A** may not be good proxies for the equilibrium level. As noted earlier, measures of the comprehensive balance sheet suggest that in the long run a much higher level of wealth may be needed. So it is possible that adjustments in stock positions are required as well. The calculations are also sensitive to the rate at which asset prices rise. For example, a smaller current account deficit would be required to maintain net external assets relative to GDP at their present level if asset prices were to rise less quickly than nominal GDP. Finally, such aggregate calculations ignore the fact that significant adjustments may be required by individual households and companies.

Nevertheless, these calculations highlight two potential issues. First, large current account deficits could lead to a deterioration in our net international investment position, unless movements in asset prices continue to be favourable to the United Kingdom. Second, there may need to be a substantial rebalancing between different domestic sectors. But, as noted earlier, households may be largely indifferent between saving they undertake themselves or saving companies and government undertake on their behalf.

How might rebalancing take place?

Developments both at home and abroad are likely to have an important bearing on the extent and timing of any further

⁽¹⁾ For more details, see Whitaker (2006).

rebalancing. And there are a number of ways in which imbalances could evolve over the next few years.

Different scenarios for rebalancing

Rebalancing could take place in a relatively benign way. In such a scenario, the trade balance would be boosted by a recovery in world demand and the continued effects of the depreciation of sterling, and balance sheet positions would unwind very gradually, limiting the increase in saving required. Output growth could remain robust as demand switches from consumption to investment and exports. Immediately following the early 1990s recession, for example, the United Kingdom had a significant current account deficit, as well as a large public sector deficit and a large private sector surplus. These unwound steadily over a number of years, with all three broadly reaching balance by 1998.

Alternatively, rebalancing might occur abruptly, for example if households and companies try to adjust their balance sheets rapidly. That could lead to a sharp slowdown in domestic spending to boost national saving. The trade balance would improve due to lower demand for imports. But output growth would be likely to weaken unless demand for UK exports increased at the same time.

A third possibility is that imbalances do not unwind, at least in the near term, with domestic demand remaining strong and the trade deficit remaining large. Some countries have maintained sizable current account deficits for much longer than the United Kingdom. Output growth may be robust in those circumstances but stock positions could deteriorate, and possibly lead to a sharper adjustment being required in the future.

Supply-side adjustments

This article has focused on the potential rebalancing of demand and spending, but the speed with which that can take place will also depend on the flexibility of the economy. Resources would need to shift between sectors in order to allow production to adjust to meet the changing pattern of demand. Some companies that see demand for their products increase, such as exporters, will need to hire more workers and employ more capital, while those that see demand for their products fall will need to reduce their use of labour and capital.

Frictions in the ability of these resources to shift across sectors could mean that the adjustment takes longer. For example, some workers may need to be retrained if the skills they have acquired in one sector are less useful in another. Similarly, it may be difficult to redeploy machinery or buildings to other sectors. In the United Kingdom, there was a substantial shift towards services and away from manufacturing before the financial crisis, but that process occurred gradually over a period of around 20 years (Chart 14). A rebalancing towards exports and investment might see those trends reverse somewhat, but the adjustment is again likely to be gradual, particularly if credit constraints make it more difficult for some companies to expand their capacity in response to stronger demand.

Chart 14 Manufacturing and services: shares of total UK output^(a)



⁽a) Data prior to 1995 have been spliced on to the current series using the growth rates published immediately before the 2011 *Blue Book*.

Monetary policy implications

The implications of any rebalancing for monetary policy will depend on its impact on aggregate demand and supply, and hence inflationary pressure. For example, if demand switches from consumption to investment and exports simultaneously, leaving aggregate demand unchanged, the impact on inflationary pressure may be limited. But if the slowdown in consumption comes through more quickly than the boost to exports and investment, that is likely to lead to weaker inflationary pressure and the need for looser monetary policy than might otherwise be the case.

The response of supply could also affect the implications of rebalancing for monetary policy. For example, frictions in redeploying resources could mean that the productive capacity of the economy is temporarily depressed so that the overall level of demand consistent with meeting the inflation target is lower for a period.

There could also be more persistent implications for monetary policy. If increased national saving prompted an increase in domestic investment, boosting the capital stock, then the productive capacity of the economy could eventually expand more rapidly. Similarly if longer life expectancy led younger generations to defer retirement, this could boost labour supply, and help to offset the decline in participation expected to result from an ageing population.⁽¹⁾ In both cases this would

Benito and Bunn (2011) discuss the effects of wealth, demographics and changes in state retirement ages on labour market participation.

increase the level of demand that was consistent with meeting the inflation target.

Conclusion

Rebalancing can be required for a number of reasons. It can be needed to adjust unsustainable flows or stock positions, and can be international or across different sectors of the economy. National saving in the United Kingdom has declined gradually over the past 40 years, and for the past 25 years that has been associated with a persistent current account deficit. Increases in asset prices meant that net wealth did not deteriorate, but the external balance sheet and those of the household and corporate sector have expanded rapidly. Larger gross balance sheet positions have left households and companies more vulnerable to changes in asset prices and financing costs.

Global developments are likely to have played an important role in increasing UK imbalances, and will therefore be important in how they unwind. But domestic factors will also have played a part over the longer term. In recent years, the financial crisis has been associated with a number of factors that are likely to have encouraged some rebalancing, but how persistent those drivers will be is uncertain. There are a number of ways in which rebalancing could evolve, and these could have very different implications for the economic outlook. Monetary policy will also need to take into account how the supply side of the economy adjusts to the changing pattern of demand.

References

Astley, M, Smith, J and Pain, D (2009), 'Interpreting recent movements in sterling', *Bank of England Quarterly Bulletin*, Vol. 49, No. 3, pages 202–14.

Bakhshi, H and Thompson, J (2002), 'Explaining trends in UK business investment', *Bank of England Quarterly Bulletin*, Spring, pages 33–41.

Benito, A and Bunn, P (2011), 'Understanding labour force participation in the United Kingdom', *Bank of England Quarterly Bulletin*, Vol. 51, No. 1, pages 36–42.

Berry, S, Waldron, M and Williams, R (2009), 'Household saving', Bank of England Quarterly Bulletin, Vol. 49, No. 3, pages 191–201.

Caballero, R, Farhi, E and Gourinchas, P-O (2008), 'An equilibrium model of 'global imbalances' and low interest rates', *American Economic Review*, Vol. 98(1), pages 358–93.

de Rato, R (2006), 'Shared responsibilities: solving the problem of global imbalances', speech delivered on 3 February, available at www.imf.org/external/np/speeches/2006/020306.htm.

Ellis, C and Groth, C (2003), 'Long-run equilibrium ratios of business investment to output in the United Kingdom', *Bank of England Quarterly Bulletin*, Summer, pages 177–87.

Haldane, A G (2009), 'Small lessons from a big crisis', available at www.bankofengland.co.uk/publications/Documents/speeches/2009/ speech397.pdf.

Hamilton, R (2003), 'Trends in households' aggregate secured debt', Bank of England Quarterly Bulletin, Autumn, pages 271–80. Kamath, K and Paul, V (2011), 'Understanding recent developments in UK external trade', *Bank of England Quarterly Bulletin*, Vol. 51, No. 4, pages 294–304.

King, M A (2000), 'Balancing the economic see-saw', available at www.bankofengland.co.uk/publications/Pages/speeches/2000/ speech82.aspx.

King, M A (2011), 'Global imbalances: the perspective of the Bank of England', contribution to the Banque de France *Financial Stability Review*, available at www.bankofengland.co.uk/publications/ Documents/speeches/2011/speech473.pdf.

Kubelec, C, Orskaug, B-E and Tanaka, M (2007), 'Financial globalisation, external balance sheets and economic adjustment', *Bank of England Quarterly Bulletin*, Vol. 47, No. 2, pages 244–57.

Lipsky, J (2010), 'Reconstructing the world economy', remarks made at the Korea Development Institute/IMF conference on 25 February.

Reinold, K (2011), 'Housing equity withdrawal since the financial crisis', *Bank of England Quarterly Bulletin*, Vol. 51, No. 2, pages 127–33.

Weale, M (2011), 'The choice between rebalancing and living off the future', available at www.bankofengland.co.uk/publications/ Documents/speeches/2011/speech514.pdf.

Whitaker, S (2006), 'The UK international investment position', Bank of England Quarterly Bulletin, Vol. 46, No. 3, pages 290–96.

Agents' Special Surveys since the start of the financial crisis

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This article looks at the Agents' Special Surveys that have been commissioned by the Bank of England's Monetary Policy Committee (MPC) since the start of the financial crisis. Through the prism of the Special Surveys, the article discusses some key features of the recession and the puzzles faced by policymakers. And it describes how the Special Surveys have been used by the MPC to try to shed light on these issues — some of which continue to be a significant source of uncertainty today.

Introduction

The Bank of England's Agents conduct regular intelligence gathering which feeds into the monthly monetary policy decision. In addition to the regular briefing, every few months, immediately following their policy meeting, the Monetary Policy Committee (MPC) will commission the Agents to conduct a Special Survey of businesses around the country to address a particular issue. Typically, several hundred businesses participate in the surveys. The surveys involve a structured set of questions, designed to generate quantitative measures, to complement the more qualitative outputs of the regular monthly intelligence gathering.

This article begins by briefly setting out some of the benefits of the Special Surveys, and highlights why they might be particularly useful during times of economic turbulence. Through the prism of the Special Surveys commissioned over the past four years, the article then goes on to plot the course of the financial crisis, recession and subsequent recovery, exploring some of the big puzzles faced by policymakers during that time. The timeline overleaf sets out all of the Special Surveys commissioned during the period since the start of the financial crisis. A box on page 33 summarises the various intelligence gathering and representational functions carried out by the Agents, as well as the structure of the Agency network.

The Special Survey

Since the start of the world financial crisis in 2007, unprecedented economic turbulence has increased the usefulness of the Special Surveys, as they provide a unique way for the Committee to 'get under the bonnet of the economy'. There are a number of reasons for this. When highly unusual events occur, forecasting models, which are largely based upon the averages of past relationships in the data, may be less able to provide a guide to the future than during periods of stability. Under such circumstances, it is helpful to be able to supplement these models with other types of information and analysis such as the Special Surveys.

In addition, during periods of instability, data are likely to be volatile, making it difficult to discern turning points and trends. By asking businesses about their behaviour and expectations, and, importantly, the reasoning underlying their responses, the Special Surveys can help to verify the patterns suggested by the hard data. And they offer insights across different sectors and sizes of firm.

Last, many types of economic data are uncertain, with early estimates subject to revision as new information becomes available and sampling and statistical techniques improve. This problem may be compounded when there are unusually large movements in the variables being measured. The Special Surveys can help the Committee to form a judgement about how much weight to place on the official data.

In the period since the start of the world financial crisis in August 2007, the Agents have conducted 34 Special Surveys. These are listed in the timeline overleaf (**Table A**). This article selects a subset of these surveys to discuss some of the major issues which the Committee has had to grapple with: credit conditions and investment; the depreciation of sterling and trade; and labour productivity and spare capacity. Further information on each of the Special Surveys can be found in the *Agents' summary of business conditions* for the corresponding month. The survey results in the credit conditions and

⁽¹⁾ The authors would like to thank Jonathan Relleen for his help in producing this article.

Publication date	Survey		
October 2007	Employment		
December 2007	Credit conditions		
January 2008	Retail sales		
February 2008	Pay and labour costs		
March 2008	Cost pass-through		
April 2008	Demand conditions		
June 2008	Export conditions		
July 2008	Migrant labour		
October 2008	Credit conditions		
December 2008	Finance for working capital		
January 2009	Retail sales		
February 2009	Pay and labour costs		
March 2009	Cost pass-through		
April 2009	Stockbuilding		
June 2009	Credit conditions		
October 2009	Employment		
December 2009	Investment		
January 2010	Retail sales and VAT		
February 2010	Pay and labour costs		
March 2010	Exports and export prices		
April 2010	Spare capacity and output prices		
July 2010	Profit margins		
October 2010	Corporate cash holdings		
November 2010	Investment		
January 2011	Employment and productivity		
	Retail sales and VAT		
February 2011	Pay and labour costs		
April 2011	Imports		
July 2011	Employment		
August 2011	Profit margins		
October 2011	Exports		
November 2011	Investment		
January 2012	Retail sales		
February 2012	Pay and labour costs		

investment section and in the trade section are weighted by turnover. The results in the labour productivity and spare capacity section are weighted by employment.

Credit conditions and investment

The world financial crisis began in August 2007, when the United States sub-prime mortgage crisis spread to other countries, and led to seizures in some asset-backed securities markets. This, in turn, impacted upon a wider range of bank funding markets.⁽¹⁾ Ahead of their December 2007 policy meeting, the Committee requested a survey on credit conditions to see whether or not stresses in bank funding markets had begun to feed through to the cost or availability of credit for businesses. Nearly half of those companies surveyed reported that credit conditions had become tighter (blue bars in **Chart 1**).

Chart 1 December 2007 and October 2008 surveys on credit $\mbox{conditions}^{(a)}$



(a) Weighted by turnover.

Credit conditions continued to tighten throughout 2008. And the Agents were commissioned to repeat the credit conditions survey ahead of the October 2008 policy meeting. The survey confirmed that there had been a further significant tightening in credit conditions (magenta bars in **Chart 1**). Firms also reported that they had been particularly affected by a fall in the availability of trade credit. And they had continued to cut investment in response.

During the period that the survey was in the field, Lehman Brothers collapsed. It was therefore very likely that the tightening in credit conditions detected in the October survey would have intensified further still as developments unfolded. And the declining availability of trade credit was becoming a particular source of concern. For the December 2008 policy meeting the Committee requested a survey to investigate the availability of finance for working capital, to try to assess whether tighter funding conditions were affecting activity in the real economy.

Around half of those surveyed reported that it had become harder to secure trade credit insurance. And a large minority of contacts had experienced a fall in the availability of working capital. Internal finance had been squeezed by falling revenues, due to a sharp weakening in demand, rising input costs — following the depreciation of sterling — and lengthening payment times.

Given the speed of developments in the financial sector, another survey on credit conditions was commissioned ahead of the June 2009 policy meeting. The survey showed that there had been a further rise in those reporting a tightening in credit conditions, to around four fifths of the sample, with the

Table A Survey timeline

For a fuller account of this period, see the April 2008 Financial Stability Report, available at www.bankofengland.co.uk/publications/Documents/fsr/2008/fsrfull0804.pdf.

The Agency network

The Bank has twelve Agencies located across the United Kingdom, with each staffed by an Agent and at least one Deputy Agent. The Bank's Agencies have two core functions: intelligence gathering and representation. (See the November 1997 and Spring 2003 *Quarterly Bulletins* for a historical perspective of the Agency network, and a more extensive discussion of the various functions of the Agencies.)

Each month the Agents and Deputies gather information from contacts around the country covering a range of economic and financial variables. Each Agency has several hundred regular contacts and the network as a whole speaks to around 8,000 businesses over the course of each year. The regular economic intelligence gathered by the Agencies is reported back to the Monetary Policy Committee (MPC) ahead of its monthly policy decision.

Along with the qualitative briefing, the Agencies produce 'scores' for a number of variables, to add a more quantitative dimension to the intelligence. The scores are published on the Bank's website (see Winter 2005 *Quarterly Bulletin* for more information on the Agents' scores. For analysis of the correlation of the scores with official data see the 2008 Q1 *Quarterly Bulletin*). The qualitative intelligence and scores are summarised in the *Agents' summary of business conditions*, which is published at the same time as the minutes of the MPC's monthly meeting.

Every few months the Committee will also commission the Agents to conduct a Special Survey to investigate a particular issue of interest. The results of the survey are reported back to the MPC one or two months later, ahead of the policy

most common response being to scale back investment plans (Chart 2). Between the end of 2007 and the middle of 2009, the level of real investment expenditure was reported by the ONS to have fallen by over a fifth.

But there were a few reports of an increase in the appetite of lenders for new business. And during the second half of 2009, the Agents' regular intelligence gathering suggested that credit conditions had begun to improve for larger firms, brightening the prospects for investment.

A survey on investment conducted ahead of the December 2009 policy meeting indicated that there was at that time a broad balance between those companies expecting to cut capital spending over the next year, and those expecting to increase it (Chart 3). But there was little sign of a robust bounceback. And smaller firms in particular continued to be constrained by a lack of external finance (Chart 4). meeting, along with the outputs of the Agents' routine monthly intelligence gathering.

Benefits of Agency intelligence gathering:

- Timeliness: Agents can sometimes provide information on economic variables ahead of the publication of hard data.
- Interpretation: Agents can help the Committee to 'look through' volatility in the data, to try to discern underlying trends and to understand why firms might be behaving in particular ways.
- Unobservable variables: Agents can investigate economic variables for which there are no hard data, such as capacity utilisation, or recruitment difficulties.
- Forward looking: Agents can provide an advance steer on where economic variables are heading.
- Flexibility: Interviews and Special Surveys afford the flexibility needed to explore a changing set of key issues.

As well as fulfilling an intelligence-gathering function, the Agencies are also representatives of the Bank. By visiting firms in each of their respective regions, and engaging with the wider community, the Agents help to communicate policy to a broad audience. The Agents also have an important role in facilitating meetings between MPC members and firms around the country. Through these meetings, Committee members are able to engage directly with the general public and business community on matters of policy. And they are able to hear, first hand, about some of the issues facing businesses, and gain insights into the workings of the economy.



Chart 2 June 2009 credit conditions survey: responses to tighter financing conditions^(a)

(a) Weighted by turnover.



(a) Each category weighted by turnover.
 (b) Large firms defined as those with a turnover of £400 million or more

Chart 4 December 2009 investment survey: drivers of expected reductions in investment^(a)



(b) Large firms defined as those with a turnover of £400 million or more.

(c) Respondents could select more than one option.

The regular intelligence gathering suggested that for many firms, especially larger ones, over the course of 2010 credit conditions continued to ease and profitability improved. But the level of investment remained low in comparison to pre-crisis levels and corporates built up substantial cash surpluses. Ahead of the October 2010 policy meeting, the Agents surveyed contacts about levels of, and plans for, cash holdings, to try to gauge whether firms intended to use some of those surpluses to fund increased investment.

Consistent with the official data, the survey showed that a majority of respondents had cash holdings that were above normal. This was especially true of large firms. A small majority of all firms expected to reduce those surpluses over the following year, largely reflecting the plans of large firms to pay down debt, or increase investment. Small firms typically planned to continue to preserve cash.

To try to get a better feel for how strongly investment might pick up, the Committee commissioned a follow-up survey on investment in November 2010. The survey showed that capital spending was expected to rise more quickly over the coming year, compared with the previous year. This expectation was driven in large part by the resumption of plans that had been put on hold during the recession (Chart 5), along with a number of 'other' factors, such as asset replacement, regulatory compliance and efficiency gains. But demand uncertainty continued to exert a significant drag on capital expenditure.

Chart 5 November 2010 investment survey: drivers of investment plans^(a)



(a) Net balances weighted by turnover.

There was a modest increase in investment during 2011. But over the second half of the year, weak UK growth and rising concerns about the euro area suggested that investment intentions might have deteriorated. Encouragingly, however, despite still heightened levels of uncertainty, the most recent survey on capital expenditure, in November 2011, suggested that investment plans had not been revised down materially. The net percentage balance of firms' investment plans indicated that capital spending was likely to remain broadly flat over the coming year (Chart 6).

Firms reported that there were a number of factors underpinning their investment plans for 2012. Increased capital spending was often intended to raise productivity, for instance. And many contacts reported that continuous investment — in product innovation, developing new markets, and finding efficiencies — was absolutely necessary simply to survive in the current environment. Some service sector firms also reported that they were investing in expanding export activity, to try to offset weakness in domestic demand.

Chart 3 December 2009 investment survey: expected change in investment over the next twelve months^(a)




(a) Weighted by turnover.

Trade and the depreciation of sterling

The depreciation of sterling since the start of the financial crisis should help the economy rebalance by making domestically produced goods and services more competitive. Following the decline in the exchange rate, however, data available at the time suggested that there had been less of an improvement in the trade balance than might have been expected, based on the response of trade to movements in sterling in 1992 and 1996 for example. But trade data are prone to revision, as additional information becomes available, and mature vintages of the official data can sometimes tell a different story to preliminary estimates.

Between the middle of 2007 and the middle of 2008, the sterling effective exchange rate index (ERI) depreciated by roughly 10%. The Committee commissioned a survey on exports ahead of their meeting in June 2008, to try to get a better feel for the response of trade flows to the depreciation. The survey suggested that over the previous year a large number of firms had used the boost to competitiveness from the depreciation of sterling to increase volumes of exports. But there was a broad balance between those that had allowed their foreign currency prices to fall, to expand volumes and market share, and those that had kept their foreign currency prices unchanged, to raise margins (Chart 7).

The finding that so many exporters were inclined to grow margins rather than volumes suggested that it could take longer than otherwise for the depreciation of sterling to feed through to exports, as that might rely, in part, on new firms entering the market in response to increased profitability.

The level of the sterling ERI fell further during 2008, and settled around 25% below its pre-crisis peak during





(a) Weighted by turnover.

Spring 2009. A second survey, in March 2010, found that most firms had kept their foreign currency export prices broadly unchanged over 2009 and expected them to remain steady over 2010 (**Chart 8**). Some contacts reported that the past depreciation of sterling had pushed up on their costs, lessening the extent to which they could afford to lower foreign currency prices. And others responded that demand for the type of high value added goods produced in the United Kingdom was relatively unresponsive to changes in price, so there was little gain to be had from lowering foreign currency prices.





⁽a) Weighted by turnover.

