Quarterly Bulletin

2010 Q2 | Volume 50 No. 2





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Foreword

The UK economy continues to emerge from the effects of the financial crisis. That recovery is likely to gather pace over the next year. But the effects of the crisis are likely to persist for some time to come and financial market volatility has increased again recently. A number of articles in this *Bulletin* explore the consequences of the financial crisis in greater detail, examining latest developments in financial markets, the nature of the Bank's response to the crisis and the impact of the crisis on the broader economy. In addition, despite the degree of spare capacity that opened up as a result of the recession, CPI inflation has risen sharply recently, reaching 3.7% in April. The increase in inflation largely reflects temporary effects and is likely to moderate as those effects wane. But if the current period of above-target inflation causes inflation expectations to rise, there is a risk that inflation may stay higher for longer. A further article considers recent behaviour of households' inflation expectations.

The financial crisis has entered a new phase over the past three months. The regular *Markets and operations* article reviews developments in sterling financial markets and the Bank's official operations since the previous *Bulletin*. Although the events surrounding the UK general election influenced developments in sterling capital markets, they were overshadowed by more generalised investor nervousness about the fiscal positions of a number of countries. International asset price volatility picked up sharply and trading conditions in some government bond markets became impaired.

The announcement on 10 May of a euro-area support package, in conjunction with the IMF, alleviated near-term pressures. But worries persisted and subsequently there were sharp falls in equities, bank funding costs increased and it became more difficult for companies to raise new financing. Against that background, short to medium-term market interest rates in the major currencies fell, reflecting perceptions that monetary policies in the major economies would remain accommodative for longer. Conditions in financial markets remain volatile.

Throughout the crisis, the Bank of England has acted to support the stability of the financial system, including by providing liquidity insurance to the financial sector. In particular, the Bank has broadened the range of collateral that it accepts in its official facilities to include certain forms of high-quality private sector assets. Accepting these assets has presented new challenges to the Bank in managing the risk inherent in its operations and an article in this *Bulletin* examines how the Bank manages that risk.

The Bank aims to build in the appropriate degree of protection to its operations. Only certain securities are eligible to be used as collateral. And the Bank monitors those securities carefully so as to ensure that its valuations accurately reflect its assessment of prevailing market prices. The Bank also lends only a proportion of the value of the collateral it takes, where that proportion varies depending on the features of the security concerned and its associated

underlying risks. Those criteria are monitored on a daily basis and the collateral policy is kept under continuous review to ensure that the Bank's balance sheet is protected.

The repercussions of the financial crisis extend far beyond banks and financial markets. There are a number of ways in which the financial crisis is likely to have affected the performance of the wider economy. Among these, one of the trickiest to quantify is the impact on the economy's supply potential. This is an important question for the Monetary Policy Committee since the degree of spare capacity in the economy is an important determinant of companies' costs and their pricing decisions.

Some of the channels through which recessions have adversely affected the economy's supply capacity in the past — through higher unemployment and increased corporate insolvencies — appear at this stage at least to be weaker than might have been feared. But the financial crisis means that other channels may be more important. In particular, companies' access to finance has been constrained, hampering their ability to fund investment spending and raise the working capital necessary for day-to-day operations. The article in this edition examines the various channels through which the economy's effective supply capacity may have been affected by the financial crisis. The conclusions of the article are necessarily tentative at this stage and the impact of the crisis on the supply capacity of the economy remains a key question for the Committee.

The uncertainty surrounding developments in the economy's supply potential makes it difficult to assess the margin of spare capacity in the economy. However, it seems clear that some degree of spare capacity has emerged — output has fallen substantially and unemployment has risen. This spare capacity should pull down on inflation. But inflation has increased sharply since the autumn of 2009. That in part reflects the temporary effects from a number of factors, including the restoration of the standard rate of VAT to 17.5%, higher oil prices and the past depreciation of sterling. As these temporary effects subside, inflation should fall back, consistent with households' longer-term inflation expectations pointing to inflation being around the 2% target. But a more prolonged period of above-target inflation could increase the risk that inflation expectations might rise. The article in this *Bulletin* examines how the increase in inflation volatility over the past three years has affected households' attitudes to inflation and to monetary policy more generally.