Upward revisions to exports in the 2011 *Blue Book* have since increased the contribution to GDP growth from exports significantly. As a result, based on the mature data, the response of exports to the decline in the exchange rate looks broadly in line with what might have been expected on the basis of changes in exports following previous changes in the

exchange rate. And the results of the June 2008 survey may provide a useful benchmark in the event of significant changes in the exchange rate in the future.⁽¹⁾

As well as supporting exports, the fall in the value of sterling should also improve the net trade position by encouraging a switch away from relatively more expensive imported goods and services towards domestically produced ones. But, as with exports, the response of imports to the depreciation of sterling was smaller than expected, based on data available at the time. As a result, import growth appeared stronger than anticipated, reducing the boost to growth from net trade.⁽²⁾

A survey on imports in April 2011 suggested that since the depreciation of the pound, imports of intermediate goods and services — which comprise the bulk of total imports — had stayed the same, or even increased slightly, as a share of total non-labour inputs. In many cases, domestic substitutes were still considered to be uncompetitive, despite the depreciation, or there simply were no domestic substitutes available (Chart 9).

Chart 9 April 2011 survey on imports: factors exerting upward pressure on the import share of intermediate goods and services^(a)



There have since been some downward revisions to import growth immediately following the depreciation. But there remains some unexplained strength in imports, in particular of goods, and that may be accounted for by the factors highlighted by the survey: the continued cost advantages of foreign production, despite the fall in sterling; and the absence of domestic suppliers for some products. This highlights the importance of using a range of sources of information, in addition to contemporaneous official data.

It is worth noting, however, that more recent intelligence gathered by the Agents points to a range of factors that appear to have reduced the attractiveness of importing intermediate goods and services further. Rapid increases in production costs abroad, particularly in Asia, have eroded their competitiveness. Natural disasters have highlighted the risks inherent in extended supply chains. Imports are sometimes of poor quality and can be subject to delays as supply is diverted to higher margin destinations. And constraints on working capital among domestic firms have led some of them to request shorter production runs from suppliers, tending to lessen the advantage of high volume foreign producers.

In addition to the fall in sterling, these developments will tend to raise the benefits of domestic production, potentially slowing the pace of import growth further. And recently, there has been a pickup in the frequency of reports from firms which have resourced imports from domestic suppliers, or brought production in-house altogether.

Labour productivity and spare capacity

During the recession, employment fell by less than might have been expected, given the size of the contraction in output. That meant that labour productivity — or output per employee — fell significantly, and suggested that there was a lot of spare capacity within firms which could be used to meet extra demand. But spare capacity in firms is impossible to observe directly, making it hard to judge the degree of potential supply in the economy.

The Committee asked for a survey to investigate the relative resilience of employment ahead of the October 2009 policy meeting. Around three quarters of respondents reported that they had used changes in average hours or pay to reduce labour costs. That suggested that flexible working practices and wage flexibility might have enabled some of the labour market adjustment to come through hours and pay rather than headcount. It also suggested that firms should be able to meet a significant pickup in demand without needing to take on new staff.

Over time, however, even though activity remained weak, the regular monthly business surveys conducted by other organisations such as the BCC and CBI, as well as the Agents' own scores for capacity utilisation, indicated that the degree of slack within firms was falling. For the April 2010 policy meeting the Committee commissioned a survey to explore how much spare capacity there was within firms. The results suggested that a margin of slack did exist within most firms (Chart 10). And that was most evident in manufacturing and construction, industries where the fall in output during the recession had been particularly marked.

⁽¹⁾ Recent analysis points to significant relative price changes in sterling export prices versus foreign currency prices. For a full analysis of the recent behaviour of trade, see Kamath, K and Paul, V (2011), 'Understanding recent developments in UK external trade', Bank of England Quarterly Bulletin, Vol. 51, No. 4, pages 294–304.

⁽²⁾ It is important to note, however, that imports of travel services, in particular, did fall sharply in response to the depreciation. *Ibid.*





But over the following months the regular business surveys of spare capacity continued to indicate that the margin of slack within firms was closing, despite the persistent weakness of output growth. And adding weight to measures showing a decline in spare capacity, firms' own behaviour suggested that many were indeed unable to raise output with existing staff, with the official Labour Force Survey measure of employment growing during 2010 and the first half of 2011.

One possible explanation for rising employment and, at the same time, the reported decline in spare capacity in the regular surveys, was that there had been a reduction in the growth rate of underlying labour productivity during the recession. It is not obvious, however, what might have caused such a hit to the growth rate of potential output per worker.

It may have been that the significant decline in activity during the recession meant that there had been much less 'learning by doing' taking place within firms, or perhaps that there had been a slowing in the growth rate of the capital stock. These factors would tend to have slowed the pace at which employees were able to produce more over time, compared with what would have been the case had there been no recession.⁽¹⁾

Under those circumstances, firms might have relatively little spare capacity, and so would have to employ more people in order to meet a pickup in demand. In turn, that would mean the output gap was smaller than had there been no slowing in underlying labour productivity. The Committee commissioned a survey to try to test this hypothesis ahead of the January 2011 policy meeting.

The survey yielded rather surprising results. Respondents reported that their activity had fallen by less than their headcount, implying that labour productivity had actually

risen since the start of the recession, in contrast to the official data on output and employment. And they also reported that they could meet a material increase in demand using existing staff (Chart 11), which tended to go against the monthly indicators of capacity utilisation.

Chart 11 January 2011 survey on employment and productivity: increase in demand that could be met using existing staff^(a)



(a) Weighted by employment.

These unexpected findings might simply have been due to sampling error, if the firms which were surveyed were not representative of businesses in the wider economy. But they might also have been partly because some of the concepts under examination — potential output and spare capacity, for example — are difficult to define.

For instance, the regular intelligence gathered by the Agents suggests that some manufacturers may have responded to the fall in demand at the start of the recession by reducing capacity temporarily in order to reduce costs, perhaps by mothballing equipment, or cutting the number of shifts. Some of those firms may then report that they are operating at normal levels of spare capacity. But at the same time they might also be able to bring mothballed capital back on stream or implement additional shifts once demand recovers.

Meanwhile, in the service sector, some firms appear to have held on to labour during the recession, even though demand remained weak. But such firms are often very busy, perhaps because they are competing over a wider range of services than usual, or over a broader geographical area. But they may not be winning much new business despite those efforts. As a result, while they might report that capacity utilisation is high — as staff are fully employed — they would still be able to meet a significant increase in demand, should it pick up.

For further discussion of the possible causes of a slowing in productivity growth, see the November 2011 Inflation Report, available at www.bankofengland.co.uk/publications/Documents/inflationreport/ir11nov.pdf.

Clearly, then, it is difficult to know how much weight to put on the results of the regular business surveys versus the Special Surveys. And the MPC considers a range of other evidence alongside these measures. But there remains considerable uncertainty around the evolution of underlying productivity and the size of the output gap.

Conclusion

At a time of economic instability, when data are volatile, and models may be less able than usual to provide a guide to the outlook, the Agents' Special Surveys are a useful addition to the MPC's toolkit. By asking businesses about their behaviour directly, they can help the committee to understand changes in the data and offer a guide to future activity. They also provide a means of investigating the values of important, but unobservable, variables. And while the surveys sometimes generate unexpected results, these can still help to improve our understanding of the behaviour of decision-makers in the real economy.

References

Beverly, J (1997), 'The Bank's regional Agencies', *Bank of England Quarterly Bulletin*, November, pages 424–27.

Dwyer, J (2008), 'The Agents' scores: a review', *Bank of England Quarterly Bulletin*, Vol. 48, No. 1, pages 47–57.

Eckersley, P and Webber, P (2003), 'The Bank's regional Agencies', Bank of England Quarterly Bulletin, Spring, pages 92–96.

Ellis, C and Pike, T (2005), 'Introducing the Agents' scores', Bank of England Quarterly Bulletin, Winter, pages 424–30.

What can the oil futures curve tell us about the outlook for oil prices?

By Dan Nixon of the Bank's International Economic Analysis Division and Tom Smith of the Bank's Macro Financial Analysis Division.⁽¹⁾

Large movements in the oil price have had significant effects on UK CPI inflation over the past few years. In order to produce an inflation forecast, it is necessary to assume a path for oil and other commodity prices. The Monetary Policy Committee assumes that oil prices follow the path given by market futures prices when deciding their central projections for CPI inflation and GDP growth. This article considers arguments for and against using the futures curve as an assumed path and describes some of the other indicators used by the Committee in assessing the outlook for oil prices.

Introduction

Large swings in the prices of raw materials have had significant effects on UK inflation in recent years. **Chart 1** shows that energy and food prices have been a key driver of changes in UK consumer price inflation since around 2004, reflecting large gyrations in the prices of commodities.⁽²⁾

Chart 1 Contributions of food and energy to UK CPI inflation



In order to produce a forecast for GDP growth and inflation, it is necessary for the Monetary Policy Committee (MPC) to make assumptions about a number of variables that feed into that forecast. The paths assumed for commodity prices in the *Inflation Report* central projections for growth and inflation are those implied by market futures curves. This article examines the case for using oil futures curves as the forecasting assumption for oil prices and compares its predictive power with other forecasting measures. It does that by looking at oil price movements over the past decade or so. It does not focus on the most recent movements in oil prices, or the current profile of the futures curve.

Generally, there are compelling reasons why a futures curve might *not* be an ideal forecasting assumption. Commodity futures prices cannot be directly interpreted as financial market participants' expectations of future spot prices. And, empirically, futures prices have not been reliable predictors of subsequent commodity price movements in the past.

But alternative oil price assumptions do not appear to offer consistently better predictions than the futures curve assumption. Moreover, the futures curve assumption has a number of advantages over alternative measures. Changes in the slope of the futures curve can reflect changes in the direction of the expected path of spot prices, and the futures curve offers a simple and transparent assumption for commodity prices which can help the MPC to communicate clearly and precisely the assumption underpinning its *Inflation Report* central projection.

This article is organised as follows. The first section sets out what information is contained in oil spot and futures prices and how it should be interpreted. The second section compares the predictive power of oil futures prices with other simple forecasting measures and rules of thumb. The third section discusses some reasons why none of the measures

The authors would like to thank Shiv Chowla and Kate Stratford for their help in producing this article.

⁽²⁾ Note that contributions to UK CPI from food and energy prices in Chart 1 will include other input costs (such as processing and packaging of food products) in addition to changes in commodity prices. On the other hand, the prices of other raw materials industrial metals, for example — contribute to the green swathe. Moreover, the *indirect* effects of changes in commodity prices on prices of other goods and services in the CPI basket (for example, via production costs) will also be picked up in the green swathe.

perform well in predicting oil price movements. It also sets out how the MPC considers the outlook for commodity prices over the forecast horizon both in terms of its central projection and the risks around that projection. And the fourth concludes.

What information is contained in the oil futures curve?

This section sets out the theoretical relationship between oil spot and futures prices. As for any risky financial asset, the oil futures price cannot be interpreted as a direct measure of market expectations of spot prices. But because oil is a physical good as well as a financial asset, the slope of the oil futures curve may contain some information about the expected path of spot prices.

Spot and futures prices

The 'spot price' of an asset is the price of buying or selling the asset today. The 'futures price' of an asset is the price of entering into a contract today to buy or sell the asset on some agreed future date. The set of prices for all future dates is then called the 'futures curve'.

In equilibrium, the futures price of any purely financial asset must equal its current spot price, adjusted for the interest that could be earned by investing an amount equal to the spot price in a risk-free asset over the contract period. If this were not the case, investors could 'arbitrage' between the two prices to earn a risk-free profit: they could borrow money, buy the asset today at the spot price and agree to sell it in the future at a price that would yield a risk-free profit.

For example, if the spot price of a share (that is, a purely financial asset) in a particular company was £100 and the risk-free interest rate was 5% per year then, ignoring dividend payments, the price of a futures contract to buy (or sell) the share in one year's time would have to cost £105. If instead the futures price was, say, £110, then investors could borrow £100 and buy a share at the spot price, then sell a futures contract for £110; the £10 difference between the spot and futures prices would more than cover the £5 interest payments on the loan, leaving the investors with a £5 risk-free profit. A similar argument would hold if the futures price was below £105. Such an arbitrage opportunity would be unlikely to last for long. In this example, prices would adjust in response to arbitrage until the futures price was exactly 5% higher than the spot price.

The presence of this 'no-arbitrage' relationship implies that futures prices should not move independently of spot prices, except when the risk-free interest rate changes. So the spot and futures prices of purely financial assets should both reflect the same information about current and expected future market conditions. It is tempting, then, to think that the futures price equals investors' expectation of what the spot price will be at the contract expiry date. This would be true (for purely financial assets) if the path of spot prices were known with certainty. In general, however, the futures price of an asset is not the same as its expected future spot price. The difference between them can be explained in terms of a 'risk premium'. Furthermore, the fact that commodities such as oil are physical assets leads to deviations in the futures curve from the no-arbitrage condition due to the 'net convenience yield'. The rest of this section explains how these factors affect the shape of the futures curve and the path of expected spot prices.

The risk premium

Investors dislike uncertainty about future income and require additional compensation for holding assets that have uncertain pay-offs, that is, risky assets. That additional compensation — the difference between the expected return on a risky asset (the rate at which its spot price is expected to increase *on average*) and the risk-free interest rate — is called the 'risk premium'. Oil, for example, is a risky asset — its future price is uncertain — and so its expected return will differ from the risk-free rate.

When risk premia are positive, the spot price is expected to increase faster, on average, than the risk-free rate, and so the expected path of spot prices will lie above the futures curve, as shown in **Chart 2**. Similarly, when risk premia are negative then the expected path of spot prices will lie below the futures curve. In general, investors prefer assets which pay off more in situations when their overall income is likely to be low — that is, they prefer assets that are *negatively* correlated with income — as they can insure against low income by investing in those assets. But, investors expect the spot price of many risky assets one year ahead to be *positively* correlated with their income — for example, because periods of strong economic growth are typically associated both with higher asset prices and higher incomes.





Returning to the example given earlier, future share prices are not known with certainty and may be expected to be positively correlated with future income. This will affect spot and futures prices today. For example, if the share price is more likely to be below £105 than above in situations when investors' overall income is low, then they would be less willing to hold the share as an investment and would only be prepared to buy the share today at a spot price *below* £100 — for instance, £98. Due to the no-arbitrage relationship set out in the previous section, they would then only be prepared to pay roughly £103 for a futures contract: 5% more than today's spot price of £98.

The uncertainty around the expected future spot price would therefore have two consequences. First, with a spot price today of £98 and an expected future spot price of £105, an investor who bought the share could expect returns of roughly 7% on average, rather than the returns of 5% available on a risk-free investment. So they would earn a positive risk premium of roughly 2 percentage points on average, compensating them for the risk that the share price might turn out lower than expected at particularly inconvenient times. And second, the existence of this risk premium means that today's futures price of £103 would no longer equal next year's expected spot price of £105.

Risk premia are unobservable and vary over time.⁽¹⁾ This is one reason why forecasting spot prices is difficult. At turning points in the economic cycle, for example, expectations of demand are especially uncertain and therefore especially sensitive to news from data outturns, and so risk premia may be larger and more volatile than usual.⁽²⁾

The net convenience yield

Commodities, unlike other financial assets, are physical, storable and exhaustible.⁽³⁾ This makes the relationship between their spot and futures prices a little more complicated than it is for purely financial assets. Most obviously, holding physical commodities such as oil for future consumption imposes storage costs. But in addition, physical ownership gives the holder an extra benefit known as a 'convenience yield':⁽⁴⁾ it allows businesses to respond to unexpected shocks to demand for their goods without the risk of paying a premium for delivery at short notice.

The level of the convenience yield and the cost of storage both affect the slope of the futures curve, moving it away from the slope implied by the no-arbitrage relationship described above. An increase in the convenience yield or a decrease in storage costs makes holding physical oil more attractive relative to holding a futures contract. So the price investors are willing to pay for physical oil increases relative to the futures price, making the futures curve less upward sloping. Unfortunately since neither the convenience yield nor the cost of storage is easily observable, there is no way of telling which of the two is responsible for changes in the slope of the futures curve. But the 'net convenience yield', defined as the convenience yield minus storage costs, can be measured as the deviation from the no-arbitrage relationship.⁽⁵⁾

A stylised example of how this can affect the oil futures curve is shown in **Chart 3**. The blue line shows an oil futures curve where the net convenience yield is zero so that spot and futures prices are simply linked by the no-arbitrage relationship, as in **Chart 2**.⁽⁶⁾ The green line shows an oil futures curve with a positive net convenience yield where, for the purposes of illustration, the two curves start from the same spot price. Relative to that spot price, the positive net convenience yield in the green curve means that investors are not willing to pay as much for futures contracts as the no-arbitrage relationship would suggest. This results in a less upward-sloping futures curve.





Chart 4 shows that the net convenience yield is typically high when oil inventories are low. Intuitively, when inventories are low, inventory holders have less capacity to smooth through unexpected shocks before they run out of oil altogether. So the marginal benefit from holding an additional barrel of oil will be relatively high. At the same time, when inventories are

For a more detailed discussion of how risk premia behave over time, see Cochrane (2011).

⁽²⁾ Over the near term, at least, prospects for world oil supply are less sensitive to economic conditions — they are determined by past investment and technological progress in the oil extraction sector.

⁽³⁾ Minerals and fossil fuels, including crude oil, natural gas and industrial metals are all considered exhaustible. Other raw materials such as agricultural commodities and livestock are not exhaustible but remain in fixed physical supply over the short to medium term.

⁽⁴⁾ Some financial assets can also provide benefits to their holders, and can therefore also have convenience yields: for instance, equity holders in a company have voting rights at the company's meetings.

⁽⁵⁾ The one-year net convenience yield is calculated as the interest rate minus the log of the ratio of the one-year futures price to the spot price, annualised to give a rate in per cent. The nominal US one-year government spot interest rate is used in place of the risk-free rate.

⁽⁶⁾ That is, the convenience yield (which pushes up on spot prices relative to futures prices) exactly offsets storage costs (which push up on futures prices relative to spot prices).



Chart 4 The net convenience yield and OECD oil inventories^{(a)(b)}

(b) The net convenience yield is calculated as the interest rate minus the log of the ratio of the one-year futures price to the spot price, annualised to give a rate in per cent.

low, the volume of available storage space is high, which may bear down on the cost of storage.⁽¹⁾

This link between inventories and the net convenience yield means that changes in the slope of the futures curve can be used to make inferences about changes in the direction of the expected path of spot prices. For example, suppose that a negative supply shock occurs which is expected to be temporary. This boosts the oil spot price, although this boost is tempered by businesses running down their inventories of oil. That inventory drawdown in turn leads to an increase in the net convenience yield, resulting in a futures curve that is less upward sloping. But what about expected spot prices? At short maturities, these will also increase, reflecting reduced supply in the near term. But since the shock is expected to be temporary, expected spot prices at longer maturities will be largely unaffected, and so the expected path of spot prices, too, will become less upward sloping. So the observed change in the slope of the futures curve can act as a signal of the change in the slope of the path of expected spot prices.

Applying this to the real world, **Chart 5** shows the evolution of oil spot prices and futures curves towards the end of 2010 and the first half of 2011. Shifts in the slope of the futures curve during this period can be given meaningful economic interpretations. In October 2010, the oil futures curve was unusually upward sloping. This is likely to have reflected historically high levels of oil inventories (**Chart 4**) following the global recession, which pushed down on the spot price relative to the futures price.

By February 2011, stronger-than-expected indicators of world oil demand led to expectations of a permanent tightening in the oil market. That led to higher prices across the futures curve, but boosted spot prices more than futures prices as



Chart 5 Oil futures curves in 2010–11^(a)

large inventory stockpiles were run down increasing the net convenience yield. And, following tensions in the Middle East and North Africa, concerns about disruptions to oil supply also started to be factored into oil prices, with the futures curve becoming downward sloping. By April 2011, these tensions had led to still higher spot prices but also a downward-sloping futures curve. Market participants were willing to pay more for physical oil than for futures contracts, indicating that at least some of the supply disruptions were expected to be temporary. In this instance, oil spot prices did fall back in subsequent months. Of course, there could be other explanations for these price movements, but the direction they moved in is consistent with observed changes in the slope of the futures curve.

There are reasons why the theory set out above may not hold perfectly in practice for all commodities. In particular, the physical nature of commodities may pose limits on the degree to which investors can incorporate information about expected future demand and supply into current spot and futures prices. For example, many agricultural commodities cannot be stored indefinitely, placing limits on the time period over which investors can arbitrage between prices. This means that the no-arbitrage relationship between spot and future prices will only hold over a finite horizon.⁽²⁾

⁽a) Inventories refers to combined government and industry holdings of crude oil, natural gas liquids, feedstocks and other oil products.

⁽a) End-of-month futures prices are used throughout this article

Pindyck (2001) thoroughly documents the relationship between oil spot prices, futures prices and inventory levels. Gorton, Hayashi and Rouwenhorst (2007) present a model in which commodity inventories are inversely related to the slope of the futures curve.

⁽²⁾ Structural factors in commodity futures markets might also move futures prices away from their theoretical equilibrium levels. For example, market intelligence suggests that, in general, consumers of commodities such as oil hedge more than producers, since shareholders in oil-producing companies want exposure to changes in the oil price. See Campbell, Orskaug and Williams (2006).

Assessing the predictive power of the futures curve

Despite the theoretical link between the futures curve and expected spot prices, the futures curve has not been a very good guide to predicting future spot prices, failing to predict the upwards trend in prices between 2003 and 2008 as well as the collapse and recovery in oil prices since then (Chart 6). This section describes some of the academic literature on forecasting with futures curves, and presents empirical evidence on some alternative forecasting rules for the oil price.



Sources: Bloomberg and Bank calculations

There is a wide range of academic literature on forecasting oil prices. A number of papers examine the forecasting performance of the futures curve, often comparing it to a random walk — the assumption that all changes in the oil spot price are unpredictable, so that the current spot price is the best possible forecast for the future spot price.