The final article reviews the work of the London Foreign Exchange Joint Standing Committee during 2009. This Committee was established in 1973, under the auspices of the Bank of England, as a forum for banks and brokers to discuss broad market issues.

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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/speeches/index.htm

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 since the 2010 Q1 *Quarterly Bulletin* up to 21 May 2010. The article also reviews the Bank's official operations.

Sterling financial markets

Overview

Heightened investor concern over fiscal situations in a number of countries was the dominant influence on sterling and international capital markets. Trading conditions in some government bond markets, normally viewed as safe assets, became impaired prompting increased demand for the most liquid instruments, including UK, US and German government bonds. More generally, realised and option-implied volatilities picked up sharply in a number of markets as investors retreated from risk-taking (Chart 1). In sterling financial markets, these developments overshadowed the impact of uncertainty associated with the outcome of the UK general election.

Chart 1 Option-implied volatilities



Sources: Barclays Capital, Bloomberg, JPMorgan Chase & Co., Thomson Reuters Datastream and Bank calculations.

(a) Simple average of the VIX, VFTSE and VSTOXX equity volatility indices.

- (b) Simple average of implied volatilities from three-month options on sterling-US dollar,
- euro-US dollar and euro-sterling exchange rates.
 (c) Simple average of implied volatilities on US, European and UK swaptions settling on ten-year swap rates, one year forward.
- (d) Simple average of one to four-month implied volatilities from options on the five-year CDX and iTraxx indices.

The euro-area situation was considered sufficiently serious to prompt Member States to agree an international support package to stem the risk of contagion and underpin market liquidity. The package alleviated some near-term pressures, but worries persisted and subsequently there were sharp falls in equities, bank funding costs increased and primary capital market issuance declined.

Against that background, despite generally positive macroeconomic data, short to medium-term market interest rates in the major currencies fell. This reflected perceptions that monetary policies in the major economies would remain accommodative for longer to help support the global economic recovery.

Recent developments in sterling capital markets Monetary policy and short-term interest rates

In each of the monetary policy meetings during the review period, the Bank of England's Monetary Policy Committee (MPC) voted to maintain the stock of asset purchases financed by central bank reserves at \pounds 200 billion and the official Bank Rate paid on commercial bank reserves at 0.5%. Given the existing stock of purchased assets, together with the low level of Bank Rate, UK monetary policy remained highly accommodative.

Towards the end of the review period there was increased volatility in financial markets following renewed concerns about European sovereign risk. These heightened concerns were evident to some degree in activity in the Bank's operations. Although there were no asset purchases financed by central bank reserves, the Bank continued to purchase sterling commercial paper (CP) and operate as a buyer and seller in the sterling corporate bond market, with net purchases financed by the issuance of Treasury bills. When market conditions deteriorated in May, demand to issue CP to the Bank increased (Chart 2). After the end of the review period, the Bank's corporate bond auction on 25 May also saw increased appetite to sell to the Bank. In addition, demand to borrow from the Bank via its three-month long-term repo operation increased notably on 18 May (see pages 86-89 for more details).

Chart 2 Corporate assets held by the Bank's Asset Purchase Facility



(a) Holdings financed by a loan from the Bank of England to the Asset Purchase Facility Fund which itself is financed by bank reserves held at the Bank of England (b) Holdings financed by a loan from the Debt Management Office to the Asset Purchase Facility Fund which itself is financed by UK Treasury bill issuance.

Looking ahead, market participants continued to expect UK monetary policy rates to remain low for some time. Expectations for Bank Rate for the end of 2011 and 2012, as implied by forward overnight index swap (OIS) rates, fell further as concerns about euro-area fiscal issues were perceived to delay wider economic recovery (Chart 3). There were similar falls in euro and US dollar OIS rates.