Alquist, Kilian and Vigfusson (2011) find that oil futures prices are generally no better at predicting spot prices than a random walk. At a twelve-month horizon they may marginally outperform a random walk, but this result is sensitive to the sample period and data frequency chosen. On the other hand, Chernenko, Schwarz and Wright (2004) conclude that the oil futures price predicts spot prices correctly on average; Wu and McCallum (2005) agree, but observe that the forecasting errors are large. Reichsfeld and Roache (2011) find that the oil futures price outperforms a random walk at the three-month horizon but is no better at longer horizons.

Overall, then, the results from the literature are mixed. But they do not strongly suggest that the futures curve is a much better predictor of spot prices than a random walk.

Testing the forecasting performance of the futures curve

In this subsection, the predictive power of oil futures curves is compared with three other simple forecasts and rules of thumb.

The three rules are all based on readily observable measures from financial markets and surveys:

- A random walk. The assumption that all changes in the oil spot price are unpredictable, so that the current spot price is the best possible forecast for the future spot price.
- **Consensus forecasts.** The arithmetic mean of a survey of professional economists' expectations for the oil price one year ahead, carried out by Consensus Economics.⁽¹⁾
- Hotelling's rule. The simple theoretical model of oil production set out in Hotelling (1931) implies that oil prices increase in line with nominal interest rates.⁽²⁾ Producers are indifferent between selling an additional barrel of oil today investing the proceeds at the market interest rate and waiting to extract the oil in the following period.⁽³⁾⁽⁴⁾

Table A summarises the forecasting performance of the futures curve, together with each of these methods at the one-year horizon, during the period January 2000 to January 2012.⁽⁵⁾ Two measures of predictive power are shown. The first measure is the mean forecast error, which captures any systematic bias in the forecast. Unbiasedness is a desirable characteristic for a forecast, but that does not mean that the least biased forecast is necessarily the most useful: a forecast which is far too high half the time and far too low the rest of the time will be unbiased, but it will not be very helpful to policymakers. The second measure, the root mean squared error (RMSE), captures this kind of predictive weakness.

Table A Alternative forecasts for the oil price

	Futures curve	Random walk	Consensus	Hotelling's rule
Mean error	-8%	-6%	-12%	-4%
Root mean squared error	37%	38%	33%	39%
Diebold-Mariano statistic ^(a)	-	0.55	-0.78	0.76

Sources: Bloomberg, Consensus Economics and Bank calculations

(a) The statistic compares the RMSE of the futures curve with each of the other measures. When the two RMSEs are equal, this statistic has a standard normal distribution in large samples. Here, the absolute value of the statistic is less than 196 in all three case, implying that none of the RMSEs are significantly different from the futures curve at the 5% significance level (see Diebold and Mariano (1994)).

While futures prices have typically underpredicted oil prices over the past decade, alternative market-based measures have not performed consistently better. The futures price, random

- (4) An alternative way of motivating the same rule is to interpret it as assuming that risk premia are equal to zero.
- (5) The table concentrates on this horizon because oil futures markets are much less liquid for longer-dated contracts, while Consensus energy forecasts for horizons longer than one year are only published on a quarterly basis.

⁽¹⁾ These forecasts are for the price of West Texas Intermediate (WTI) oil, while the MPC uses the Brent oil price. This is taken into account when considering the results. In addition, Consensus forecasts do not correspond precisely to the end-of-month data used throughout this article.

⁽²⁾ Strictly, Hotelling's rule applies to the net oil price, that is, the oil price minus the cost of production. But marginal production costs, which vary considerably by oilfield project, are not easily observable — making forecasting using this rule difficult. The formulation used here implicitly assumes that production costs also increase in line with nominal interest rates.

⁽³⁾ Again, the nominal US one-year government spot interest rate is used in place of the risk-free rate.

walk and Consensus forecasts all underpredicted the actual spot price on average by between 4% and 12% (illustrated in **Chart 7**). The forecasts made using Hotelling's rule were, on average, the least biased. But this apparent accuracy masked considerable variation of forecasting performance within that period, with the RMSE comparable to that of the other forecasting methods. Statistical tests, reported in the third row of **Table A**, could not reject the hypothesis that the RMSE for the futures curve was the same as that for either the random walk, Consensus survey or Hotelling's rule forecasts: in other words, none of the other forecasts was significantly better than the futures curve.⁽¹⁾





(a) The Consensus forecast for April 2011 is omitted due to the size of the wedge between the

price of Brent crude and WTI at this time (see footnote (1) on this page).

Of course, there are various extensions to these forecast measures that one might consider. Reeve and Vigfusson (2011), for example, consider a random walk with drift, which assumes that commodity prices continue on the path implied by their average growth rate over the previous twelve months. This approach could be consistent with the idea that commodity prices will continue to rise in line with world demand, say. But the authors find that this measure performs significantly worse than the futures curve. Interestingly, however, they do find that the futures curve outperforms a random walk when the slope of the futures curve is steep. Other authors find that augmenting the futures price with additional financial or real-world variables can improve its forecasting performance. Pagano and Pisani (2009), for instance, find that a measure of capacity utilisation in US manufacturing can explain part of the forecast error from using futures prices. There are, of course, various ways to model the oil market based on market fundamentals - this approach is discussed briefly in the following section.

Assessing the outlook for commodity prices

The previous section highlighted the poor track record of both oil futures prices and other simple forecasting rules in

predicting changes in oil spot prices. In this section some reasons are put forward as to why this finding is not very surprising given the likely determinants of oil price movements over the past. The MPC's approach to considering the outlook for commodity prices over the forecast horizon is then discussed, including the futures curve assumption for the central projection.

Explaining why oil prices are hard to predict

The nature of oil as a financial asset means that the failure of futures prices and other measures to predict large swings in prices is not very surprising. As discussed earlier, oil spot and futures prices will always be tied by an arbitrage relationship, which, in practice, means that the futures curve has been relatively flat compared to the scale of price moves seen over the past few years. So what can explain these large swings in oil and other commodity prices?

Previous analysis has concluded that it is likely that much of the large swings in oil prices can, *ex post*, be explained by changes to oil market fundamentals. For example, Hamilton (2009) attributes the run-up to the 2007–08 spike in oil prices to a combination of strong demand confronting stagnating world production. Saporta, Trott and Tudela (2009) stress the importance of *unexpected* shocks to fundamentals — notably the strength of demand from emerging markets and a successive overestimation of non-OPEC oil supply — in explaining the steady upwards trend in oil prices between 2003 and 2007.⁽²⁾ At the same time, the authors do not find empirical support for theories that point to the rapid increase in financial flows from speculators in the oil futures market as driving a wedge between spot prices and market fundamentals.

This view that shocks to fundamentals have been the main drivers of oil price changes might suggest using a model based on oil market fundamentals to generate forecasts for the oil price. Increasingly, this is being investigated in the academic literature. For example, Kilian and Murphy (2010) develop a structural vector autoregression (VAR) model of the oil market that includes measures for global oil production, economic activity, oil stocks and the real oil price. Baumeister and Kilian (2011) test the forecasting performance of this model and find that the mean square error is lower than for a random

⁽¹⁾ Since early 2011, WTI and Brent oil prices have diverged considerably. As mentioned in footnote (1) on page 43, Consensus forecasts are made for the WTI price. This could in principle explain their underprediction of the Brent price. But restricting the sample to the period before the two prices diverged does not improve their forecasting performance. And again, caution should be taken when assessing the predictive power of these forecasts at the peaks and troughs shown in Chart 7, since the forecasts may have been made before those peaks and troughs were reached.

⁽²⁾ This view has implications for the interpretation of the empirical forecasting tests of the previous section. For example, the Hotelling path is *always* upward sloping (as nominal interest rates are positive) even though news on oil market fundamentals can contingently move in either direction. If we consider the subperiod of January 2000-July 2007, we find that the RMSE for the Hotelling path is considerably lower than for the other measures considered above. But if one believes that shocks to market fundamentals drove price changes over that period, then the Hotelling rule would appear to be broadly right but for the wrong reasons over that sample period.

walk over short horizons (one to three months ahead) over the period from January 1992 to June 2010. The model, however, performs less well over longer horizons (six to twelve months ahead).⁽¹⁾ Moreover, similarly to the simple forecasting rules discussed in the previous section, their fundamentals-based model is unable, for the most part, to predict the large swings in oil prices over the 2008–09 period.

More generally, forecasting oil prices using a

fundamentals-based approach can be problematic for two reasons. First, there is the challenge of generating predictions for all the oil market-specific variables required to forecast oil prices.⁽²⁾ And second, there is the communications challenge that this would present. This is discussed in greater detail below.

How the Monetary Policy Committee assesses the outlook for commodity prices

Despite the poor track record of oil futures prices in predicting large movements in spot prices, the MPC's central projections for growth and inflation are based on the futures curve for oil and other commodity prices. This is for three main reasons. First, as discussed in the previous section, there are no other simple measures that consistently outperform the futures curve in predicting future price movements.

Second, changes in the slope of the futures curve should, by signalling changes in the net convenience yield, reflect changes to the expected path of spot prices — at least in terms of the direction of this expected path. This consideration would be lost by assuming a random walk, say. As mentioned in the previous section, there is some evidence that the futures curve outperforms a random walk when the slope of the futures curve is steep, perhaps because the signal from the convenience curve is clearest in such situations.⁽³⁾

The third reason for assuming that commodity prices follow the path implied by futures curves is that it is easy to communicate a simple and transparent market-based measure as an underlying assumption in the central projections for GDP growth and inflation — an important consideration for the MPC when publishing the *Inflation Report*. In this respect, the futures curve is preferable to less transparent, model-based forecasts.

Nonetheless, in assuming that commodity prices follow paths implied by futures curves, the MPC remains mindful of a number of factors. As described earlier, oil futures prices are not generally equal to market expectations of spot prices. And due to practical limits to arbitrage they may not reflect all available information about future supply and demand. Moreover, as described above, there is an expanding academic literature on oil price forecasting with increasingly sophisticated techniques employed to refine those forecasts. Due to these considerations, the MPC looks at a range of measures, in addition to the futures curve, when assessing the balance of risks to commodity prices over the forecast horizon. These risks are then reflected in the fan charts of the *Inflation Report* projections for growth and inflation. Analysis of commodity market fundamentals helps inform the MPC's view about possible outcomes for oil and other commodity prices. For example, fundamentals-based models of the oil market, as well as simple rules of thumb, are used to consider the range of plausible outcomes for oil prices under various scenarios for world demand, oil production, spare production capacity, and so on over the forecast period.

Financial markets also provide useful metrics for considering the range of plausible outcomes for oil prices at a given point in time. One such measure is the probability distribution for the oil price implied by option prices.⁽⁴⁾ Changes in this distribution can be informative about changes in market perceptions of the risks around the oil price. But just like spot and futures prices, the implied probability distribution for oil prices will differ from market participants' beliefs about the actual probability distribution for the oil price.⁽⁵⁾

Chart 8 shows two implied probability distributions for the oil price three months ahead from late 2010 and early 2011. As

Chart 8 Option-implied distributions for the oil price three months ahead^(a)



Sources: Bloomberg, Chicago Mercantile Exchange and Bank calculations

(a) Calculated from options on WTI crude oil.

- (1) Baumeister and Kilian (2011) also test a version of the VAR using Bayesian estimation techniques. For the specification with a lag order of 24 months, they find that the model does perform better than a random walk over all horizons out to twelve months. However, the model only reduces the RMSE at the twelve-month horizon by a relatively small amount (approximately 2.5%).
- (2) In some models (such as structural VARs) this problem can be partly overcome by estimating the oil market as a system of equations that can generate forecasts for each variable in the system. Ideally, though, to forecast oil prices, one would need to form a view on the outlook for variables such as the amount of OPEC crude oil production and marginal production costs (for which data over the past is not readily available), both of which are hard to predict.
- (3) See Reeve and Vigfusson (2011).
- (4) These distributions are calculated using the non-parametric fitting technique described in Clews, Panigirtzoglou and Proudman (2000) and Bliss and Panigirtzoglou (2002).
- (5) The prices paid for options will also reflect the distribution of risks perceived by market participants. The mean of the distribution, for instance, is not the expected spot price but the futures price.

discussed earlier, the futures curve became downward sloping during this period as geopolitical tensions increased in the Middle East and North Africa. At the same time, the implied weight on future oil prices above US\$100 per barrel, and even above US\$150 per barrel, also increased sharply, despite the oil spot price only rising to around US\$110 per barrel. So the skewness of the implied distribution became more positive. On the other hand, the increase in the skewness was much larger at the three-month horizon than at the twelve-month horizon (Chart 9), suggesting that any possible shock to the oil supply was expected to be temporary.



Sources: Bloomberg, Chicago Mercantile Exchange and Bank calculations.

 (a) Calculated from options on WTI crude oil.
(b) The balance of risks is measured by the skewness of the implied distribution of returns No unit is shown on the y-axis because skewness is unitless

Conclusion

There have been large movements in the oil price over the past few years, which have been a major contributor to UK CPI inflation. For their central projections for GDP growth and inflation published in the Inflation Report, the MPC assumes that oil prices follow the market futures curve profile.

There are problems associated with using the futures curve to forecast oil prices. The presence of risk premia in asset prices means that futures prices are not the same as expected spot prices. And they did not predict the large movements in oil spot prices observed over the past few years.

But it is not clear that any other simple forecasting rule consistently outperforms the futures curve assumption. Commodity futures curves offer a simple, transparent and market-based measure which helps the MPC communicate the assumptions underlying its forecasts for growth and inflation. Moreover changes in the *slope* of the futures curve can reflect changes to the *direction* of the expected path of spot prices.

When assessing the balance of risks to commodity prices over the forecast horizon, the MPC considers a range of measures. These risks are reflected in the fan charts for GDP growth and inflation. As explained in this article, the central projections for GDP growth and inflation in the Inflation Report use the futures curve profile, but this is one of many possible assumptions and the MPC will continue to monitor the validity of this assumption in the future.

References

Alquist, R, Kilian, L and Vigfusson, R J (2011), 'Forecasting the price of oil', prepared for Elliott, G, Granger, C and Timmerman, A (eds), Handbook of Economic Forecasting.

Baumeister, C and Kilian, L (2011), 'Real-time forecasts of the real price of oil', *CEPR Discussion Paper No. 8414*.

Bliss, R B and Panigirtzoglou, N (2002), 'Testing the stability of implied probability density functions', *Journal of Banking and Finance*, Vol. 26, pages 381–422.

Campbell, P, Orskaug, B and Williams, R (2006), 'The forward market for oil', *Bank of England Quarterly Bulletin*, Spring, pages 66–74.

Chernenko, S V, Schwarz, K B and Wright, J G (2004), 'The information content of forward and futures prices: market expectations and the price of risk', *Federal Reserve Board International Finance Discussion Paper No.* 808.

Clews, R, Panigirtzoglou, N and Proudman, J (2000), 'Recent developments in extracting information from options markets', *Bank of England Quarterly Bulletin*, February, pages 50–60.

Cochrane, J (2011), 'Discount rates', *Journal of Finance*, Vol. 66, pages 1,047–108.

Diebold, F X and Mariano, R S (1994), 'Comparing predictive accuracy', *NBER Technical Working Paper No.* 169.

Gorton, G B, Hayashi, F and Rouwenhorst, K G (2007), 'The fundamentals of commodity futures returns', *NBER Working Paper No.* 13249.

Hamilton, J (2009), 'Causes and consequences of the oil shock of 2007–08', *NBER Working Paper No. 15002*.

Hotelling, H (1931), 'The economics of exhaustible resources', *The Journal of Political Economy*, Vol. 39(2), pages 137–75.

Kilian, L and Murphy, D (2010), 'The role of inventories and speculative trading in the global market for crude oil', *CEPR Discussion Paper No. DP7753*.

Pagano, P and Pisani, M (2009), 'Risk-adjusted forecasts of oil prices', *The Berkeley Electronic Journal of Macroeconomics*, Vol. 9(1), Article 24.

Pindyck, R (2001), 'The dynamics of commodity spot and futures markets: a primer', *The Energy Journal*, Vol. 22(3), pages 1–30.

Reeve, T and Vigfusson, R J (2011), 'Evaluating the forecasting performance of commodity futures prices', *Federal Reserve Board International Finance Discussion Paper No. 1025*.

Reichsfeld, D A and Roache, S K (2011), 'Do commodity futures help forecast spot prices?', *IMF Working Paper No.* 11/254.

Saporta, V, Trott, M and Tudela, M (2009), 'What can be said about the rise and fall in oil prices?', *Bank of England Quarterly Bulletin*, Vol. 49, No. 3, pages 215–25.

Wu, T and McCallum, A (2005), 'Do oil futures prices help predict future oil prices?', *Federal Reserve Bank of San Francisco Economic Letter No. 2005–38*.

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

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⁽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.

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 2 US Federal Reserve: policy rate versus balance sheet



(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%.





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

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.

Chart 1 Bank of England: policy rate versus balance sheet

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

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 11/2% on the level of real GDP and a peak effect of 1¹/₄ 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.

This was one of the background papers that was summarised in Joyce, Tong and Woods (2011).
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.

References

Andrés, J, López-Salido, J D and Nelson, E (2004), 'Tobin's imperfect asset substitution in optimizing general equilibrium', *Journal of Money, Credit and Banking*, Vol. 36, No. 4, pages 665–90.

Bean, C (2011), 'Lessons on unconventional monetary policy from the United Kingdom', available at www.bankofengland.co.uk/ publications/Documents/speeches/2011/speech478.pdf.

Borio, C and Disyatat, P (2009), 'Unconventional monetary policies: an appraisal', *BIS Working Paper No.* 292.

Bridges, J and Thomas, R (2012), 'The impact of QE on the UK economy — some supportive monetarist arithmetic', *Bank of England Working Paper No. 442*.

Brunner, K and Meltzer, A H (1973), 'Mr Hicks and the 'Monetarists'', Economica, Vol. 40, No. 157, pages 44–59.

Chen, H, Cúrdia, V and Ferrero, A (2011), 'The macroeconomic effects of large-scale asset purchase programs', *Federal Reserve Bank of New York Staff Report No. 527*.

Cúrdia, V and Woodford, M (2011), 'The central-bank balance sheet as an instrument of monetary policy', *Journal of Monetary Economics*, Vol. 58, No. 1, pages 54–79.

Daines, M, Joyce, M and Tong, M (2012), 'QE and the gilt market: a disaggregated analysis', *Bank of England Working Paper*, forthcoming.

Driffill, J and Miller, M (2011), 'Liquidity when it matters most: QE and Tobin's Q', CEPR Discussion Paper No. 8511.

Eggertsson, G and Woodford, M (2003), 'The zero bound on interest rates and optimal monetary policy', *Brookings Papers on Economic Activity 1*, pages 139–211.

Gagnon, J, Raskin, M, Remache, J and Sack, B (2010), 'Large-scale asset purchases by the Federal Reserve: did they work?', Federal Reserve Bank of New York Staff Report No. 441.

Gambacorta, L, Hofmann, B and Peersman, G (2011), 'Effectiveness of unconventional monetary policy at the zero lower bound', *mimeo*, available at www.feb.ugent.be/fineco/gert_files/research/ Gambacorta_Hofmann_Peersman_nov11.pdf.

Giannone, D, Lenza, M, Pill, H and Reichlin, L (2012), 'The ECB and the interbank market', CEPR Discussion Paper No. 8844.

Harrison, R (2012), 'Asset purchase policy at the effective lower bound for interest rates', Bank of England Working Paper No. 444.

John, S, Roberts, M and Weeken, O (2012), 'The Bank of England's Special Liquidity Scheme', *Bank of England Quarterly Bulletin*, Vol. 52, No. 1, pages 57–66.

Joyce, M, Lasaosa, A, Stevens, I and Tong, M (2011), 'The financial market impact of quantitative easing in the United Kingdom', *International Journal of Central Banking*, Vol. 7, No. 3, pages 113–61.

Joyce, M, Tong, M and Woods, R (2011), 'The United Kingdom's quantitative easing policy: design, operation and impact', *Bank of England Quarterly Bulletin*, Vol. 51, No. 3, pages 200–12.

Kapetanios, G, Mumtaz, H, Stevens, I and Theodoridis, K (2012), 'Assessing the economy-wide effects of quantitative easing', *Bank of England Working Paper No. 443*.

Kiyotaki, N and Moore, J (2008), 'Liquidity, business cycles, and monetary policy', *mimeo*, Princeton University and LSE.

Kozicki, S, Santor, E and Suchanek, L (2011), 'Unconventional monetary policy: the international experience with central bank asset purchases', *Bank of Canada Review*, Spring, pages 13–25.

McMahon, M and Polemarchakis, H (2011), 'The unintended consequences of unconventional monetary policy', *mimeo*, available at www2.warwick.ac.uk/fac/soc/economics/staff/academic/ mcmahon/research/unintended.pdf.

Tobin, J (1963), 'An essay on the principles of debt management', in *Fiscal and debt management policies*, pages 143–218, Englewood Cliffs, NJ: Prentice Hall.

Trichet, J-C (2009), 'The ECB's enhanced credit support', keynote address at the University of Munich, 13 July, available at www.ecb.int/press/key/date/2009/html/sp090713.en.html.

Vayanos, D and Vila, J-L (2009), 'A preferred-habitat model of the term structure of interest rates', *NBER Working Paper No.* 15487.

Williams, J C (2011), 'Unconventional monetary policy: lessons from the past three years', *FRBSF Economic Letter No. 2011-31*, 3 October.

Wright, J (2011), 'What does monetary policy do at the zero lower bound?', *NBER Working Paper No.* 17154.

The Bank of England's Special Liquidity Scheme

By Sarah John, Matt Roberts and Olaf Weeken of the Bank's Sterling Markets Division.⁽¹⁾

The Bank of England introduced the Special Liquidity Scheme (SLS) in April 2008 to improve the liquidity position of the UK banking system. It did so by helping banks finance assets that had got stuck on their balance sheets following the closure of some asset-backed securities markets from 2007 onwards. The Scheme was, from the outset, intended as a temporary measure, to give banks time to strengthen their balance sheets and diversify their funding sources. The last of the SLS transactions expired in January 2012, at which point the SLS terminated. During the period in which the SLS was in operation, the Bank undertook a fundamental review of its framework for sterling market operations and developed a new set of facilities to provide ongoing liquidity insurance to the banking system. This article explains the design and operation of the SLS and describes how that experience has influenced the design of the Bank's permanent liquidity insurance facilities.

Introduction

The closure of some asset-backed securities markets in the second half of 2007 led to funding and liquidity problems for banks. Banks had used these markets to fund part of their balance sheets. They did this by packaging assets such as mortgage loans into securities that could be sold to investors, including other banks, or used as collateral to borrow cash. Rising defaults on mortgage loans and falling house prices, initially in the United States, raised the prospect of investors incurring losses on such asset-backed securities. They also triggered a more general reassessment of the risks inherent in such securities and raised concerns about the quality of assets on banks' balance sheets. In such an environment, it became increasingly difficult for banks to sell securities backed by mortgages or other assets, or to use them as collateral to borrow cash. This left banks with an 'overhang' of illiquid assets on their balance sheets.

The Bank introduced the Special Liquidity Scheme (SLS) in April 2008 to improve the liquidity position of the banking system by tackling this overhang of illiquid assets.⁽²⁾ Under the terms of the SLS, banks and building societies (hereafter 'banks') could, for a fee, swap high-quality mortgage-backed and other securities that had temporarily become illiquid for UK Treasury bills, for a period of up to three years. Because Treasury bills are a liquid asset, banks were able, in turn, to use them as collateral to borrow cash.

The SLS was, from the outset, intended as a temporary measure to address the immediate liquidity problems facing

banks at that time. It was designed to provide liquidity support on a one-off basis, in large scale and for a long maturity, thereby giving banks time to strengthen their balance sheets and diversify their funding sources. The last swaps under the Scheme expired in January 2012, at which point the SLS terminated. During the period in which the SLS was in operation, the Bank undertook a fundamental review of its framework for sterling market operations and developed a new set of facilities to provide ongoing liquidity insurance to the banking system. In many cases, these facilities draw on the design principles and experience of operating the SLS. The Bank stands ready to provide liquidity assistance to the banking system through these liquidity insurance facilities.

This article explains the design and operation of the SLS and describes how that experience has influenced the design of the Bank's permanent facilities through which it provides liquidity insurance to the banking system. The first section explains the objectives and design principles of the Scheme. The second section describes how the Scheme was used. The third section describes the Bank's new permanent liquidity insurance facilities, and the final section concludes.

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⁽²⁾ Prior to the launch of the SLS, in response to strains in money markets during 2007, the Bank had extended the range of collateral it would accept in its regular three-month long-term repo operations. For further details see Cross, Fisher and Weeken (2010).

Objectives and design principles of the Scheme

Objectives

During the autumn of 2007 and early 2008, it was clear that the lack of liquidity in some markets was preventing banks from funding themselves through what had become normal means. Across the world, there was a lack of confidence in assets created from packages of bank loans, most notably mortgage-backed securities. That lack of confidence was prompted by the downturn in the US housing market and, in particular, the problems associated with sub-prime mortgages there. The markets in which those assets normally traded had, in effect, closed, so it had become very difficult for banks to exchange those assets for cash — the assets had become 'illiquid'.

As a result, banks in many of the major financial centres had an 'overhang' of assets on their balance sheets, which they could not readily sell or use to secure borrowing. This overhang created uncertainty about the financial position of banks, including whether — given the size of their balance sheets — banks had sufficient capital to cover a decline in the value of their assets. This made it more difficult for banks to attract funding, including from other banks, and, in turn, affected their ability and willingness to lend money to individuals and businesses.

Following the collapse of Bear Stearns in early 2008, it became clear that there was no immediate prospect that markets in mortgage-backed securities would start to operate as they had previously. The Bank of England felt that, unless the overhang of illiquid assets on banks' balance sheets was dealt with, banks might further curtail their lending to each other, and, more importantly, to the wider economy. The Bank launched the SLS on 21 April 2008 to deal with this overhang of illiquid assets by exchanging them temporarily for more easily tradable assets, which the banks could use to finance themselves.⁽¹⁾

Design principles

The SLS was based on a number of key design principles, aimed at meeting the Scheme's overall objectives:

Long-term liquidity via a collateral swap

The SLS operated as a collateral swap, allowing counterparties to exchange high quality but illiquid assets — specifically those most affected by the closure of asset-backed securities markets — for liquid UK Treasury bills (see the box on pages 60–61 for a description of the operational design of the Scheme). Counterparties could then use the Treasury bills to finance themselves, for example by using them to obtain cash in the repo market. The Bank considered it important to provide banks with certainty about their liquidity position for a long enough period to give them time to diversify their funding sources and strengthen their balance sheets, thereby underpinning confidence in their financial positions. To this end, assets could be swapped for up to three years.

Liquidity provision against the overhang of illiquid assets

The SLS was specifically designed to deal with the overhang of existing assets on banks' balance sheets, not to finance new lending directly. To that end, only securities formed from loans existing before 31 December 2007 (known as 'legacy assets') were eligible for use in the Scheme.

One-off scheme

Banks were only able to enter into new collateral swaps ('drawings') with the Bank of England within a pre-determined period, known as the 'drawdown window'. It was set to be long enough to allow banks to package up portfolios of legacy loans into a form that would be accepted in the Scheme. No new drawings could be undertaken once the drawdown window closed.

At the time of the launch of the Scheme, the drawdown window was set to last six months, closing on 21 October 2008. But, on 17 September 2008, the Bank announced an extension of the drawdown window to 30 January 2009 in light of the disorderly market conditions following the failure of Lehman Brothers.

Credit risk remained with banks

The fact that the SLS operated as a collateral swap meant that, unless a participating bank defaulted, the credit risk associated with the assets pledged by banks as security against their drawings of Treasury bills ultimately remained with the banks and their shareholders.

To minimise the risk of a loss in the event that a counterparty defaulted, the Bank insisted that banks provided assets with a value greater than that of the Treasury bills borrowed. This difference between the value of the collateral provided and the market value of the Treasury bills borrowed is known as the 'haircut'.

Given the scale of the SLS relative to the size of the Bank of England's capital, the Scheme was indemnified by HM Treasury (HMT). This indemnity was designed so that HMT indemnified the Bank against any *net* loss it incurred in connection with the SLS: any loss following a default by a counterparty would first have been covered by fee income made by the Scheme, after which there would have been a requirement for HMT to meet any residual loss under the indemnity.

Other central banks also introduced a variety of temporary facilities in the course of the financial crisis. For example, the US Federal Reserve's response to the crisis is set out at www.federalreserve.gov/monetarypolicy/bst_crisisresponse.htm.

The public sector would therefore have been exposed to a loss only if all three of the following conditions were met: (i) a counterparty defaulted; (ii) the value of collateral provided by that counterparty fell after that default by more than the size of the haircuts applied; and (iii) the resulting exposure (after any recoveries via the administration process) exceeded the buffer of retained SLS fee income. At the end of the Scheme no counterparty had defaulted and no such losses were recorded.⁽¹⁾

Controlled disclosure

There was controlled disclosure of aggregate SLS usage while the Scheme was in operation. After the closure of the drawdown window, the Bank released a statement detailing the total amount of Treasury bills borrowed and the total value of collateral pledged in the Scheme.⁽²⁾ In addition, the amount of Treasury bills outstanding in the Scheme was periodically disclosed in the Bank of England's *Annual Report*, the *Quarterly Bulletin*, the *Financial Stability Report* and in speeches by members of the Bank Executive.

Usage of the Scheme

Amount of Treasury bills borrowed

At its peak, the Scheme lent Treasury bills with a face value of \pounds 185 billion. To put this number in perspective, this was more than twice the size of the Bank's balance sheet prior to the financial crisis.

There was a steady increase in the value of SLS drawings throughout the drawdown window period. As noted above, the drawdown window was extended on 17 September 2008. By that stage, Treasury bills with a face value of £75 billion had been borrowed in aggregate. The peak usage of £185 billion of Treasury bills was reached by the time the drawdown window closed on 30 January 2009 (Chart 1). At that point, 32 banks had accessed the Scheme. In aggregate, those banks accounted for over 80% of the sterling balance sheets of the financial institutions eligible to use the Scheme.





Collateral used in the Scheme

The Bank formed its own judgement on the risks inherent in securities submitted as collateral to the SLS. As in all its operations, the Bank exercised this judgement and managed the risks associated with the collateral through three basic tools: (i) eligibility — the types of collateral the Bank will lend against; (ii) valuations — how much that collateral is worth; and (iii) haircuts — how much the Bank will lend relative to the value of the collateral.

The high-level collateral eligibility criteria of the SLS are described in the box on pages 64-65. Where the Bank judged that a security met these criteria, the Bank assigned a value to the security. This valuation was made using market prices where available. Where market prices were not available or judged unreliable, the Bank used its own pricing models to value the security. To protect the Bank against loss in the event that a bank participating in the SLS defaulted, the Bank insisted that the value of the securities that participant provided as collateral was much larger than the Treasury bills borrowed. The difference between the market value of the collateral and the market value of the Treasury bills borrowed is known as the 'haircut'. The total haircut applied to a security comprised two elements: (i) a standard 'base' haircut for that asset type and (ii) haircut add-ons to protect against additional risks, including those that may have been specific to that security. The value of the securities was updated daily and if — after adjusting for the haircut — the value of the assets pledged as security fell below the value of the Treasury bills lent, banks had either to provide more assets to the Bank (a process known as margining) or to return some of the Treasury bills borrowed.(3)

At the end of the drawdown window the Bank held securities with a nominal value of \pounds 287 billion as collateral in the Scheme. The Bank's valuation of these securities was

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The time it took for banks to access the Scheme was largely determined by whether they had the ability to issue SLS-eligible securities via residential mortgage-backed securities (RMBS) or covered bond 'programmes' when the Scheme was launched. Those institutions that already had such programmes in place tended to be able to create eligible securities backed by legacy loans and start to access the Scheme within the first few months. These were typically the larger banks. Many smaller institutions did not have such programmes already established. In these cases it tended to take between four and six months to establish suitable programmes, create eligible securities and start to access the Scheme.

The surplus arising from the SLS to be paid to HMT in April will be published in the Bank's 2012 Annual Report.

⁽²⁾ See www.bankofengland.co.uk/markets/Documents/marketnotice090203c.pdf.

⁽³⁾ See Breeden and Whisker (2010) and Fisher (2011a) for a more detailed description of the Bank's collateral risk management.

Operational design of the Scheme

Eligible institutions

The institutions eligible to participate in the Scheme were banks that were eligible to sign up to the Bank's existing bilateral Standing Facilities.⁽¹⁾ These facilities allowed banks to borrow from the Bank of England overnight against high-quality collateral.

Collateral swap structure

Participants accessed the Scheme via collateral swaps, technically structured as collateralised stock lending transactions. SLS participants were able to borrow nine-month maturity UK Treasury bills from the Bank of England in exchange for eligible collateral, for a fee (Figure A) (see the box on pages 64–65 for details of the collateral eligible in the Scheme).



The Treasury bills used were issued specifically for the Scheme. They were liabilities of the National Loan Fund, issued to the UK Debt Management Office (DMO) and held by the DMO as retained assets on the Debt Management Account. The Bank borrowed the Treasury bills from the DMO under an (uncollateralised) stock lending agreement (**Figure A**). The Bank paid the DMO a fee based on each transaction to cover administrative and other costs.

Treasury bills were used rather than gilts to minimise any potential disruption to the wider gilt market. As the SLS was designed to have an extended maturity, SLS Treasury bills were issued with a maturity of nine months. This was a longer maturity than the DMO's regular Treasury bills (usually one, three and six-month maturities) and reduced the number of times the Treasury bills would need to be rolled over throughout the three-year life of the Scheme.

Length of swaps

Transactions in the SLS, both with participants and the DMO, were initially for one-year maturity, with the option to renew the swap to take the maturity up to a maximum total of three years. Where the collateral provided by a participant had a maturity date of less than three years from the date the swap was initiated, the maturity of the swap (and the related transaction between the Bank and the DMO) was set to the maturity date of the collateral.

Counterparties were able to access the SLS repeatedly during the nine-month drawdown window. This meant that many counterparties had multiple SLS drawings, with swaps maturing on different dates over a nine-month period to end-January 2012. These 'staggered' maturities are illustrated in **Figure B** below.





SLS Treasury bill rollovers

The combination of nine-month Treasury bills and one-year swaps that could be extended for a period of up to a maximum total of three years meant that the Treasury bills had to be exchanged regularly during the life of the Scheme (see **Figure C** for a stylised example). To enable such 'rollovers', the DMO would provide a 'new' Treasury bill each month. Participants holding soon-to-mature Treasury bills had to return these to the Bank once the residual maturities of the Treasury bills were between ten and 20 days. The Bank would then return these 'old' Treasury bills to the DMO in exchange for new nine-month Treasury bills, which the Bank would in turn pass back to the participant on the same day.





Fee

The Bank charged participants a fee for using the Scheme. This fee was based on the spread between three-month sterling Libor and the three-month sterling general collateral (GC) gilt repo rate, as published daily by the British Bankers' Association. As the Bank was lending Treasury bills rather than central bank reserves in the SLS, participants had to repo the Treasury bills if they wanted to obtain cash. This would have cost banks approximately the general collateral gilt repo rate. So the Bank set the fee as a spread above that rate.

A minimum fee was set at 20 basis points. This was higher than the Libor-GC spread prior to the financial crisis and so designed to make the Scheme relatively unattractive if market interest rates fell to pre-crisis levels, helping to incentivise exit. The minimum fee also ensured that the Bank's administrative costs were covered, including the fee paid to the DMO for borrowing the Treasury bills. In fact, the three-month Libor-GC spread was below 20 basis points from September 2009 until April 2011 (Chart A).

To reduce overreliance on the Scheme, the Bank charged higher fees for higher levels of usage relative to the size of each institution's balance sheet.

The participant's fee for each SLS swap was initially fixed on the date of the drawdown. It was subsequently refixed every three months thereafter based on the Libor-GC spread prevailing at that time. This was done in order to reduce incentives for banks to time their drawings under the Scheme according to prevailing market interest rates. The fee was calculated by applying the Libor-GC spread for the refix period to the daily mark-to-market value of the Treasury bills and was payable every three months at the end of the refix period, and on termination. Because the fee was payable in arrears, banks had to provide collateral against it, ie the haircut-adjusted

approximately £242 billion, against which the Bank would have been prepared to lend £190 billion. This implies an average haircut of 22% against the valuation of the collateral securities. The market value of the £185 billion of Treasury bills lent was £184 billion. This was slightly smaller than the haircut-adjusted value of the collateral of £190 billion (**Chart 2**). In part this reflected some counterparties preferring to overcollateralise their drawings slightly, to reduce the operational costs of having to post extra margin if small price fluctuations reduced the value of their collateral.

The majority of the collateral received in the Scheme was sterling RMBS and covered bonds backed by UK residential mortgages (**Table A**). The average haircut applied to this collateral was much larger than, for example that applied to UK government debt (which was used to cover margin calls in the SLS). That reflected a number of factors. First, the greater uncertainty surrounding the price and liquidity of such securities resulting in higher base haircuts (12 percentage points for a floating-rate RMBS compared to 0.5 percentage points applied to floating-rate sovereign debt). Second, where an observable market price was not available, haircuts were

Chart A Sterling three-month Libor-GC spread

Three-month sterling Libor-GC repo spread (basis points)



Sources: Bloomberg and Bank calculations.

market value of collateral used had to be greater than the sum of the market value of Treasury bills borrowed and the fee owed to the Bank.

In addition to the fees, the Bank charged back to participants certain other costs incurred by the Bank in the SLS, including specific legal costs associated with checking the eligibility of collateral, and the custody costs incurred in holding the collateral securities.

(1) Institutions eligible to sign up to the Bank's existing bilateral Standing Facilities were all banks and building societies that were required under the Bank of England Act 1998 to place cash ratio deposits at the Bank. For further information about cash ratio deposits, see www.bankofengland.co.uk/statistics/Pages/faq/faq_crds.aspx.



Chart 2 Credit protection taken in the Scheme

Notes: Data are for the end of the drawdown window on 30 January 2009. Because some asset-backed securities repay the principal amount over the life of the security, the original principal has been adjusted such that the nominal value only reflects the remaining principal that was left to be distributed (so-called 'factored nominal').

increased by 5 percentage points to deal with risk inherent in estimating a valuation. And, third, the fact that the overwhelming majority of this collateral was 'own-name', ie the participant pledging the collateral was also the

Table A Type of collateral used in Scheme at 30 January 2009

Collateral type	Nominal value ^(a) (£ billions)	Market value (£ billions)	Haircut-adjusted value (£ billions)	Average implied haircut
UK prime RMBS	160.3	132.3	103.9	21%
Other UK RMBS	11.3	7.8	6.0	24%
European RMBS	11.5	8.2	6.3	23%
Covered bonds backed residential mortgage	d by s 84.1	75.9	59.2	22%
Asset-backed securitie backed by credit card	es Is 15.9	14.1	10.6	25%
UK government-guara bank debt	nteed 0.3	0.3	0.3	9%
UK government debt ⁽	o) 2.9	2.9	2.9	1%
Other government an supranational debt	d 0.4	0.4	0.4	4%
Total	286.7	242.0	189.6	22%

Note: The 'haircut-adjusted value of collateral' is the amount the Bank would be prepared to lend against, following the application of the haircut.

(a) Nominal is factored nominal.

(b) All UK government debt given as collateral was given as margin.

originator of the underlying assets. In these cases, the haircut was increased by 5 percentage points to reflect the risk of adverse correlation between the quality of the underlying loans and the creditworthiness of the participant that had delivered the security.

Haircuts were adjusted during the course of the life of the SLS to cater for specific risks in some securities. In particular, in some securitisations, the Scheme participant provided services to the securitisation, which would no longer be available if the participant were to default. For example, where cash related to the mortgages backing a security was held in an account with the participant who had delivered the security to the Bank, the Bank would have been an unsecured creditor to the participant in the event of their default. The Bank applied additional, security-specific, haircuts to cover such risks.



(a) Market value of securities pledged as collateral and margin in the Scheme.
(b) 'Other' includes UK government debt, UK government-guaranteed bank debt, government-guaranteed agency debt, and other government and supranational debt

The composition of collateral changed over the course of the Scheme (Chart 3). This reflected participants terminating swaps as well as participants substituting securities delivered as collateral in the SLS for other securities eligible in the SLS (substitution is described in the box on pages 64–65). Decisions to substitute collateral reflected a number of factors. For example, some banks removed collateral that they were able to use in transactions with market counterparties.

Managing the exit from the Scheme

As SLS swaps were initiated over the nine-month drawdown window (April 2008 to January 2009), almost all of the £185 billion of Treasury bills borrowed in the Scheme were contractually due to be returned to the Bank in the nine months to end-January 2012,⁽¹⁾ with almost £70 billion due to be returned in the final month. These contractual maturities are shown by the magenta line in **Chart 4**.





(a) Face value of Treasury bills borrowed in the Scheme

It was clear that this concentration of maturities in the final months of the Scheme posed risks. In particular, if banks had waited to refinance their SLS drawings until their contractual maturities, there would have been a glut of debt issuance by banks in the final months of the Scheme. The market could have found it difficult to absorb this issuance, which in turn, may have pushed up the overall funding costs of banks.

At the same time, SLS participants faced a co-ordination problem in smoothing the exit profile because no individual bank had the incentive to accelerate its repayment schedule. To help tackle the risks posed by this potential co-ordination problem, and so avoid a refinancing 'cliff', the Bank held discussions with the major SLS participants during 2009 Q4 and 2010 Q1. The Bank encouraged institutions to consider raising at least some funding earlier than they might otherwise

 As described in the box on pages 60–61, some swaps had a maturity of less than three years, reflecting the underlying collateral. have done in order to avoid issuance congestion in the final few months of the Scheme. Following those discussions, banks were asked to submit individual voluntary repayment schedules consistent with what they considered to be credible funding plans. These voluntary repayment plans are shown by the blue line in **Chart 4** and implied a much smoother profile than the contractual maturity profile.

In practice, the banks went further than their revised repayment plans had suggested, in aggregate repaying their drawings at an even faster rate (shown by the green line in **Chart 4**). This was possible because of the relatively favourable conditions in long-term funding markets in the second half of 2010 and first half of 2011.

The Bank's permanent liquidity insurance facilities⁽¹⁾

Prior to the financial crisis, the Bank's published Sterling Monetary Framework (SMF) was primarily focused on the implementation of monetary policy. Although the SMF at that time also recognised as an objective the importance of ensuring banks had the means to manage their liquidity in stressed or otherwise extraordinary conditions, this was primarily to be achieved against a relatively narrow range of high-quality collateral. During 2007–08, it became clear that this was inadequate in the face of the developing crisis. The Bank responded by extending its operations, undertaking a number of extraordinary longer-term open market operations against a broader range of collateral, as well as introducing the SLS.⁽²⁾

Although these operations allowed the Bank to respond to the immediate stresses in the system, the experience of the financial crisis revealed the need to develop and formalise the range of liquidity insurance tools available as part of the permanent SMF. Such formalised facilities would give counterparties more clarity about the terms and conditions on which liquidity insurance could be provided. The Bank therefore undertook a fundamental review of the entire framework for its sterling market operations and issued a consultative paper in October 2008, setting out potential technical reforms to its existing operations and, more fundamentally, possible new liquidity insurance facilities.⁽³⁾ In particular, the paper included proposals for new tools capable of dealing with a broad range of liquidity shocks, including those that affected the banking system as a whole, and providing liquidity insurance against a broad range of collateral, at an appropriate price. These proposals, which constituted a significant change in the way in which the Bank uses its balance sheet to provide liquidity support, are now part of the permanent SMF. The remainder of this section describes how the design of many of these facilities, in particular the Discount Window Facility, benefited from the experience the Bank gained in designing and operating the SLS.