(a) Instantaneous forward rates derived from the Bank's sterling OIS curve

Market participants may also have become more uncertain about the outlook for Bank Rate, however. Information from options on sterling short-term interest rate futures indicated that implied volatility rose, largely reversing falls earlier in the year (Chart 4). That could have reflected a general increase in uncertainty about the global macroeconomic outlook. But it

may also have been related to UK consumer price inflation outturns for March and April, which were higher than market participants had expected. Alternatively, or in addition, since these options settle on Libor (rather than OIS rates), the increase in implied volatility could have reflected uncertainty about risk premia embedded in Libor, rather than around expected future policy rates.

Chart 4 Sterling short-term interest rate implied volatility



Sources: Euronext.liffe and Bank calculations

Libor-OIS spreads widened somewhat in sterling and other currencies (Chart 5). There was a more pronounced widening in forward spreads suggesting that market participants perceived that bank funding costs might increase further in the months ahead. Nevertheless, implied forward Libor-OIS spreads remained well below the levels of late 2008, in part because the significant injection of central bank liquidity during 2009 and early 2010 had reduced bank demand for short-maturity funding.

One reason reported by contacts for the widening in Libor-OIS spreads was increased concern about the possible implications for banks of sovereign default risks. In particular, there were worries that banks would suffer losses on their holdings of European government securities, especially those issued by Greece, Portugal and Spain. European banks' credit default swap (CDS) premia increased sharply, especially for Greek and Portuguese banks (Chart 6).

Accompanying higher short-term domestic funding costs for banks, there were also renewed signs of stress in cross-currency funding markets. This was especially visible in the market for US dollar funding, with an increase in the implied cost of borrowing sterling, Swiss francs or euros and swapping into US dollars via the foreign exchange spot and forward markets (Chart 7). The increase in cost was less than during earlier episodes of distress, such as following the failure of Lehman Brothers in September 2008. However, this might

be because European banks had a lower amount of US dollar assets to fund than previously, given asset sales and balance sheet restructuring. It might also reflect the effect of official support mechanisms that were in place.



Three-month, three-month forward Libor-OIS spreads derived from forward rate agreements

Basis points

Previous Bulletin

600

500

400

300

200

100

0

10

Chart 6 Selected international banks' CDS premia(a)

Chart 5 Three-month Libor-OIS spreads

Source: Markit Group Limited

2008

(a) Unweighted averages of five-year, senior CDS prices.

(a) Three-month Libor-OIS spreads derived from Libor fixings

United Kingdom^(b)

France, Germany and Switzerland^(d)

Greece, Ireland, Italy, Portgual and Spain^(e)

United States(c)

- Average of Barclays, HSBC, Lloyds Banking Group, RBS and Standard Chartered. Average of Bank of America, Citigroup, Goldman Sachs, JPMorgan Chase & Co. and
- Morgan Stanley

Jan Apr July Oct Jan Apr July Oct Jan Apr

(d) Average of BNP Paribas, Crédit Agricole, Credit Suisse, Deutsche Bank, Société Générale and UBS (e) Average of Banco Espirito Santo, Bank of Ireland, BBVA, National Bank of Greece, Santander

09

and UniCredit





Sources: British Bankers' Association, Reuters and Bank calculations

(a) Spread of three-month US dollar Libor implied from foreign exchange forwards over actual hree-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.

The deterioration in US dollar funding markets prompted the reintroduction of arrangements between the Federal Reserve Bank of New York and other central banks⁽¹⁾ (including the Bank of England) to offer US dollars to their domestic counterparties. There was no use of this facility via the Bank, but contacts noted that it acted as a backstop source of US dollar funding.