Discount Window Facility(4)

In October 2008, the Bank separated its bilateral Standing Facilities into Operational Standing Facilities (OSFs) and a Discount Window Facility (DWF). OSFs are primarily designed to keep short-term market interest rates within a corridor around Bank Rate, but also provide liquidity insurance for dealing with overnight frictional payment shocks. In contrast, the DWF is a new permanent bilateral liquidity insurance facility. Borrowing under the DWF is instigated by the counterparty, but at prices and on conditions determined in advance by the Bank and subject to the borrowing counterparty being judged by the Bank to be solvent and viable.

The Bank drew on a number of the features of the SLS in designing the DWF. Like the SLS, DWF transactions would usually be collateral swaps, with counterparties receiving liquid securities — gilts in the case of the DWF — rather than central bank reserves in exchange for the less liquid collateral they provide.⁽⁵⁾ And, there is no institution-level disclosure of drawings, either by the Bank or the participant. Aggregate usage levels are released with a lag. This ensures that any individual drawing will have ended before data on it are published.

But there are some important differences between the DWF and the SLS. The DWF is designed to deal with shorter-term liquidity shocks than the SLS. DWF drawings are intended to be for a maximum of 30 days, although they can be rolled over at the Bank's discretion. And it is more expensive than the SLS at times when market conditions are not stressed, so that commercial banks are incentivised to manage their liquidity risk prudently in the market. The DWF was also designed to be able to deal with a broader range of liquidity shocks than provided for by the SLS. So the range of collateral accepted in the DWF is not restricted to securities made up of loans that were originated prior to 2007. Instead, the Bank has used the knowledge it developed in managing the risks from SLS securities to broaden the range of collateral it accepts in the DWF. This now includes portfolios of loans that have not been packaged into securities (a process which can be costly and time consuming). The Bank believes that as a result of this change, the majority of assets held by commercial banks have become eligible for use as collateral.

To enable the Bank to analyse and value assets that banks may wish to pledge in the DWF, and thus to respond more

(3) See Bank of England (2008).(4) The DWF is described in more detail in Tucker (2009).

The Bank's regular operations in the sterling money market are described in more detail in Bank of England (2011).

⁽²⁾ See www.bankofengland.co.uk/markets/Pages/sterlingoperations/timeline/ timeline.aspx for a timeline of the Bank of England's operations.

⁽⁵⁾ At its discretion, the Bank may agree to lend sterling cash rather than gilts. That might prove necessary in rare circumstances, for example if the government bond repo market fails to function properly.

Collateral eligible in the SLS

Eligibility criteria

The SLS was set up to provide liquidity for temporarily illiquid legacy assets. Each participant in the Scheme could deliver as collateral only securities held on balance sheet at 31 December 2007, and eligible securities formed from underlying loans held on balance sheet at that date.

Eligible asset classes

The following asset classes were eligible in the SLS:

- Covered bonds issued in the United Kingdom and European Economic Area (EEA) backed by residential mortgages, social housing loans or public sector debt;
- residential mortgage-backed securities (RMBS) issued in the United Kingdom or EEA;
- asset-backed securities backed by social housing loans or credit cards, issued in the United Kingdom, United States or EEA;
- bonds issued by G10 government agencies explicitly guaranteed by national governments;
- conventional debt security issued by certain US government-sponsored enterprises: the Federal Home Loan Mortgage Corporation, the Federal National Mortgage Association and the Federal Home Loan Banks System.

In addition to the eligible securities outlined above, participants were allowed to post as margin the narrow collateral securities that were routinely eligible in the Bank's open market operations, (including UK and, for example, German government debt).

On 8 October 2008, in support of the Government's actions to recapitalise the UK banking system, the Bank announced that UK government-guaranteed bank debt would also be eligible in the Scheme.

Securities could have been denominated in sterling, euro, US dollars, Australian dollars, Canadian dollars, Swedish krona, Swiss francs or, in the case of Japanese government bonds and bank debt issued under the UK government's Credit Guarantee Scheme only, yen.

Securities accepted included those issued by the institution, or entities in the same group as the institution, entering into the transaction — known as 'own-name' securities. The assets underlying asset-backed securities had to be cash loans and not synthetic (that is, not derivatives). And properties on which residential mortgages were secured had to be located in the United Kingdom or the EEA. Securities whose high credit quality was the result of a guarantee or insurance provided by a third party ('a wrap') were not eligible (with the exception of the government-guaranteed instruments noted above).

Individual loans or portfolios of loans that had not been packaged into asset-backed securities were not eligible. Nor were securities formed in whole or in part from underlying commercial loans. Securities backed in part by buy-to-let loans to private residential landlords were eligible, however.

Judgement on eligibility of individual securities

The Bank formed its own judgement on the credit quality of individual securities accepted in the SLS. In the published eligibility criteria, the Bank required that eligible securities be high quality, rated as AAA by two or more of Fitch, Moody's, and Standard & Poor's. This requirement was intended to serve as a broad indicator of standards of credit quality expected, but the Bank exercised its own discretion, avoiding any mechanical reaction to changes in external ratings. For example, where securities fell below these indicative standards during the time they backed SLS drawings, the Bank undertook a review of the underlying assets, including an analysis of the latest loan-level data. In a number of such cases, the Bank determined that there had been no fundamental change in the credit quality of the underlying assets, and so continued to allow the securities to back SLS transactions as eligible collateral.

All securities were independently checked for eligibility by the Bank before acceptance in the Scheme. As a result of this process some securities, which initially appeared to meet the high-level criteria, were subsequently deemed ineligible. As in all of its operations, the Bank formed its own independent view of the risks in collateral pledged and reserved the right to deem a security ineligible at any time.

The Bank refined and clarified the eligibility criteria for collateral during the course of the Scheme. For example, the Bank issued a Market Notice in August 2008 to clarify, among other things, the eligibility of revolving structures and securities backed, in whole or in part, by commercial loans.⁽¹⁾

Amortisation limits

Some of the securities used in the SLS were issued from 'revolving' structures. This meant that the underlying pools of loans backing the securities accepted as collateral could be topped up by loans originated after 31 December 2007. This is a common feature of covered bonds and some RMBS, and compromised the design principle of the SLS only to provide liquidity against legacy assets. Rather than making such structures ineligible, the Bank decided to limit the value of securities issued from revolving programmes that could be delivered into the SLS by a single institution. These limits, known as 'amortisation limits', were applied over the three-year life of the SLS for participants delivering covered bonds and RMBS with revolving structures. The limit for each institution in the first year of the Scheme was the total value of eligible legacy assets, not already in non-revolving structures, available on the institution's balance sheet as at end-December 2007. The limit was reduced by one third in each year of the Scheme using a simplifying assumption that about a third of the underlying mortgages would be paid off by the start of the second year, and another third by the start of the third year of the Scheme.

quickly to requests to access the DWF, many banks have pre-positioned eligible assets with the Bank.⁽¹⁾

Indexed long-term repos⁽²⁾

Prior to the launch of the SLS, in response to strains in money markets during 2007, the Bank had extended the range of collateral it would accept in its regular three-month long-term repo operations. The Bank replaced these extended long-term repo (ELTR) operations in June 2010 with indexed long-term repo (ILTR) operations. In contrast to the bilateral SLS and DWF, ILTRs, like the ELTRs they replaced, are auction-based with the Bank offering central bank reserves to the banking system as a whole. But the Bank benefited from the insights it gained from the SLS in managing the range of collateral accepted in the auctions.

In ILTRs the Bank offers to supply a fixed amount of central bank reserves against two distinct sets of collateral — a narrow set of sovereign or near-sovereign bonds that is reliably liquid in private markets ('narrow collateral') and a wider set that includes high quality, but less liquid private sector securities ('wider collateral'). Participants can submit bids against either or both of the two collateral sets. These bids are expressed as a spread to Bank Rate (subject to a minimum spread of zero). The Bank allocates a proportion of the reserves on offer to the bids against wider collateral, in line with a pre-determined supply schedule. In this way the proportion of the auction allocated against wider collateral is endogenously determined depending on the level of stress reflected in the spreads offered; a larger proportion of the auction is automatically allocated to wider collateral in response to higher levels of stress. The remainder of the auction is allocated to bids against narrow collateral.

ILTRs are usually conducted once a month, with two operations with a maturity of three months and one operation with a maturity of six months each quarter. But both the size and the frequency of ILTRs can be varied at the discretion of the Bank in response to stressed conditions.

Extended Collateral Term Repo Facility

The Bank announced the potential availability of an Extended Collateral Term Repo (ECTR) facility in December 2011. The

Substitution of collateral

Participants were allowed to substitute eligible collateral in their swaps at any time. The haircut-adjusted market value was, however, not allowed to fall and the swap maturity date could be reduced if the collateral substituted into the swap had a shorter residual maturity.

(1) See www.bankofengland.co.uk/markets/Documents/sls/sls-addendum080814.pdf.

ECTR facility is a contingent liquidity facility which the Bank can activate in response to actual or prospective market-wide stress of an exceptional nature. The ECTR facility lends cash against the same wide range of collateral that the Bank accepts in the DWF, drawing on the experience of managing much of that collateral in the SLS. But in contrast to the bilateral DWF and the SLS, the ECTR is an auction-based facility specifically designed to address a market-wide liquidity shock by providing liquidity, normally for a term of 30 days, against a broader range of collateral than is eligible in the ILTRs.

Conclusion

The Bank introduced the SLS in April 2008 as a temporary measure to address the immediate liquidity problems facing the UK banking system at the time. Under the Scheme banks could swap high-quality assets that had temporarily become illiquid for liquid UK Treasury bills. In turn, banks could use these Treasury bills in private markets to obtain cash.

At the Scheme's peak (at the end of January 2009), Treasury bills with a face value of £185 billion had been lent for a period of up to three years. By providing liquidity support on a one-off basis, in large scale and for a long maturity, the SLS gave banks time to strengthen their balance sheets and diversify their funding sources.

The last of the swaps under the SLS expired at the end of January 2012, at which point the Scheme terminated. To ensure an orderly exit from the Scheme, participants had agreed voluntary repayment plans with the Bank to avoid a concentration of swap maturities in the last few months of the life of the Scheme.

During the period in which the SLS was in operation the Bank undertook a fundamental review of its framework for sterling market operations and developed a new set of facilities to provide ongoing liquidity insurance to the banking system.

See Bank of England (2010) for further details on the extension of eligible collateral in the DWF.

⁽²⁾ The Bank's ILTRs are described in more detail in Fisher (2011b).

Most of these facilities had not been in place at the time the SLS was introduced, and their design benefited from the insights the Bank gained from the design and operation of the SLS. These facilities were designed to deal with a broad range

of liquidity shocks, and in some cases accept a wider range of collateral than the SLS. The Bank stands ready to provide liquidity assistance to individual banks or to the banking system as a whole through these permanent facilities.

References

Bank of England (2008), 'The development of the Bank of England's market operations — a consultative paper by the Bank of England', available at www.bankofengland.co.uk/markets/Documents/ money/publications/condococt08.pdf.

Bank of England (2010), 'Extending eligible collateral in the Discount Window Facility and information transparency for asset-backed securitisations — a consultative paper by the Bank of England', available at www.bankofengland.co.uk/markets/ Documents/money/publications/condocmar10.pdf.

Bank of England (2011), The Framework for the Bank of England's Operations in the Sterling Money Markets, available at www.bankofengland.co.uk/markets/Documents/money/publications/ redbookdec11.pdf.

Breeden, S and Whisker, R (2010), 'Collateral risk management at the Bank of England', *Bank of England Quarterly Bulletin*, Vol. 50, No. 2, pages 94–103.

Cross, M, Fisher, P and Weeken, O (2010), 'The Bank's balance sheet during the crisis', *Bank of England Quarterly Bulletin*, Vol. 50, No. 1, pages 34–42.

Fisher, P (2011a), 'Central bank policy on collateral', available at www.bankofengland.co.uk/publications/Documents/speeches/2011/ speech491.pdf.

Fisher, P (2011b), 'Recent developments in the sterling monetary framework', available at www.bankofengland.co.uk/publications/ Documents/speeches/2011/speech487.pdf.

Tucker, P (2009), 'The repertoire of official sector interventions in the financial system: last resort lending, market-making, and capital', available at www.bankofengland.co.uk/publications/Documents/ speeches/2009/speech390.pdf.

Identifying risks in emerging market sovereign and corporate bond spreads

Summary of Working Paper no. 430 Gabriele Zinna

Monitoring emerging markets' (EMs') credit risk is of paramount importance, not only for emerging market economies (EMEs), but also for developed countries. In particular, the evolution of risks embedded in EM securities determines the riskiness of international portfolios. Underdiversified portfolios may expose international investors to severe losses, trigger sudden capital flow reversals, and raise financial stability concerns. Adverse events originated in EMEs can spill over to developed countries. But there may also be 'second-round' effects, whereby a crisis that originates in developed countries and is transmitted to EMEs worsens as it then feeds back to developed countries.

As EMEs have become more financially integrated, the EM asset class has become more important for the stability of global financial markets. Consequently, an increasing number of studies have focused on the EM asset class, and our understanding of sovereign EM credit risk has improved significantly. For example, some studies have documented a strong dependence of EM sovereign spreads on global risk factors, highlighting the urgency for EME governments to implement policies to insulate their economies from external shocks. However, in recent years, corporate bonds have increased to become an important member of the EM asset class. For instance, EM corporate issuance in 2007 matched that of the US high-yield sector. The rise of the corporate market brought with it new challenges for EM authorities. And, yet, the joint nature of sovereign and corporate risks remains largely unexplored.

We aim to shed light on the different behaviour of these two markets by jointly modelling indices of EM sovereign and corporate bonds. This not only allows us to emphasise the comovement of sovereign and corporate bonds but also to highlight their differences. In addition, instead of focusing on a particular region, we take a global perspective, whereby we jointly model regional indices of bond spreads for Latin America, Europe, Asia and the Middle East. But using so many bond indices comes at the cost of having too many parameters. As a result, we turn this original system of equations (a vector autoregression) into a more parsimonious model where the spreads depend on a small number of observable risk factors. This allows us to use time-varying responses of the spreads to changes in the risk factors; a feature of the model which enables us to monitor EM credit risk over the crisis. Moreover, time-varying coefficients can accommodate varying degrees of EM integration. In addition, we allow the volatility to change over time in order to account for the increased size of financial shocks during the recent market turmoil.

Our model is also a useful tool for building indicators of EM credit risk, as it informs us of changing risks across a number of dimensions. For example, these indicators are able to capture variations of credit spreads which are common across spreads ('common' indicators); variations which are regional specific ('regional' indicators); variations which are specific to the sovereign or corporate market ('variable specific' indicators); and variations due to global risks ('global risk' indicators). However, *a priori* a number of model specifications can look plausible. But, alternative model specifications reveal different information on the nature of systemic risks in EM bonds. To this end, we test for the model which best matches the data.

Our main result is that the behaviour of sovereign and corporate spreads differs because of their specific reactions to global risk factors (VIX, US corporate default risk, and overnight index swap (OIS) Treasury spread). In the aftermath of Lehman Brothers' default, EM corporate bonds were severely hit by spillovers from US corporate default risk. But the VIX and the OIS-Treasury spread, which proxy for global risk aversion and demand for liquid securities respectively, also contributed to widen corporate spreads. By contrast, sovereign spreads 'decoupled' from the US corporate bond market, as they narrowed in response to higher US corporate default risk. That said, the narrowing in sovereign spreads was largely attributable to a higher demand for liquid securities, whereas the effect of heightened risk aversion quickly reverted. In this way, our credit risk indicators highlight the differing responses of sovereign and corporate bonds as the crisis spread from advanced economies to EMEs.

Overall, we find that the financial turmoil spread to all EMs, as the common component of EM credit risk increased sharply around October 2008. But we also find that corporates were more affected than sovereigns, and the most affected region was emerging Europe.

Financial intermediaries in an estimated DSGE model for the United Kingdom

Summary of Working Paper no. 431 Stefania Villa and Jing Yang

Financial intermediaries play an important role in the transmission mechanism of the shocks hitting the economy, as the recent financial crisis has dramatically demonstrated. However, in the main macroeconomic literature with financial frictions, intermediation, when present, is largely a veil. Consequently, Mark Gertler and Peter Karadi introduced a model where financial intermediaries play an active role in the real economy. Their model also introduced credit policy as an additional tool for policymakers.

The aim of this paper is to estimate that model with financial intermediaries (but without credit policy) for the UK economy. In particular, we examine the capability of the model to mimic the path of financial variables. The microfoundation of the banking sector is one of the novelties of the paper; therefore, we ask whether this microfoundation has good empirical properties and whether the model reproduces the observed behaviour of financial variables. We also analyse the contribution of structural shocks to the fluctuations in the variables we examine.

The model has the following agents: households; financial intermediaries; intermediate goods firms; capital producers; retailers; and the policymaker. The set-up is pretty standard but for the financial intermediaries, where we face an agency problem. That is, the banks operate on behalf of households. As a result, their balance sheets are endogenously constrained because the assets the financial intermediaries can acquire depend positively on their equity capital.

To estimate the model, we use data on gross domestic product, investment, seasonally adjusted inflation, lending to private non-financial corporations and corporate bond spreads for the period 1979 Q2–2010 Q1. This model exhibits a 'financial accelerator' mechanism because shocks affect the debt to equity ratio ('leverage') of financial intermediaries, which affects their ability to lend. The more leveraged they are, the larger is the impact of capital losses on the reduction in lending. This retrenchment in lending leads to a fall in banks' profits. Financial intermediaries can only rebuild their profit and capital base by increasing the lending rate; therefore, the spread rises. In the face of the increase in financing cost, firms reduce their demand for loans and therefore cut back investment and increase the utilisation rate of capital. Both investment and output suffer a protracted decline. Subdued aggregate demand feeds back to the banking sector resulting in lower profits. This, in turn, causes financial intermediaries to further tighten credit supply and raise lending spreads in order to satisfy their endogenous balance sheet constraint. Given the decline in lending volume, financial intermediaries can only try to increase profit by increasing spreads, which is likely to lead to a further fall in lending demand.

We have two main results. First, an evaluation of the model's empirical properties reveals that the fit of the estimated model is quite satisfactory, in particular for the financial variables. The results suggest that financial frictions play an important role in explaining UK business cycles. Second, the banking sector shocks explain about half of the fall in output during the recent recession. The sharp rise in spreads since the onset of the crisis can be mainly attributed to credit supply shocks, although in the last quarter in our sample, credit demand starts to play a role as well. Credit supply shocks seem to account for most of the weakness in bank lending.

An estimated DSGE model: explaining variation in term premia

Summary of Working Paper no. 441 Martin M Andreasen

Conventional bond prices (ie gilts) with different maturities to expiry give rise to a set of interest rates which are referred to as the nominal term structure. Similarly, the interest rates from bond prices where the pay-off is linked to inflation (real bonds) imply a real term structure. In each case, these take account of both the expected future sequence of short rates and risk premia, neither of which is directly observable. But if they can be unpacked, they potentially contain information which is of great relevance for policymakers. For instance, the nominal term structure reveals expectations of future one-period nominal interest rates and the compensation for uncertainty in interest rates with maturities beyond one period. This compensation, for the extra uncertainty in holding a nominal bond for more than one period, is called the nominal term premium. In general, expected nominal one-period interest rates are affected by changes in expected real consumption or expected inflation. Similarly, nominal term premia are affected by changes in real consumption uncertainty or inflation uncertainty. Decomposing the information content from term structure data in this way is potentially very useful for monetary policy. For example, the implications for policy to, say, an increase in nominal interest rates along the yield curve may differ according to whether it is due to higher real interest rates, higher inflation expectations or higher inflation uncertainty.

The purpose of this paper, therefore, is to decompose the information content in the two term structures. This is done with the aid of a dynamic stochastic general equilibrium (DSGE) model for the UK economy. This is a many-period model that uses economic theory to tell us how the dynamic behaviour of all the agents in the economy interact in the face

of random ('stochastic') shocks. A key advantage of using a DSGE model in the current setting is that it provides a consistent framework for studying the effect of monetary policy and other structural shocks on the evolution of the nominal and real term structure. In our case, to account for asset pricing, it must allow for the presence of uncertainty in computing equilibrium prices that ensure supply equals demand in all markets, which is not necessary in models that ignore asset prices. That raises some technical problems, made more complicated by the need to allow effects to vary over time, that are addressed in an efficient way in the paper.

Our model is estimated on UK data from 1992 Q3 to 2008 Q2. We find a reduction in nominal term premia following the adoption of inflation targeting in 1992 and operational independence of the Bank of England in 1997. This is of course only one model among the many possibilities, and, as for all models, the precise estimates are subject to uncertainty. But given this caveat, in our model this fall in nominal term premia is mainly due to lower inflation risk premia. A decomposition of the ten-year inflation risk premium suggests that this fall was driven by negative shocks to the utility that households get from consumption, lower fixed production costs, positive investment shocks, and a more aggressive attitude to inflation by the Bank of England. Adopting the terminology from the finance literature, our model implies a gradual reduction in the market price of inflation risk (the amount of compensation markets require for a given quantity of inflation risk) during the 1990s. The quantity of inflation uncertainty itself is found to fall after the adoption of inflation targeting in 1992 and operational independence to the Bank of England in 1997.