Government bond markets

Against the backdrop of increased investor concerns about fiscal sustainability in some European countries, government bond markets, including the gilt market, experienced sharp price changes. Spreads between yields on certain countries' government bonds and German bunds widened sharply (Chart 8) and sovereign CDS premia increased (Chart 9). As discussed in the box on page 81, part of the increase in sovereign CDS premia might be related to the hedging activity of so-called counterparty valuation adjustment desks.

Relatedly, market functioning in a number of bond markets became impaired. In particular, bid-offer spreads for government bonds of some euro-area countries rose sharply relative to those in UK and German government bond markets (Chart 10).

In response to these developments, on 11 April euro-area Member States agreed to a three-year loan facility for Greece. This was followed by a broader official support package. On 2 May, the EU and IMF agreed to provide emergency loans to Greece worth €110 billion and the European Central Bank (ECB) suspended its minimum credit rating criteria for Greek government debt allowable as collateral in its operations. On

⁽¹⁾ Specifically the ECB, Bank of England, Swiss National Bank, the Bank of Canada and the Bank of Japan

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Counterparty valuation adjustment desks

Increased use of derivatives by financial institutions during the past couple of decades, together with a general consolidation of the international banking system has led to a structural reorganisation in the way large banks manage counterparty risk. Specifically, many banks have set up specialist trading units to measure and hedge counterparty credit risk, known as counterparty valuation adjustment (CVA) desks. This box explains the activities of CVA desks and how they may influence financial markets; particularly the market for credit default swaps (CDS).

The role of CVA desks

A commercial bank's CVA desk centralises the institution's control of counterparty risks by managing counterparty exposures incurred by other parts of the bank. For example, a CVA desk typically manages the counterparty risk resulting from a derivative transaction with another financial institution (such as entering an interest rate swap agreement).

The main role of the CVA desk is to consolidate credit risk management within the company. This can improve risk control procedures, including taking account of any offsetting positions with the same counterparty (which can reduce the need to hedge). CVA desks will charge a fee for managing these risks to the trading desk, which then typically tries to pass this on to the counterparty through the terms and conditions of the trading contract. But CVA desks are not typically mandated to maximise profits, focusing instead on risk management.

CVA desks' hedging of derivatives exposures

In a derivative transaction, a bank may incur a loss if its counterparty defaults. Specifically, if the bank's derivative position has a positive marked-to-market (MTM) value (calculated for the remaining life of the trade) when the counterparty defaults this is the bank's 'expected positive exposure'. These potential losses are asymmetric. If the value of a bank's derivative position increases (ie the bank is likely to be owed money by its counterparty), the potential loss in the event of default of the counterparty will rise. In contrast, if the value of the bank's derivative position falls such that it is more likely to owe its counterparty when the contract matures then the potential loss on the transaction is zero.

Having aggregated the risks, CVA desks often buy CDS contracts to gain protection against counterparty default. If liquid CDS contracts are not available for a particular counterparty, the desk may enter into an approximate hedge by purchasing credit protection via a CDS index and increase the fee charged to the trading desk to reflect the imperfect nature of the hedge. On occasion, when CDS contracts do not exist, CVA desks may try to short sell securities issued by the counterparty (ie borrow and then sell the securities) but this is rare.

Another way to mitigate counterparty risk is for parties to a derivative trade to exchange collateral when there are changes in the MTM value of the derivative contract. The terms of the collateral agreements between the counterparties (detailed in the credit support annex in the derivative documentation) include details such as frequency of remargining. Since MTM exposure for the bank is greatest if counterparties do not post collateral, CVA desks have reportedly been influential in promoting better risk management via tighter collateral agreements in order to reduce the CVA charge.

CVA activity and the sovereign CDS market

Against the background of heightened investor awareness of sovereign risk, the cost to insure against default on government bonds through CDS has risen recently. According to contacts, increased hedging by CVA desks has been an influential factor behind these moves.

Specifically, CVA desks of banks with large uncollateralised foreign exchange and interest rate swap positions with supranational or sovereign counterparties have reportedly been actively hedging those positions in sovereign CDS markets. For example, for dealers that have agreed to pay euros to counterparties and receive dollars, a depreciation in the euro will result in a MTM profit and hence a counterparty exposure that needs to be managed. As explained in the box on pages 8-9 of the 'Markets and operations' article in the 2010 Q1 Quarterly Bulletin, given the relative illiquidity of sovereign CDS markets a sharp increase in demand from active investors can bid up the cost of sovereign CDS protection. CVA desks have come to account for a large proportion of trading in the sovereign CDS market and so their hedging activity has reportedly been a factor pushing prices away from levels solely reflecting the underlying probability of sovereign default.





Sources: Bloomberg and Bank calculations.

(a) Spreads over ten-year German government bond yields.





Source: Markit Group Limited

10 May this was extended to an emergency funding facility of €720 billion available to all euro-area countries, and the ECB announced that it would intervene in euro-area public and private debt securities markets to 'ensure depth and liquidity in those market segments which are dysfunctional'.

Given the large projected UK fiscal deficit position, some commentators had anticipated that gilt yields would also be pushed higher as general concerns about sovereign debt sustainability rose. For much of the period, these concerns may have been exacerbated by uncertainty about the eventual outcome of the UK general election in May. In particular, survey polls indicated a reduced probability of a single-party government — reportedly seen as relevant to the UK government taking decisive action to tackle the fiscal deficit.





(a) Bid-offer spreads on ten-year government bonds.
 (b) Bonds issued by the following euro-area countries: Greece, Ireland, Italy, Portugal and Spain.

In fact the prices of gilts, as well as those of US and German government bonds, rose and their yields fell. Contacts suggested that investors sought refuge away from government bonds that they perceived to be riskier. Overall, the gilt yield curve shifted lower, with similar moves being observed for US Treasuries and French and German government bonds (Chart 11). The spread between gilt and bund yields was little changed (Chart 12).

Chart 11 International nominal government bond yield $\operatorname{curves}^{(a)}$



Source: Bank calculations.

(a) Instantaneous forward rates derived from the Bank's government liability curves.
 (b) Derived from government bonds issued by Germany and France.

These so-called 'safe haven' flows into gilts might have been expected to reduce gilt yields relative to other benchmark sterling interest rates. However, the spread between gilt yields and equivalent-maturity OIS rates, which should in principle

⁽a) From five-year CDS prices.

Per cent

4.5

Chart 12 Ten-year sterling interest rates and equivalent-maturity spreads



Sources: Bloomberg and Bank calculations

(a) Nominal sterling ten-year spot rates derived from the Bank's government liability curve (b) Based on ten-year benchmark government bond yields

respond to changes in liquidity premia in gilt yields, narrowed only slightly (Chart 12).

A possible explanation for lower medium-horizon OIS rates is that market participants revised down their expectations for future monetary policy rates, perhaps reflecting concerns about the impact of the anticipated fiscal consolidation on economic growth. Consistent with that, and despite the large projected UK government debt position, sterling medium-term real rates remained low compared with their historical levels. Indeed, the rise in sterling five-year, five-year forward real interest rates observed in the previous review period was partly unwound (Chart 13). Furthermore, at ultra-long horizons, continued pension fund demand for index-linked gilts - in order to match better their liabilities reportedly contributed in keeping real yields close to their historical lows.

During the review period, medium-term measures of sterling forward inflation rates remained broadly unchanged, although they generally fell during April and May (Chart 13). In principle, these moves may reflect changes in investors' expectations about future inflation and/or their required compensation for uncertainty around future inflation. However, contacts reported that sterling index-linked gilts did not benefit from increased investor demand to the same degree as conventional gilts. That would have had the effect of lowering measured forward inflation rates. An alternative indicator of longer-term expected future inflation is provided by surveys, which on the whole remained broadly stable (Chart 13).