The impact of QE on the UK economy — some supportive monetarist arithmetic

Summary of Working Paper no. 442 Jonathan Bridges and Ryland Thomas

In response to the intensification of the financial crisis and the onset of recession in 2008, the Monetary Policy Committee (MPC) loosened policy significantly. By March 2009 Bank Rate had been cut to just 0.5%, but the MPC judged that further stimulus was required. It was decided that the best way to loosen monetary policy further was to undertake a programme of asset purchases, financed by central bank money, known as quantitative easing (QE). Around £200 billion of assets, mainly government securities, were bought between March 2009 and February 2010. The ultimate aim of QE was to stimulate demand via a lower cost of external finance and stronger asset prices, and thus to bring about higher output growth and offset deflationary pressures. This was an exceptional policy response in the face of a severe recession and it was therefore uncertain what the precise effects would be. The Bank of England has explored the impact of QE in a number of different ways. This particular paper does so by adopting an explicitly monetarist perspective.

In order to do this, a simple money demand and supply framework is used to estimate the impact of QE. Many papers have looked at the impact of QE by undertaking event studies of asset price movements, either on impact or over the QE period. Other studies have taken these financial market impacts and then looked at the effect of these on the macroeconomy. The role of asset quantities and the money supply in the QE transmission mechanism is often implicit or left in the background in these studies. But the hypothesised transmission mechanism of QE, at least as implemented in the United Kingdom, can be viewed within a monetarist framework, provided that money is broadly defined and that sectoral differences in money demand behaviour are taken into account.

First, standard money accounting is used to try to establish the impact of asset purchases on broad money holdings. In other words we ask: how big was the money supply shock resulting from QE? We show that the initial impact of £200 billion of asset purchases on the money supply was offset by other 'shocks' to the money supply, most notably the substitution from bank debt to the capital markets by non-financial companies and increased debt and equity issuance by the banking system. Some of these offsetting shocks may have been, at least partially, a by-product of QE. We estimate that QE boosted the broad money supply by at least 5% and potentially by as much as 13%, depending on the extent to which the offsetting shocks would have occurred in its absence. By making a comparison with reasonable counterfactuals for these offsetting factors, our central case assumption is that the £200 billion of purchases boosted the stock of broad money by around £122 billion or 8%.

Next, our estimates of the impact of QE on the money supply are applied to a set of 'monetarist' econometric models that articulate the extent to which asset prices and spending need to adjust to make the demand for money consistent with the boost to the broad money supply. We first look at an aggregate model. The long-run ('co-integrated') relationships in this model are pinned down by the theoretical determinants of the demand for money. In order to explore the dynamics of the model, we use an approach known as a structural vector autoregression to estimate a system of equations, where each equation includes lagged values of all the variables examined. 'Structural' here means that we attempt to identify the economic causes, or 'shocks', that have buffeted the system, which is done using restrictions implied by economic theory. We introduce a QE-like shock into this system and observe how the aggregate variables in the system might have to evolve to restore monetary equilibrium.

Alongside our aggregate model, we also perform a similar experiment on a set of sectoral money demand systems. In these systems the money holdings of a particular sector are modelled jointly with other relevant sectoral variables, such as asset prices in the case of the financial company sector and consumption and investment in the case of the household and corporate sectors. The sectoral approach is particularly informative given that previous research has suggested that the linkages between money, asset prices and spending have tended to be clearer at a sectoral level in the UK data. Moreover, focusing on each sector in turn allows for a richer investigation of the transmission mechanism of asset purchases, given that QE is likely to have impacted the money holdings of different sectors differently and with different lags. In order to establish an economy-wide impact from this sectoral approach, we glue our sectoral models together with a number of aggregate assumptions. This offers a useful insight into how QE works, by allowing us to trace out the QE transmission mechanism from the initial increase in financial sector money holdings all the way through to the ultimate impact on GDP and inflation.

Using our preferred sectoral approach, we obtain a central case estimate that an 8% increase in money holdings may have pushed down on yields by an average of around 150 basis points over the QE period and increased asset values by approximately 20%, relative to what would otherwise have been the case. In turn, these effects may have had a peak impact on the level of real GDP of 2% by the middle of 2011, with an impact on inflation of 1 percentage point around a year later. These estimates are necessarily uncertain and we show the sensitivity of our results to different assumptions about the size of the shock to the money supply and the nature of the transmission mechanism. But taking a mean response across all of our aggregate and sectoral specifications, we obtain similar macroeconomic effects to those derived from our preferred specification.

We do not wish to claim too much from the empirical results, given the models we use are estimated over periods that have not, for the large part, been subject to money supply shocks of a similar nature to QE. And, given the way we work out the size of the money supply shock and apply it to our models, it would probably be best to describe our results as a set of illustrative 'arithmetic' calculations rather than precise statistical estimates. Nevertheless, we can use the results to get some idea of what the counterfactual path of the economy would have looked like in the absence of QE. We show that once the QE 'footprint' is removed from the data, the counterfactual path of money growth and velocity looks more similar to the experience in the 1990s recession than would otherwise seem the case. We also show that, in the absence of QE, the growth rates of asset prices and GDP would have been notably weaker in 2009 and 2010.
Assessing the economy-wide effects of quantitative easing

Summary of Working Paper no. 443 George Kapetanios, Haroon Mumtaz, Ibrahim Stevens and Konstantinos Theodoridis

This working paper describes research undertaken at the Bank to assess the macroeconomic impact of the Monetary Policy Committee's (MPC's) quantitative easing (QE) policy undertaken during March 2009 to January 2010. This, along with other work, fed into the article on 'The United Kingdom's quantitative easing policy: design, operation and impact', which was published in the *Bank of England Quarterly Bulletin*, 2011 Q3.

The sharp deterioration of the global financial crisis in late 2008 led to the increased risk of a severe downturn on a scale not seen since the Great Depression of the 1930s. In many countries, the fiscal and monetary authorities responded with a variety of conventional and less conventional measures aimed at mitigating the effects on financial stability and the real economy. Actions taken by central banks mainly consisted of liquidity support and large-scale asset purchases, commonly described as quantitative easing.

The MPC of the Bank of England reduced Bank Rate, the official UK policy rate, to $\frac{1}{2}$ % on 5 March 2009. But despite reducing interest rates to their effective lower bound, the MPC felt that additional measures were necessary to achieve the 2% CPI inflation target in the medium term. The Committee therefore also announced that it would begin a large programme of asset purchases financed by central bank money, mainly consisting of UK government bonds (gilts). The aim of the programme of asset purchases was to inject a large monetary stimulus into the economy, in order to boost nominal expenditure and thereby increase domestic inflation sufficiently to meet the inflation target. Between March 2009 and the end of January 2010 the Bank purchased a total of £200 billion assets, an amount equivalent to about 14% of UK GDP.

Asset purchases were expected to affect the real economy in a number of ways, but a key one was through the so-called portfolio balance channel. Through this channel, asset purchases push up the price of the assets being purchased, as well as the price of other assets that are closer substitutes for the purchased asset than money. This in turn stimulates demand through lower borrowing costs and increased wealth. Previous Bank work that examined the financial market impact of large-scale asset purchases suggested that it had had a significant effect on medium and long-term government bond (or gilt) yields. The main objective of this working paper is to gauge how the wider economy responded to the stimulus from QE by estimating the effects on output and inflation. However, analysing these effects is not an easy task. It calls for a counterfactual analysis of what would have happened to real GDP and CPI inflation if the QE policy had not been implemented. In order to construct our no policy counterfactual, we assume that the macroeconomic effects of QE come through the impact on government bond yields. This counterfactual is then compared with a baseline prediction which includes QE. The difference between the two scenarios is taken as a measure of the macroeconomic impact.

We construct conditional forecasts (for real GDP and CPI inflation) from three different empirical models, which are all variants of models known as vector autoregressions, or VARs. In general, VARs are systems of equations that each include lagged values of all the variables examined, which allows them to account for the complicated interrelationships in the data. The first model is a large Bayesian vector autoregression (BVAR), which is estimated over a rolling sample period, to allow for structural change. The BVAR incorporates a large amount of data but imposes minimum economic structure. The other two models are smaller models with more underlying economic structure. One is a Markov-switching or change-point structural VAR (MS-SVAR), where the parameters are allowed to change at a particular time, and the other is a time-varying parameter structural VAR (TVP-SVAR), where parameters can change gradually over time. The word 'structural' here means that we attempt to identify the economic causes, or 'shocks', that have buffeted the system. This is done using restrictions from economic theory, which tell us about the sign or absence of effects following particular types of shock. We conduct counterfactual analysis using all three models, examining both the macroeconomic impact of QE and the persistence of the effects.

Our empirical results suggest that without the QE programme real GDP would have fallen even more during 2009 and inflation would have reached low or even negative levels. Taking the more conservative average estimates across the three models suggests that QE had a peak effect on the level of real GDP of around 11/2% and a peak effect on annual CPI inflation of about 11/4 percentage points. However, the magnitude of these effects varies considerably across the different model specifications, and with the assumptions made to generate the counterfactual simulations, so these estimates are subject to considerable uncertainty.

Asset purchase policy at the effective lower bound for interest rates

Summary of Working Paper no. 444 Richard Harrison

The financial crisis and subsequent global recession of 2008–09 prompted substantial responses from policymakers around the world and interest rates were reduced sharply to support aggregate demand. Short-term nominal policy rates in a number of countries reached historically low levels and in some cases were reduced to an effective lower bound (usually slightly positive). A number of central banks also deployed a broader range of policy tools than usual. In particular, some engaged in 'unconventional monetary policies' that involve the purchase of assets by the central bank. These policies are 'unconventional' because they are on a much larger scale and cover a broader range of assets than usual.

This paper studies monetary policy in a standard workhorse model that is extended to incorporate imperfect substitutability between short and long-term bonds. The standard features of the model include the assumption that prices are sticky and so do not immediately and fully adjust to changes in costs or demand. This gives rise to a 'Phillips curve' relating inflation to expected future inflation and the output gap. The modification to the standard model provides a channel through which asset purchases by the monetary policy maker can affect aggregate demand. Because assets are imperfect substitutes, asset purchases that alter the relative supplies of assets will also influence the prices of those assets. In the model, aggregate demand depends on the prices (or interest rates) of both long-term and short-term bonds. To the extent that central bank asset purchases reduce long-term interest rates (over and above the effect of expected future short rates), aggregate demand can be increased, leading to higher inflation through the Phillips curve. So these types of policy responses may help to offset the effects of large falls in demand when the short-term nominal interest rate has already been reduced to the lower bound. This paper shows that using asset purchases as an additional policy instrument can improve economic outcomes in the face of a negative demand shock, even if asset purchase policies are also subject to (both upper and lower) bounds.

The imperfect substitutability between bonds that gives asset purchases their traction also reduces the potency of conventional monetary policy (that is, changes in the short-term nominal interest rate). This is because (other things equal), reductions in the short-term nominal interest rate reduce the relative supply of short-term bonds. This reduces the price of long-term bonds and hence pushes up long-term bond rates, reducing aggregate demand. For the model analysed in this paper, however, using asset purchase policies in the face of negative demand shocks more than offsets the reduced effectiveness of conventional interest rate policy resulting from the imperfect substitutability between bonds.

Does macropru leak? Evidence from a UK policy experiment

Summary of Working Paper no. 445 Shekhar Aiyar, Charles W Calomiris and Tomasz Wieladek

The regulation of bank capital to improve the resilience of the financial system and, related to this aim, as a means of smoothing the credit cycle are important elements of forthcoming macroprudential regimes internationally. For such regulation to be effective in controlling the aggregate supply of credit it must be the case that: (i) changes in capital requirements affect loan supply by regulated banks, and (ii) substitute sources of credit — or 'leakages' — are unable to offset fully changes in credit supply by affected banks. Despite the centrality of both these propositions to the macroprudential enterprise, empirical evidence on either proposition is scant.

The United Kingdom provides an ideal testing ground for these questions because of the country's policy regime in the 1990s and early 2000s, when the Financial Services Authority (FSA) set time-varying minimum capital requirements — so-called 'trigger ratios' — at the level of individual banks. These trigger ratios were set for all banks under the FSA's jurisdiction, ie for all UK-owned banks and all subsidiaries of foreign banks operating in the United Kingdom. The discretionary regime was intended to fill gaps in the early Basel I regime, which simply imposed a uniform minimum capital requirement of 8% of risk-weighted assets.

This study collects quarterly data on minimum capital requirements for all FSA-regulated banks between 1998 and 2007. Over the period the variation in minimum capital requirements as a percentage of risk-weighted assets was large, ranging from a minimum of 8% to a maximum of 23%. Moreover, although the FSA's mandate over the period was explicitly microprudential, the aggregate outcome of its bank-by-bank decisions was in fact countercyclical, just as one might expect in a future macroprudential regime.

Changes in bank lending to the real economy are regressed on several lags of changes in the trigger ratio. Control variables include GDP growth and a number of bank-specific balance sheet characteristics. Several different strategies are employed to control for demand shocks. A large and significant impact of changes in minimum capital requirements on bank lending is found across all specifications. A rise in the trigger ratio of 100 basis points is estimated to induce a cumulative reduction in the growth rate of bank lending of between 6% and 9%.

Next, the study investigates leakages. The United Kingdom is host to a large number of branches of foreign-owned banks, which are not subject to FSA regulation, but are regulated by the country authorities of the parent bank. When capital requirements are tightened on FSA-regulated banks, this confers a relative cost advantage on the foreign branches operating in the United Kingdom, which might raise lending in response. Of course, this is only one potential source of leakage (others include capital markets and cross-border lending), but it is likely to be the most important one.

The change in lending by foreign branches is regressed on several lags of the change in lending by a reference group of regulated banks. For each foreign branch, the reference group of regulated banks comprises banks that specialise in lending to the same sectors of the economy as the branch; thus the reference group captures the relevant set of competitor banks. A technique called instrumental variables is used to ensure that the changes in lending examined are restricted to those caused by changes in regulatory capital requirements.

It is found that foreign branches increase lending in response to a regulation-induced decline in lending by competing regulated banks. The average branch increases lending by about 3% in response to a decline in lending by its reference group of 1%.

An economy-wide aggregate assessment of leakages needs to further take into account that (i) foreign branches outnumber UK-regulated banks; and (ii) the average foreign branch is much smaller than the average UK-regulated bank. Accounting for these factors yields an estimate of aggregate leakages of about 32%. That is, for any given change in minimum capital requirements across the regulated banking system, leakages through foreign branches reduce the credit supply response by a third. The fact that the offset is only partial implies that, on balance, changes in capital requirements can induce a substantial impact on aggregate credit supply by UK-resident banks.

The business cycle implications of banks' maturity transformation

Summary of Working Paper no. 446 Martin M Andreasen, Marcelo Ferman and Pawel Zabczyk

Economists, including those at central banks, have a keen interest in understanding the impact of different types of disturbances and tracing how they work through the economy. Such analyses are often conducted using dynamic stochastic general equilibrium (DSGE) models. These models use theory to describe how all the actors in the economy behave, and how they interact over time to produce an economy-wide outcome. The word 'stochastic' indicates that there is a fundamental uncertainty pervading the economy, with different types of random 'shocks' affecting the dynamics of prices and quantities.

The recent economic crisis highlighted the importance of financial factors in the propagation of economic disturbances. While some analyses, most notably the well-known studies by Kiyotaki and Moore and Bernanke, Gertler and Gilchrist have studied the role of financial frictions, they did so without explicitly modelling the behaviour of the banking sector. A growing number of papers has therefore incorporated this sector into general equilibrium models. With a few exceptions, however, this literature abstracts from a key aspect of banks' behaviour — ie the fact that banks fund themselves using short-term deposits while providing long-term credit. This so-called 'maturity transformation' has the potential to affect the propagation of stochastic shocks, and the aim of this paper is to propose a DSGE model which helps to clarify how.

A general equilibrium approach is essential for our analysis, because we are interested not only in explaining how long-term credit affects the economy but also in the important feedback effects from the rest of the economy to banks and their credit supply. There are, however, several technical difficulties which mean that maturity transformation based on long-term credit has not been widely studied in a DSGE set-up. The framework we propose overcomes these difficulties and remains conveniently tractable. We assume, in particular, that firms need credit to purchase their capital stock and that they change their level of capital at random intervals — meaning they require financing for longer periods of time.

Importantly, we show that this set-up, by itself, has no implications for shock propagation. This means that the aggregate effects of maturity transformation we obtain are *not*

a trivial implication of the infrequent capital adjustment assumption. It is only when we introduce banks, which use accumulated wealth and short-term deposits from the household sector to provide longer-term credit to firms, that maturity transformation starts playing a role.

We illustrate the quantitative implications of maturity transformation in two standard types of DSGE models — one in which firms can adjust their prices instantly, and one in which they can only reset them at infrequent intervals. We focus on stochastic shocks affecting productivity and nominal interest rates. Our analysis highlights the existence of a *credit maturity attenuator effect*, meaning that the response of output to both types of shocks decreases with higher degrees of maturity transformation.

A positive unexpected change in firm productivity has a smaller effect on output because banks' revenues respond less to the shock. In particular, many loans will have been granted prior to the shock, and cannot be adjusted quickly. This smaller increase in banks' net worth means that the increase in the amount of credit they can supply will also be smaller, constraining the increase in output — relative to the case of no maturity mismatch and no long-term lending.

In a model in which firms cannot adjust their prices instantly, increasing the degree of maturity transformation also attenuates the fall in output following an unexpected increase in interest rates. This can be explained by three main channels. First, the resultant fall in production lowers the price of capital. As above, changes in the price of capital have weaker effects on banks' revenues for higher degrees of maturity transformation, and this reduces the fall in output following the disturbance. Second, the shock generates a fall in inflation and raises the ex-post real interest rate on loans. The aggregate value of loans falls by less in the presence of maturity transformation (due to the first channel) and the higher ex-post real rate therefore has a larger positive effect on banks' balance sheets and output than without long-term loans. Finally, the smaller reduction in output (and income) following the shock implies that households' deposits fall by less with maturity transformation. Banks are therefore able to provide more credit and this reduces the contraction in output.

Implicit intraday interest rate in the UK unsecured overnight money market

Summary of Working Paper no. 447 Marius Jurgilas and Filip Žikeš

Almost all central banks differentiate between overnight and intraday liquidity in their monetary frameworks either explicitly, in terms of the interest rates charged, or implicitly, via different eligibility criteria for acceptable collateral. While the overnight market is the most liquid interbank market, there is no explicit private *intraday* money market in which counterparties contract to deliver funds at a specific time of the day. This is puzzling since various empirical and theoretical studies show that the participants of the payment systems have incentives to delay the settlement of non-contractual payment obligations.

We test the hypothesis of a positive intraday interest rate implicit in the UK overnight money market. Our hypothesis is that although there is no explicit intraday money market, the pricing of overnight loans of different lengths is consistent with the existence of an implicit intraday money market. We believe that overnight loans provide dual service to the participants of the money market. First, overnight loans allow banks to smooth day-to-day imbalances and achieve targeted end of the day reserve balance positions. Second, managing the timing of overnight loan advances and repayments allows banks to smooth intraday imbalances of payment flows. We show that these two components have different effects on the pricing of the overnight loans.

Our empirical results lead us to conclude that the pricing of overnight loans in the UK money market is consistent with the existence of an implicit intraday money market. While the average implicit hourly intraday interest rate is quite small in the pre-crisis period (0.1 basis points), it increases more than tenfold during the financial crisis (1.56 basis points). For an average loan of £65 million, advancing the loan one hour earlier in the day increases the interest payment by an estimated £2,778 in the crisis period. We also observe an increase in the implied loan rate during the last hour of trading. As expected, the end of the day effect is most pronounced during the period without reserves averaging as the settlement banks had to meet the 'target' of a non-negative overnight reserve balance each day.

The main policy implication of our work is that the opportunity cost of collateral pledged to obtain intraday liquidity from the Bank of England can become significant during market distress. This can create an incentive for banks to delay payments, as the intraday value of liquidity rises substantially. Through this channel the financial system under stress can become subject to further market pressure. To avoid possible payment delays, CHAPS participants are subject to throughput guidelines that prescribe a percentage of payments that need to be processed before certain thresholds during the day. But the Bank of England's Payment Systems Oversight Report 2008 shows that even with throughput guidelines, CHAPS banks started delaying payments after the collapse of Lehman Brothers. In light of our results, we suggest that the implicit intraday interest rate can be used as an indicator of emerging intraday liquidity concerns in payment systems.

PROMISE

Report

Monetary Policy Roundtable

On 15 December 2011, the Bank of England and the Centre for Economic Policy Research hosted the seventh Monetary Policy Roundtable. These events are intended to provide a forum for economists to discuss key issues affecting the design and operation of monetary policy in the United Kingdom.⁽¹⁾ As always, participants included a range of economists from private sector financial institutions, academia and public sector bodies. At this seventh Roundtable there were two discussion topics:

- what are the key headwinds facing the UK economy?; and
- how effective is the further round of asset purchases likely to be?

This note summarises the main points made by participants.⁽²⁾ Since the Roundtable was conducted under the 'Chatham House Rule', none of the opinions expressed at the meeting are attributed to individuals. The views expressed in this summary do not represent the views of the Bank of England, the Monetary Policy Committee (MPC) or the Centre for Economic Policy Research.

What are the key headwinds facing the UK economy?