Chart 13 Sterling five-year real interest rates and inflation five years forward and long-run inflation expectations

RPI inflation (derived from index-linked gilts)^(a) RPI inflation (derived from inflation swaps)^(b) • YouGov/Citigroup survey^(c) Real (a) Consensus Economics survey^(d) Previous Bulletin



Sources: Bank of England, Consensus Economics and YouGov/Citigroup

- (a) Derived from the Bank's government liability curve(b) Derived from the Bank's inflation swap curve.
- (c) YouGov/Citigroup survey results of long-term public inflation expectations for five to ten

years ahead. (d) Consensus Economics survey results of economists' expectations for RPIX inflation.

Uncertainty about future inflation might be reflected in the prices of options that pay out if nominal interest rates (which encompass compensation for future inflation) rise significantly. Indeed, the skew of the implied distribution of future long-term interest rates, as derived from swaption prices, remained elevated compared with levels in 2008 (Chart 14).





Source: Barclays Capital

(a) Skews of five-year, five-year sterling forward payer swaptions. The so-called payer skew is the difference between the implied volatility of an out-of-the-money (in this case 200 basis) points above the prevailing five-year, five-year sterling forward rate) swaption and the implied volatility of an at-the-money swaption. It captures the relative cost of upside protection against higher medium-term nominal interest rates.

Foreign exchange

Overall, the sterling effective exchange rate (ERI) ended the period little changed, although this masked contrasting moves against different currencies (Chart 15). According to contacts,

Chart 15 Cumulative changes in sterling ERI and bilateral exchange rates since 2 January 2009



Sources: Bloomberg and Bank calculations.

the moves in currency markets over the period were in large part attributable to renewed concerns about the fiscal position of some European countries. This led to a sharp depreciation of the euro and a general appreciation of the US dollar.

Contacts suggested that the pound benefited from a general retreat from euro-area assets, but UK-specific risks were also reported to be a concern for investors. In particular, heightened uncertainty about the outcome of the UK general election in early May might have boosted risk premia on sterling assets.

The relative balance of probabilities attached to future large upward or downward moves in the value of sterling against the euro (as inferred from option prices) ended the period broadly unchanged. But it became more negative for the prospective value of sterling against the US dollar (**Chart 16**). This implied that market participants were prepared to pay more to protect themselves against a future depreciation of sterling against the US dollar than against an appreciation. US dollar-sterling implied volatility also remained high, reflecting increased uncertainty about the future rate of exchange.

Equity markets

UK equity indices moved broadly in line with other major equity indices over recent months (Chart 17). In particular, global equity prices increased in the first half of the period, resuming the general upward trend in share prices that began in March 2009. However, they subsequently declined sharply in April and May, to end the period slightly lower.

According to contacts, the decline in global equity markets was triggered by the generalised rise in risk aversion and increased investor concerns about long-term economic growth prospects for countries requiring significant fiscal adjustment.





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

- (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) The simplified sterling ERI places 70% weight on the euro-sterling bilateral exchange rate and 30% weight on US dollar-sterling bilateral exchange rate.

Chart 17 International equity indices(a)(b)







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.

The prospects of increased financial sector regulation in both the United States and Europe also contributed to falls in equity prices in the latter part of the review period.

Consistent with heightened risk aversion, implied equity volatilities derived from options for the FTSE 100 picked up sharply in May, having drifted lower earlier in the quarter. Likewise, the skew of the distribution of future equity prices implied from options prices became more negative, indicating that investors perceived that the balance of risks shifted further to the downside. Taken together, these moves suggested that the weight investors attached to the possibility of a large fall in UK equity prices increased sharply (Chart 18).