The UK economy had grown by 0.5% over the four quarters to 2011 Q3, according to the most recent vintage of data available at the time. This was much weaker than the United Kingdom's average growth rate of about 3% over 1993–2007. It was also disappointing relative to recent forecasts for growth. For example, the November 2010 *Inflation Report* had judged the probability of four-quarter GDP growth being at or below 0.5% in 2011 Q3 to be about one in seven. This provided the backdrop to any assessment of current headwinds.

One participant noted that the 2008–09 recession had been different from previous UK recessions. Those recessions had been characterised by monetary policy being tightened initially to tackle domestic overheating and a widening in the current account deficit. Growth had then recovered quickly. In contrast, in spite of a significant easing in monetary policy, output had recovered slowly following the 2008–09 recession, which reflected the high debt burdens of households and businesses as well as the continued tightness of credit conditions. The financial sector would be central to enabling deleveraging to take place without significant effects on output. To that end, the conflicting priorities facing banks would need clarifying — for example, whether they should focus on increasing lending or raising capital.

There were differing views on how similar current UK performance was to that of Japan between 1990 and 2005. One participant characterised Japan's experience — and that of the United Kingdom currently — as a balance sheet recession in which an asset price bubble had burst, leaving large liabilities behind. In this situation monetary policy became largely ineffective because debtors were focused on reducing their debt levels, meaning lower interest rates did little to boost spending. A possible lesson from this was that central banks should not raise false expectations that they could raise demand in these circumstances. But, more importantly, it was argued that governments should not try to reduce their budget deficits until households and businesses had mended their balance sheets. Premature fiscal consolidation in Japan had choked off the recovery in the late 1990s.

Other participants thought there were important differences between the current UK economic conjuncture and that of Japan between 1990 and 2005. First, part of Japan's problems had arguably stemmed from failing to tackle structural supply issues in the economy, unlike the United Kingdom. Second, in the years before the financial crisis, the UK corporate sector had in contrast run a financial surplus and overindebtedness did not seem to be a reasonable characterisation of many businesses. Third, while some UK households were currently facing difficult conditions, severe difficulties were arguably more common in the early 1990s when the proportion of homeowners in negative equity is likely to have been about double that of today. Finally, much of the current fragility of the UK economy seemed to be related to a lack of credit supply, rather than a lack of demand for credit which had been the experience in Japan. In these circumstances there was greater scope for the central bank to intervene.

Some participants suggested that in practice it was difficult to disentangle how much of the current low level of lending reflected credit demand versus credit supply in the

Roundtables are held twice a year. The next Roundtable is scheduled for June 2012.
This summary was originally published on the Bank of England's website on 16 February 2012. For both this and previous summaries, see

¹⁶ February 2012. For both this and previous summaries, see www.bankofengland.co.uk/publications/Pages/other/monetary/roundtable/ default.aspx.

United Kingdom. In addition, it was much easier to criticise lenders for lending too little rather than criticise borrowers for borrowing too little. Directly questioning households and businesses might help more clearly apportion the extent of the credit demand and supply problems.

The merits of governments deferring fiscal consolidation while households and businesses adjusted their balance sheets were questioned by some participants. This might push up government bond yields, offsetting the effect on output of the more positive fiscal impulse. More generally, governments might have to run deficits for a number of years before the private sector resolved their balance sheet problems; it was unclear if governments would be able to continue borrowing over such a period (because investors or voters might not tolerate it) or how economies would eventually wean themselves off government borrowing.

To the extent that UK households and businesses were suffering from serious balance sheet problems, there were some suggestions for how these might be tackled. One suggestion was to have large-scale restructuring of liabilities. This was likened to a more extensive version of Chapter 11 bankruptcy procedures which were implemented by courts in the United States. Liabilities could be converted from debt to equity or written off to some extent. There were some questions about how well these procedures would work if their use became widespread — would there be the legal capacity and would there be destabilising effects on the economy from losses to creditors?

Another suggestion for tackling balance sheet problems was to raise the inflation target, say from 2% to 4%. Higher inflation would erode the real value of debt more quickly. But there were some difficulties with this proposal. First, it would erode the credibility of the inflation-targeting regime, which could make it harder to achieve the inflation target in future. Second, it was not clear how easily a central bank could engineer a relatively small increase in inflation over a sustained period. On the one hand, the private sector would still be trying to reduce its debt levels despite the change in the inflation target. So the weakness in domestic spending would make it hard to achieve an increase in inflation initially. On the other hand, if the central bank was successful in stimulating demand, it might have difficulties in limiting the increase in inflation to the new target.

Participants also discussed the headwinds facing the United Kingdom from the world economy. The key risk at the moment was judged to be from developments in the euro area. Participants had become more pessimistic about the outlook there, but found it difficult to quantify the potential negative impact on the UK economy of the most extreme possible outcomes. Developments in emerging market economies (EMEs) could have offsetting effects on the UK economy. For example, the growth outlook in some larger economies, such as China, seemed relatively positive. This should provide some support to world demand. However, this could have undesirable side effects. One was that commodity prices could increase further, beyond what was priced in by financial markets. This then would put further pressure on household real incomes in developed economies. Another possible side effect was that more investment might flow to EMEs rather than to developed economies, such as the United Kingdom, although underdeveloped financial market infrastructure might make it difficult to absorb a large increase in these flows.

How effective is the further round of asset purchases likely to be?

On 6 October 2011, the MPC announced the resumption of the asset purchase programme, also known as quantitative easing (QE), with a further £75 billion of UK government bonds to be purchased over a four-month period. This prompted the question of whether this second round of asset purchases (QE2) would have an impact similar to the first round (QE1), particularly on gilt yields, GDP and inflation; some of the key metrics of interest. The participants were broadly in agreement that this extension to the QE programme would be effective but considered that there was potential for a diminishing marginal impact relative to QE1.

The methods used to analyse the impacts of QE were the subject of much discussion. One participant noted that many micro-founded macro models failed to account for all of the transmission channels highlighted by the Bank, as portfolio rebalancing cannot hold without risk premia and market segmentation.⁽¹⁾ Portfolio rebalancing models, meanwhile, had not accounted for signalling and confidence effects, which might have been significant. The limits to the use of event studies were noted and questions were raised about the persistence of gilt yield falls following QE announcements, but other models (such as VARs) may be better placed to study this. Several participants suggested that the bank lending channel might be more important than had been assumed.

As a benchmark for analysing the impact of QE2, many participants found it useful to first assess the impact of QE1. One participant noted that the first announcements of QE1 accounted for most of the yield curve movements over the period, which was consistent with the notion that the confidence and signalling channels might be stronger than had been thought. Participants indicated that the gilt-OIS spread could be a useful metric for assessing the portfolio rebalancing channel. One participant suggested that the GDP and inflation

Joyce, M, Tong, M and Woods, R (2011), 'The United Kingdom's quantitative easing policy: design, operation and impact', *Bank of England Quarterly Bulletin*, Vol. 51, No. 3, pages 200–12.

effects of QE1 might have been underestimated based on a counterfactual of a deeper recession. There was also debate about the spillover effects of QE to other countries. The general opinion was that QE1 had been effective, and that although the narrative about how it worked was important, the fact that it had worked mattered more.

Participants offered a variety of views about the likely effectiveness of QE2. One participant suggested that event studies would be less reliable as expectations of further QE had built up in advance of the announcement. Several participants indicated that the smaller movements in gilt yields and gilt-OIS spreads around the QE2 announcement were evidence of a weaker marginal impact of QE2. But participants noted that if the signalling and confidence channels are important, then this would be expected. One participant noted that the evidence was consistent with the later announcements of QE1. It was also consistent with the US experience from the second round of asset purchases in November 2010. There might also have been stronger portfolio rebalancing effects during QE1 as arbitrageurs were arguably more credit constrained and risk-averse than during QE2. One participant used the multipliers from the analysis of QE1 to suggest an upper bound for the effects of QE2 of a 1/2%-3/4% GDP level impact and a 1/4%-1/2% peak inflation impact.⁽¹⁾ There was no suggestion that QE2 would not work, only that the marginal impact might be somewhat weaker.

Participants considered the importance of the context of the QE2 announcement relative to the QE1 announcement. Safe-haven flows resulting from euro-area concerns might

have had a more significant impact than QE2 on gilt yields, so disentangling the two effects might be difficult. If euro-area concerns were to ease, there was speculation that gilt yields might increase as safe-haven flows reversed. One participant noted that to the extent that such a move was associated with a stronger growth outlook, higher yields could be a positive indicator for the UK economy. The QE1 announcements were also the first time asset purchases had been used in the United Kingdom, so some uncertainty over the impact may have extended to the time taken to price QE into markets. Given this experience, QE2 might have been priced in more quickly and in advance of the actual announcement. There was some concern that inflation expectations might have begun to rise as QE2 was announced in the context of high inflation while QE1 was enacted as inflation was falling. But as earnings growth had remained subdued and indicators of inflation expectations had been stable, it was unclear that this was a cause for concern.

Many discussants argued that with weak growth and with a potentially smaller marginal impact of QE2, further announcements of QE would be warranted. There was broad support for expanding the range of assets to be purchased, amid concerns over market functioning and the potential limits to further expanding gilt purchases given the proportion of gilts already owned by the Bank. There was broad support for a policy of credit easing to head off the risk of a renewed tightening in credit conditions, but it was recognised that this verged into fiscal territory and that it would be more appropriate for the Government to undertake such interventions.

Speeches

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Bank of England speeches

A short summary of speeches and *ad hoc* papers made by Bank personnel since publication of the previous *Bulletin* are listed below.

Towards a common financial language

Andrew Haldane, Executive Director for Financial Stability, March 2012.

www.bankofengland.co.uk/publications/Documents/speeches/2012/speech552.pdf

In a joint paper with Robleh Ali and Paul Nahai-Williamson delivered at the SIFMA Legal Entity Identifier Symposium in New York, Andrew Haldane discussed how the financial crisis had exposed information failures in the financial system and the case for adopting a common financial language as a solution.

Andrew described how the key elements of this language would be Legal Entity Identifiers (LEIs) and Product Identifiers (PIs), which uniquely identify counterparties and products respectively. Like any other language, it could describe the most complex financial transactions by breaking them down into simpler elements and creating a grammar for describing how those elements fit together.

Product supply chains and the World Wide Web were given as two examples where creating a common language was revolutionary. In both cases, a common language led to more accurate network mapping, less systemic risk, a reduction in barriers to entry and greater innovation. The financial system has lagged these two global industries by decades in its development of common data standards and its exploitation of technology for information management. By introducing a common language, the financial system could be made more transparent to both banks and regulators, helping them monitor and reduce systemic risk and allowing new participants to enter, encouraging competition.

Insurance, stability and the United Kingdom's new regulatory architecture

Paul Tucker, Deputy Governor, March 2012.

www.bankofengland.co.uk/publications/Documents/speeches/2012/speech551.pdf

In this speech, Paul Tucker outlined how the insurance industry fits within the UK authorities' efforts to make the financial system more resilient. He highlighted the potential for insurance firms to build shadow banks within their businesses. Related to that there was a need to put some structure around the securities lending, perhaps by introducing a trade repository to create some daylight. On microregulation, he expressed concern that Solvency II risks being too complicated, with too much stress on detailed approval of models. Supervisors would need to focus on the big risks to the safety and soundness of a firm. Insurers must be able to fail in a controlled, orderly way. That was underlined by the progressive withdrawal of the safety net of banks, to which insurers were major lenders.

Policymaking at the Bank of England: the Financial Policy Committee

Paul Fisher, Executive Director for Markets, March 2012.

www.bankofengland.co.uk/publications/Documents/speeches/2012/speech550.pdf

In this speech, Paul Fisher spoke about the new Financial Policy Committee (FPC), established as part of the wide-ranging overhaul of the United Kingdom's financial stability arrangements. The FPC's responsibilities include detecting and reducing threats to the financial sector, and setting macroprudential policy to enhance the resilience of the financial system as a whole, so that the costs of financial instability shocks are reduced. Paul discussed the progress and recommendations of the FPC to date, the realised benefits of closer interaction between the Bank and the FSA. and some of the potential challenges the FPC will face going forward. In particular, Paul discussed the risk of conflict between the decisions of the MPC and the FPC, concluding that separate policy committees, each with a single clear responsibility, sufficiently independent instruments, a common chair and overlapping membership, should ensure that this risk is minimised.

Asset prices, saving and the wider effects of monetary policy David Miles, Monetary Policy Committee member, March 2012.

www.bankofengland.co.uk/publications/Documents/speeches/ 2012/speech549.pdf

In this speech, David Miles outlined his view of the current stance of monetary policy, and discussed how asset purchases might be affecting the economy. He described the two main channels through which he believes asset purchases boost demand: the portfolio rebalancing channel; and a bank funding channel. Professor Miles also discussed the impact of asset purchases on those saving for retirement. He noted that the impact of asset purchases on retirement resources depends not only on what the purchases do to gilt yields, and so to annuity prices, but also on what they do to the value of retirement savings. If those about to retire hold assets — gilts, corporate bonds, equities, or residential property, for example — and monetary policy generates rises in the prices of those assets, it can offset some, or all, of the effects of rising annuity prices. And the impact of monetary policy on the real economy — on GDP and on unemployment — will affect welfare too.

From retailers' paradise to shoppers' strike: what lies behind the weakness in consumption?

Martin Weale, Monetary Policy Committee member, February 2012.

www.bankofengland.co.uk/publications/Documents/speeches/2012/speech548.pdf

In a speech delivered at Cass Business School, Dr Weale began by noting that the adjustment in consumption over the recent period of recession and stagnation had been more gradual than might have been expected and provided some possible reasons for this. First, it has only gradually become clear how large the adverse shock to incomes has been; second, people may continue to follow their habits and therefore not adjust their spending patterns initially; and third, by rapidly cutting Bank Rate, the MPC encouraged consumers to bring forward consumption.

Dr Weale then went on to explore some of the factors weighing down on consumption. He noted that the real wages of fully employed young adults had fallen than more than those of older people since the crisis began, and, since the young rely more than older people on their current and expected future wage income as a means of financing consumption, this could have resulted in a fall in consumption larger than if wages had declined uniformly across ages. Dr Weale considered whether uncertainty could be depressing consumption and concluded that an increased risk of unemployment could produce a marked effect, but that it faded over time. Changes to the state benefit system were also considered and he suggested that an increase in the state pension age was likely to lead to a savings rate higher than the pre-crisis average. Finally, Dr Weale argued that credit conditions had not worsened since the early part of the financial crisis and, hence, were unlikely to contribute to further rises in the saving rate. The overall conclusion was that consumption should be expected to grow more slowly than income over the medium term.

National balance sheets and macro policy: lessons from the past

Paul Tucker, Deputy Governor, February 2012.

www.bankofengland.co.uk/publications/Documents/speeches/2012/speech547.pdf

In this speech, Paul Tucker discussed some lessons learned from the financial crisis about the appropriate macro policy framework, in particular from the overstretched balance sheets accumulated by the Western world. Prior to the crisis, robust credit growth and asset price appreciation were encouraged by two international macroeconomic factors: a fall in the world safe real rate of interest, triggered by excess savings in the East; and increased global liquidity, transmitted through expansive cross-border lending, and kicked off by prolonged accommodative monetary policy. Both involve shifts in risk premia. Risk premia can be key drivers of fluctuations in asset prices, and probably have substantial influence over macroeconomic fluctuations. Policymakers need to be alive to the possibility that monetary policy can affect risk-taking. Developments in national balance sheets need to be closely monitored. Where imbalances are identified, macroprudential tools should be used to temper them.

Quantitative easing and the economic outlook Charles Bean, Deputy Governor, February 2012.

www.bankofengland.co.uk/publications/Documents/speeches/2012/speech546.pdf

In a speech to the Scottish Council for Development and Industry, Deputy Governor Charlie Bean described the economic outlook and discussed recent MPC actions. Although recent indicators of UK growth had been encouraging and the squeeze on real household incomes had started to ease, he noted the significant headwinds to the pace of recovery. Without additional asset purchases announced by the MPC, inflation would more likely than not undershoot the 2% target in the medium term, he said. Charlie Bean described the transmission mechanism for asset purchases and saw little evidence to suggest that the impact had markedly changed. He also noted that the impact of lower interest rates on new annuity incomes would be offset by an increase in pension savings as asset prices rose. He concluded that loose monetary policy was necessary now in order to sustain demand and return to more normal policy settings in the future.

Three principles for successful financial sector reform Chris Salmon, Executive Director for Banking Services and Chief Cashier, February 2012.

www.bankofengland.co.uk/publications/Documents/speeches/2012/speech545.pdf

In a speech delivered at City Week 2012, Chris Salmon began by recapping the objectives of the financial sector reform programme and the key building blocks through which it will be implemented in the United Kingdom. While acknowledging the inherent challenges of implementing such significant changes, he described three guiding principles for successful implementation. First, it is better to manage the costs of change by having a long transition period than to water down the reform. Second, there is a need for strong dialogue both between public authorities to maximise consistency of approach and between market participants and the public authorities to understand the potential impact of the reforms. Finally, Chris advocated the need to build in mechanisms which allow rules to be amended, recalibrated or adjusted. In the medium term, market participants will need to adjust their businesses to take full advantage of the opportunities that the new regulatory framework and other structural changes provide.

Introductory remarks by Paul Tucker at the book launch for *Investing in change: the reform of Europe's financial markets* Paul Tucker, Deputy Governor, February 2012.

www.bankofengland.co.uk/publications/Documents/speeches/2012/speech544.pdf

In this short speech, Paul Tucker gave some introductory remarks at the book launch for *Investing in change: the reform* of Europe's financial markets. He focused on the chapter of the book that he authored entitled 'Banking in a market economy - the international agenda' which examined one of the central principles of reform: banks should not depend on a safety net from taxpayers. That will require banks to carry considerably more capital and liquidity, as planned by the Basel Committee. It will also require resolution regimes to manage the failure of systemically important financial institutions in an orderly way. A blueprint for such regimes has been agreed by G20 leaders. These changes come with three implications. First, in a world of less leveraged banks, a business model of Originate and Warehouse is unlikely to be as prevalent. Second, holders of bank debt will be exposed to risk, and so will have a large incentive to monitor the riskiness of banks. Third, withdrawing the safety net from banks will require other parts of the financial system to be sound, and robust to bank failures.

Towards a new architecture for payment arrangements Chris Salmon, Executive Director for Banking Services and Chief Cashier, January 2012.

www.bankofengland.co.uk/publications/Documents/speeches/ 2012/speech542.pdf

In a speech delivered at the BAFT-IFSA Global Annual Meeting, Chris Salmon described how the financial crisis has influenced the perspective of financial stability policymakers towards payment operations. He argued that this will impact banks in two main ways. First, authorities are likely to place more attention on the overall network of payment operations within a financial system, including the pattern of direct and indirect participation in payment systems. Here he reiterated the Bank's view that an increase in direct participation in CHAPS would be good for UK financial stability. Second, in the context of resolution plans and the focus on ensuring orderly resolution of financial institutions, including the recommendations of the Financial Stability Board, authorities are likely to ask more questions about the internal organisation of firms' operations.

Chris concluded by encouraging financial institutions to consider the attitudes of financial stability authorities and the broader regulatory backdrop when developing their medium-term planning.

Speech by Mervyn King, Governor

Sir Mervyn King, Governor, January 2012.

www.bankofengland.co.uk/publications/Documents/speeches/2012/speech541.pdf

The Governor began by noting that inflation had started to fall. That would relieve the squeeze on real income growth and with it the pressure on consumer spending.

But 2012 would not be an easy year. Three factors had been shaping the economic environment and would continue to act as headwinds in 2012. First, credit conditions would be tight while problems in the euro area persisted. Second, household savings were elevated, reflecting uncertainty about future incomes. And, third, the world economy was experiencing a slowdown.

The common thread in all three factors was the need to correct overleveraged balance sheets. After many years in which the stock of debt had built up rapidly, there had been a reappraisal. The world economy was moving to a new equilibrium.

The Governor asked what this meant for policy in the United Kingdom? The main objective of policy was to ease the inevitable adjustment. Three areas were particularly important. First, monetary policy, where low short-term interest rates and unprecedentedly low long-term interest rates would help to smooth the adjustment of balance sheets. Second, rebuilding a healthy and competitive banking system would improve access to credit. And, third, supply-side reforms would boost future incomes.

The Governor concluded that it would take time, but helped by the right policy actions the UK and world economies could and would recover. And when they did so, they would be on a more sustainable footing than at any point in the previous fifteen years.

Accounting for bank uncertainty

Andrew Haldane, Executive Director for Financial Stability, January 2012.

www.bankofengland.co.uk/publications/Documents/speeches/2012/speech540.pdf

In remarks given to the Institute of Chartered Accountants in England and Wales, Andrew Haldane argued that existing accounting rules for banks had amplified investor and regulatory uncertainty. The special characteristics of banks' balance sheets might call for a distinct accounting regime to lean against this. Specifically, valuing assets at so-called 'fair value' had played a role in extending financial upswings, while the retreat from fair values had elongated financial downswings when banks were unable to accurately value their assets. To deliver a more robust regime for banks, two issues needed to be recognised. First, the intrinsic uncertainty around the value of banks' assets should be quantified. Progress has recently been made in providing such information to regulators. In time, this ought to be provided to investors. Second, the mismatch between banks' assets and liabilities generates an inherent fragility. To recognise this, auditors should have scope to adopt a more graduated, less binary, approach to making 'going concern' assessments of a bank's solvency.

What the return of 19th century economics means for 21st century geopolitics

Adam Posen, Monetary Policy Committee member, January 2012.

www.bankofengland.co.uk/publications/Documents/speeches/2012/speech539.pdf

In this speech, Dr Posen drew parallels between the underlying global economic environments of the late 19th century and of today. In particular, he compared the interaction between the United Kingdom and the United States in the prior period to what he expects between the United States and China in the next two decades. Based on these similarities, he offered a number of predictions for the longer-term macroeconomic outlook. He argued that globalisation will continue, with increasing support from important constituencies in emerging markets. As US hegemony recedes into multipolarity, the international economic system will have less strict rule enforcement and be subject to greater economic volatility. This will have significant effects on the global division of labour, which will reinforce this multipolarity and income convergence. Price stability will prevail, with sharper fluctuations around low average inflation driven by real shocks, and deflation will occur from time to time. More than one currency will play a global or reserve role. International diversification of investment will increase, and so will the gross flows of capital, with capital accounts in the major emerging markets moving more towards balance if not deficit.

Why banks must think carefully before they shrink their assets Robert Jenkins, Financial Policy Committee member, December 2011.

www.bankofengland.co.uk/publications/Documents/speeches/2011/speech538.pdf

In this short article, Robert Jenkins noted that European regulators had asked European banks to increase their capital ratios by June 2012. Banks could achieve this in two ways, by increasing their capital levels (equity plus qualifying debt), or by reducing their assets.

Robert noted that the two approaches would have different implications for the resilience of banks and for the health of the economy. Boosting capital levels would improve banks' capacity to absorb losses and so boost confidence in their resilience. Shrinking loans to households and businesses would harm the economy which would harm banks' resilience.

Unfortunately, bank executives remained excessively focused on return on equity (RoE) to measure their success. RoE was a flawed measure, it did not account for risk and disincentivised bank executives from increasing levels of equity. Robert concluded by urging banks to think carefully about these considerations.

Prospects for monetary policy: learning the lessons from 2011 Spencer Dale, Executive Director and Chief Economist, December 2011.

www.bankofengland.co.uk/publications/Documents/speeches/ 2011/speech537.pdf

In this speech, Spencer Dale argued that the main reason growth had disappointed over the past year was that household consumption had fallen sharply, due largely to the fall in households' real incomes associated with the increases in VAT, energy prices and other import prices. However, the euro-area crisis seemed the most likely reason for the material weakening in the UK outlook more recently. How deep and persistent this slowing would be was very uncertain.

Spencer addressed some criticisms levelled at quantitative easing (QE). He refuted that undertaking QE signalled a reduced commitment to hitting the inflation target. He recognised the impact that low interest rates had on many savers and pensioners but argued that most people in our society, including pensioners, would be even worse off had monetary policy responded less aggressively. Low gilt yields did not imply that there was little scope for QE to be effective. Nor would the money just sit in banks. Finally, he did not believe that the MPC should have purchased a greater range of private sector assets to provide more support to small and medium-sized enterprises. Complementary policies were better suited to this.

Spencer separated the outlook for inflation into two phases. In the first, to March 2012, CPI inflation should fall rapidly as the price level increases from the VAT rise and the increase in petrol prices in early 2011 drop out of the inflation rate. But how persistent inflation would be thereafter was more uncertain and important. He believed the chances of inflation being above or below the target towards the end of 2012 and into 2013 were more balanced than those embodied in the November *Inflation Report* fan chart. The Financial Policy Committee at the Bank of England Donald Kohn, Financial Policy Committee member, December 2011.

www.bankofengland.co.uk/publications/Documents/speeches/ 2011/speech536.pdf

In this speech, delivered at the US Department of the Treasury Conference, Don Kohn gave an overview of the new macroprudential policy framework at the Bank of England and the work of the interim Financial Policy Committee.

Don noted that the pre-crisis lack of a single institution with responsibility, authority, and powers to monitor the financial system as a whole motivated the need for a macroprudential authority in the United Kingdom.

Don explained that the Committee's recommendations to date had fallen into one of two broad categories: acquiring additional information necessary for the FPC and markets to monitor and take actions to contain risks to financial stability, and attempting to build additional resilience into the banking system without impairing its willingness or ability to perform key intermediary functions.

Finally, Don recognised that implementing countercyclical macroprudential policy would be challenging. In bad times, actively encouraging drawing down of capital and liquidity buffers would not be easy for policymakers. And in good times, the system would appear strong and there would be resistance to dampening the upswing.

Appendices

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Contents of recent Quarterly Bulletins

The articles and speeches that have been published recently in the *Quarterly Bulletin* are listed below. Articles from May 1994 onwards are available on the Bank's website at:

www.bankofengland.co.uk/publications/Pages/ quarterlybulletin/default.aspx.

Articles and speeches

Speeches are indicated by (S)

2007 Q4

- Household debt and spending: results from the 2007 NMG Research survey
- The macroeconomic impact of higher energy prices on the UK economy
- Decomposing corporate bond spreads
- The foreign exchange and over-the-counter derivatives markets in the United Kingdom
- The Governor's speech in Northern Ireland (S)
- Current monetary policy issues (S)
- The global economy and UK inflation (S)
- Trends in European labour markets and preferences over unemployment and inflation (S)
- Fear, unemployment and migration (S)
- Risk, uncertainty and monetary policy (S)
- New markets and new demands: challenges for central banks in the wholesale market infrastructure (S)
- A tale of two shocks: global challenges for UK monetary policy (S)

2008 Q1

- Capital inflows into EMEs since the millennium: risks and the potential impact of a reversal
- Recent developments in portfolio insurance
- The Agents' scores: a review
- The impact of low-cost economies on UK import prices
- The Society of Business Economists' survey on MPC communications
- The Governor's speech in Bristol (S)
- The impact of the financial market disruption on the UK economy (S)
- The return of the credit cycle: old lessons in new markets (S)
- Money and credit: banking and the macroeconomy (S)
- Financial markets and household consumption (S)

2008 Q2

- Public attitudes to inflation and interest rates
- Recent advances in extracting policy-relevant information from market interest rates
- How do mark-ups vary with demand?
- On the sources of macroeconomic stability

- A review of the work of the London Foreign Exchange Joint Standing Committee in 2007
- Sovereign wealth funds and global imbalances (S)
- Monetary policy and the financial system (S)
- Inflation and the global economy (S)
- Does sterling still matter for monetary policy? (S)
- Strengthening regimes for controlling liquidity risk: some lessons from the recent turmoil (S)
- Inflation, expectations and monetary policy (S)

2008 Q3

- Market expectations of future Bank Rate
- Globalisation, import prices and inflation: how reliable are the 'tailwinds'?
- How has globalisation affected inflation dynamics in the United Kingdom?
- The economics of global output gap measures
- Banking and the Bank of England (S)
- The Governor's speech at the Mansion House (S)
- A tale of two cycles (S)
- The financial cycle and the UK economy (S)
- The credit crisis: lessons from a protracted 'peacetime' (S)
- Financial innovation: what have we learnt? (S)
- Global inflation: how big a threat? (S)
- Remarks on 'Making monetary policy by committee' (S)

2008 Q4

- The financial position of British households: evidence from the 2008 NMG Research survey
- Understanding dwellings investment
- Price-setting behaviour in the United Kingdom
- Monetary Policy Roundtable

2009 Q1

- Price-setting behaviour in the United Kingdom: a microdata approach
- Deflation

2009 Q2

- Quantitative easing
- Public attitudes to inflation and monetary policy
- The economics and estimation of negative equity
- A review of the work of the London Foreign Exchange Joint Standing Committee in 2008

2009 Q3

- Global imbalances and the financial crisis
- Household saving
- Interpreting recent movements in sterling
- What can be said about the rise and fall in oil prices?

- Bank of England Systemic Risk Survey
- Monetary Policy Roundtable

2009 Q4

- The financial position of British households: evidence from the 2009 NMG survey
- Accounting for the stability of the UK terms of trade
- Recent developments in pay settlements

2010 Q1

- Interpreting equity price movements since the start of the financial crisis
- The Bank's balance sheet during the crisis
- Changes in output, employment and wages during recessions in the United Kingdom
- Monetary Policy Roundtable

2010 Q2

- Collateral risk management at the Bank of England
- The impact of the financial crisis on supply
- Public attitudes to inflation and monetary policy
- A review of the work of the London Foreign Exchange Joint Standing Committee in 2009

2010 Q3

- Understanding the price of new lending to households
- Interpreting the world trade collapse
- What can we learn from surveys of business expectations?
- Residential property auction prices
- Chief Economists' Workshop: state-of-the-art modelling for central banks
- Monetary Policy Roundtable

2010 Q4

- The history of the Quarterly Bulletin
- Index of articles 1960-2010
- The UK recession in context what do three centuries of data tell us?
- The Bank's money market framework
- Managing the circulation of banknotes
- Understanding the weakness of bank lending
- Evolution of the UK banking system
- The financial position of British households: evidence from the 2010 NMG Consulting survey
- The foreign exchange and over-the-counter interest rate derivatives markets in the United Kingdom
- Global finance after the crisis

2011 Q1

- Understanding the recent weakness in broad money growth
- Understanding labour force participation in the United Kingdom
- Global imbalances: the perspective of the Bank of England
- China's changing growth pattern
- Monetary Policy Roundtable

2011 Q2

- Assessing the risk to inflation from inflation expectations
- International evidence on inflation expectations during Sustained Off-Target Inflation episodes
- Public attitudes to monetary policy and satisfaction with the Bank
- The use of foreign exchange markets by non-banks
- Housing equity withdrawal since the financial crisis
- Using internet search data as economic indicators
- A review of the work of the London Foreign Exchange Joint Standing Committee in 2010

2011 Q3

- The United Kingdom's quantitative easing policy: design, operation and impact
- Bank resolution and safeguarding the creditors left behind
- Developments in the global securities lending market
- Measuring financial sector output and its contribution to UK GDP
- The Money Market Liaison Group Sterling Money Market Survey
- Monetary Policy Roundtable

2011 Q4

- Understanding recent developments in UK external trade
- The financial position of British households: evidence from the 2011 NMG Consulting survey
- Going public: UK companies' use of capital markets
- Trading models and liquidity provision in OTC derivatives markets

2012 Q1

- What might be driving the need to rebalance in the United Kingdom?
- Agents' Special Surveys since the start of the financial crisis
- What can the oil futures curve tell us about the outlook for oil prices?
- Quantitative easing and other unconventional monetary policies: Bank of England conference summary
- The Bank of England's Special Liquidity Scheme
- Monetary Policy Roundtable

Bank of England publications

The Bank of England publishes information on all aspects of its work in many formats. Listed below are some of the main Bank of England publications. For a full list, please refer to our website:

www.bankofengland.co.uk/publications/Pages/default.aspx.

Working papers

An up-to-date list of working papers is maintained on the Bank of England's website at:

www.bankofengland.co.uk/publications/Pages/workingpapers/ default.aspx

where abstracts of all papers may be found. Papers published since January 1997 are available in full, in portable document format (PDF).

No. 435 Preferred-habitat investors and the US term structure of real rates (July 2011) *Iryna Kaminska, Dimitri Vayanos and Gabriele Zinna*

No. 436 Systemic capital requirements (October 2011) Lewis Webber and Matthew Willison

No. 437 Estimating the impact of the volatility of shocks: a structural VAR approach (October 2011) *Haroon Mumtaz*

No. 438 How do individual UK consumer prices behave? (October 2011) *Philip Bunn and Colin Ellis*

No. 439 An efficient minimum distance estimator for DSGE models (October 2011) *Konstantinos Theodoridis*

No. 440 Time-varying volatility, precautionary saving and monetary policy (October 2011) *Michael Hatcher*

No. 441 An estimated DSGE model: explaining variation in term premia (December 2011) Martin M Andreasen

No. 442 The impact of QE on the UK economy — some supportive monetarist arithmetic (January 2012) *Jonathan Bridges and Ryland Thomas*

No. 443 Assessing the economy-wide effects of quantitative easing (January 2012) George Kapetanios, Haroon Mumtaz, Ibrahim Stevens and Konstantinos Theodoridis

No. 444 Asset purchase policy at the effective lower bound for interest rates (January 2012) *Richard Harrison*

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No. 446 The business cycle implications of banks' maturity transformation (March 2012) Martin M Andreasen, Marcelo Ferman and Pawel Zabczyk

No. 447 Implicit intraday interest rate in the UK unsecured overnight money market (March 2012) Marius Jurgilas and Filip Žikeš

External MPC Unit discussion papers

The MPC Unit discussion paper series reports on research carried out by, or under supervision of, the external members of the Monetary Policy Committee. Papers are available from the Bank's website at:

www.bankofengland.co.uk/publications/Pages/ externalmpcpapers/default.aspx.

The following papers have been published recently:

No. 34 How flexible can inflation targeting be and still work? (October 2011) Adam Posen and Ken Kuttner

No. 35 Demographics, house prices and mortgage design (March 2012) David Miles

Monetary and Financial Statistics

Monetary and Financial Statistics (Bankstats) contains detailed information on money and lending, monetary and financial institutions' balance sheets, banks' income and expenditure, analyses of bank deposits and lending, external business of banks, public sector debt, money markets, issues of securities, financial derivatives, interest and exchange rates, explanatory notes to tables and occasional related articles. *Bankstats* is published on a monthly basis, free of charge, on the Bank's website at:

www.bankofengland.co.uk/statistics/Pages/bankstats/ default.aspx.

Further details are available from: Leslie Lambert, Monetary and Financial Statistics Division, Bank of England: telephone 020 7601 4544; fax 020 7601 3208; email leslie.lambert@bankofengland.co.uk.

Articles that have been published in recent issues of *Monetary and Financial Statistics* can also be found on the Bank's website at:

www.bankofengland.co.uk/statistics/Pages/ms/articles.aspx.

Financial Stability Report

The *Financial Stability Report* is published twice a year under the guidance of the interim Financial Policy Committee (FPC). It covers the Committee's assessment of the outlook for the stability and resilience of the financial sector at the time of preparation of the *Report*, and the policy actions it advises to reduce and mitigate risks to stability. The Bank of England intends this publication to be read by those who are responsible for, or have interest in, maintaining and promoting financial stability at a national or international level. It is of especial interest to policymakers in the United Kingdom and abroad; international financial institutions; academics; journalists; market infrastructure providers; and financial market participants. It is available at a charge, from Publications Group, Bank of England, Threadneedle Street, London, EC2R 8AH and on the Bank's website at:

www.bankofengland.co.uk/publications/Pages/fsr/default.aspx.

Payment Systems Oversight Report

The *Payment Systems Oversight Report* provides an account of how the Bank is discharging its responsibility for oversight of recognised UK payment systems. Published annually, the *Oversight Report* identifies the most significant payment system risks to financial stability and assesses progress in reducing these risks. Copies are available on the Bank's website at:

www.bankofengland.co.uk/publications/Pages/psor/ default.aspx.

Handbooks in central banking

The series of *Handbooks in central banking* provide concise, balanced and accessible overviews of key central banking topics. The *Handbooks* have been developed from study materials, research and training carried out by the Bank's Centre for Central Banking Studies (CCBS). The *Handbooks* are therefore targeted primarily at central bankers, but are likely to be of interest to all those interested in the various technical and analytical aspects of central banking. The *Handbooks* series also includes '*Technical Handbooks*' which are aimed more at specialist readers and often contain more methodological material than the *Handbooks*, incorporating the experiences and expertise of the author(s) on topics that address the problems encountered by central bankers in their day-to-day work. All the *Handbooks* are available via the Bank's website at:

www.bankofengland.co.uk/education/Pages/ccbs/handbooks/ default.aspx.

The framework for the Bank of England's operations in the sterling money markets (the 'Red Book')

The 'Red Book' describes the Bank of England's framework for its operations in the sterling money markets, which is designed to implement the interest rate decisions of the Monetary Policy Committee while meeting the liquidity needs, and so contributing to the stability of, the banking system as a whole. It also sets out the Bank's specific objectives for the framework, and how it delivers those objectives. The framework was introduced in May 2006. The 'Red Book' is available at:

www.bankofengland.co.uk/markets/Documents/money/publications/redbookdec11.pdf.

The Bank of England Quarterly Model

The Bank of England Quarterly Model, published in January 2005, contains details of the new macroeconomic model developed for use in preparing the Monetary Policy Committee's quarterly economic projections, together with a commentary on the motivation for the new model and the economic modelling approaches underlying it.

www.bankofengland.co.uk/publications/Pages/other/beqm/ default.aspx.

Cost-benefit analysis of monetary and financial statistics

The handbook describes a cost-benefit analysis (CBA) framework that has been developed within the Bank to ensure a fair balance between the benefits derived from good-quality statistics and the costs that are borne by reporting banks. Although CBA is a well-established approach in other contexts, it has not often been applied to statistical provision, so techniques have had to be adapted for application to the Bank's monetary and financial statistics. The handbook also discusses how the application of CBA has enabled cuts in both the amount and the complexity of information that is required from reporting banks.

www.bankofengland.co.uk/statistics/Pages/about/cba.aspx.

Credit Conditions Survey

As part of its mission to maintain monetary stability and financial stability, the Bank needs to understand trends and developments in credit conditions. This survey for bank and non-bank lenders is an input to this work. Lenders are asked about the past three months and the coming three months. The survey covers secured and unsecured lending to households and small businesses; and lending to non-financial corporations, and to non-bank financial firms.

www.bankofengland.co.uk/publications/Pages/other/ monetary/creditconditions.aspx.

Trends in Lending

This quarterly publication presents the Bank of England's assessment of the latest trends in lending to the UK economy. The report draws mainly on long-established official data sources, such as the existing monetary and financial statistics collected by the Bank of England. These data have been supplemented by the results of a new collection, established by the Bank in late 2008, to provide more timely data covering aspects of lending to the UK corporate and household sectors. The report also draws on intelligence gathered by the Bank's network of Agents and from market contacts, as well as the results of other surveys.

Copies are available on the Bank's website at:

www.bankofengland.co.uk/publications/Pages/other/ monetary/trendsinlending.aspx.

Quarterly Bulletin

The *Quarterly Bulletin* provides regular commentary on market developments and UK monetary policy operations. It also contains research and analysis and reports on a wide range of topical economic and financial issues, both domestic and international.

www.bankofengland.co.uk/publications/Pages/ quarterlybulletin/default.aspx.

Inflation Report

The Bank's quarterly *Inflation Report* sets out the detailed economic analysis and inflation projections on which the Bank's Monetary Policy Committee bases its interest rate decisions, and presents an assessment of the prospects for UK inflation. The *Inflation Report* is available at:

www.bankofengland.co.uk/publications/Pages/inflationreport/ default.aspx.

The *Report* starts with an overview of economic developments; this is followed by five sections:

- analysis of money and asset prices;
- analysis of demand;
- analysis of output and supply;
- · analysis of costs and prices; and
- assessment of the medium-term inflation prospects and risks.

Publication dates

Copies of the *Quarterly Bulletin, Inflation Report* and *Financial Stability Report* can be bought separately, or as combined packages for a discounted rate. Current prices are shown overleaf. Publication dates for 2012 are as follows:

Inflation Report

Quarterly Bulletin

27 March	February	15 February
14 June	May	16 May
13 September	August	8 August
18 December	November	14 November
	27 March 14 June 13 September 18 December	27 MarchFebruary14 JuneMay13 SeptemberAugust18 DecemberNovember

Financial Stability Report

29 June 29 November

Quarterly Bulletin, Inflation Report and Financial Stability Report subscription details

Copies of the *Quarterly Bulletin* (*QB*), *Inflation Report* (*IR*) and *Financial Stability Report* (*FSR*) can be bought separately, or as combined packages for a discounted rate. Subscriptions for a full year are also available at a discount. The prices are set out below:

Destination	2012					
	<i>QB, IR</i> and <i>FSR</i> package	QB and IR package	IR and FSR package	QB only	<i>IR</i> only	FSR only
United Kingdom						
First class/collection ⁽¹⁾	£31.50	£27.00	£13.50	£21.00	£10.50	£5.25
Students/schools (concessionary rate UK only)	£10.50	£9.00	£4.50	£7.00	£3.50	£1.75
Academics (concessionary rate UK only)	£21.00	£18.00	£9.00	£14.00	£7.00	£3.50
Rest of Europe						
Letter service	£38.50	£33.00	£17.00	£25.00	£13.00	£6.50
Outside Europe						
Surface mail	£38.50	£33.00	£17.00	£25.00	£13.00	£6.50
Air mail	£50.00	£43.00	£21.50	£34.00	£17.00	£8.50

(1) Subscribers who wish to collect their copy (copies) of the Bulletin, Inflation Report and/or Financial Stability Report may make arrangements to do so by writing to the address given below. Copies will be available to personal callers at the Bank from 10.30 am on the day of issue and from 8.30 am on the following day.

Readers who wish to become **regular subscribers**, or who wish to purchase single copies, should send to the Bank, at the address given below, the appropriate remittance, payable to the Bank of England, together with full address details, including the name or position of recipients in companies or institutions. If you wish to pay by **Visa**, **MasterCard**, **Maestro** or **Delta**, please telephone +44 (0)20 7601 4030. Existing subscribers will be invited to renew their subscriptions automatically. Copies can also be obtained over the counter at the Bank's front entrance.

The **concessionary** rates for the *Quarterly Bulletin, Inflation Report* and *Financial Stability Report* are noted above in *italics*. Academics at UK institutions of further and higher education are entitled to a concessionary rate. They should apply on their institution's notepaper, giving details of their current post. **Students and secondary schools** in the United Kingdom are also entitled to a concessionary rate. Requests for concessionary copies should be accompanied by an explanatory letter; students should provide details of their course and the institution at which they are studying.

These publications are available from Publications Group, Bank of England, Threadneedle Street, London, EC2R 8AH; telephone +44 (0)20 7601 4030; fax +44 (0)20 7601 3298; email mapublications@bankofengland.co.uk or fsr_enquiries@bankofengland.co.uk.

General enquiries about the Bank of England should be made to +44 (0)20 7601 4878. The Bank of England's website is at www.bankofengland.co.uk.

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