Chart 18 FTSE 100 option-implied probability of a 20% fall(a)



(a) Calculated from the risk-neutral distribution of returns from three-month option prices

Nonetheless, the implied (risk-neutral) probability of a large fall in equity prices remained lower than levels reached in late 2008. Moreover, looking over a longer time window, equity prices remained well above their levels in March 2009, consistent with a recovery in future corporate profits. Indeed, on the back of generally stronger-than-expected UK company earnings for the first quarter, the Institutional Brokers' Estimate System (IBES) survey of investment analysts continued to point to upward revisions to company earnings expectations compared with earlier in the year (Chart 19).

Chart 19 Actual and IBES forecasts for earnings per share for the FTSE All-Share index(a)(b)(c)



rces: Thomson Reuters Datastream and Bank calculation

(a) IBES uses consensus forecasts of earnings per share by sell-side analysts.

(b) Data refer to earnings per share on the FTSE All-Share index. Forecasts are denoted by dashed lines, and outturns are denoted by the solid line.

(c) The figures for a specific year relate to companies' annual results that have a year end

between start-June of that year and end-May of the following year. (d) Refers to forecast data available at the data cut-off for each *Bulletin*.

However, dividend swap prices — a market-based measure which embodies investor perceptions for future corporate earnings — for the FTSE 100 moved slightly lower over the quarter (Chart 20). Implied dividends on the Euro Stoxx 50 fell by substantially more (despite similarly positive European corporate earnings news). In principle, these falls in dividend swap prices might indicate that investors revised down their expectations for future corporate payouts, especially at longer horizons. But market contacts suggested that the moves were more likely driven by increases in the required compensation for uncertainty around future dividends linked to the general retrenchment from risky assets.

Chart 20 Dividend swap prices(a)(b)



Sources: Bloomberg and Bank calculations

(a) From exchange-traded futures contracts

(b) For more details on dividend swaps, see the box 'Dividend swaps', in the Bank of England Quarterly Bulletin, Vol. 50, No. 1, page 30.

Corporate credit markets

Alongside the increase in short-term funding costs for banks, the spread between yields on sterling and euro-denominated corporate bonds issued by financial companies and similar-maturity government bond yields widened (Chart 21). And senior debt issuance by UK banks was low relative to the amount contacts suggested might be needed to replace government-sponsored schemes due to expire over the next couple of years (Chart 22). Contacts thought that this partly reflected the recent general deterioration in market conditions.

Outside the financial sector, movements in corporate bond spreads were more muted although the cost of insuring against non-financial corporate bond default via credit default swaps edged up further.

Primary issuance by UK non-financial corporates also fell, particularly in May. While cumulative bond issuance in the first five months of 2010 remained well below the record 2009 levels, it was broadly in line with the average between 2005 and 2008 (Chart 23).

To the extent that increased volatility across financial markets discouraged investors from making primary market bond purchases, lower corporate bond issuance might indicate that



(a) Option-adjusted spreads

Chart 22 UK bank senior debt issuance(a)



Source: Dealogic

(a) Issuance with a value greater than US\$500 million equivalent and original maturity greater

(b) Senior debt issued under HM Treasury's Credit Guarantee Scheme

Chart 23 Cumulative gross bond issuance by UK private non-financial corporations



Sources: Dealogic and Bank calculations

companies were forced to hold back some of their planned 2010 issuance. But lower issuance may also be the result of corporates having pre-emptively issued some of their 2010 planned funding in 2009, in a bid to pay off outstanding bank debts and extend the maturity of their debt.

Bank of England operations

The size of the Bank's balance sheet was little changed since the previous *Bulletin*, following a period of rapid expansion.⁽¹⁾ The balance sheet increased from £247 billion at the end of the previous review period to £251 billion at the end of the current review period, which principally reflected a small increase in the stock of long-term repo open market operations (OMOs). The remainder of this section describes in more detail the Bank's operations over the review period.

Asset purchases(2)

In the week prior to the February 2010 MPC meeting, the Bank met the target set by the MPC of purchasing £200 billion of public and private sector assets, financed by the issuance of central bank reserves, via its Asset Purchase Facility (APF).⁽³⁾ At each of the monetary policy meetings during the review period, the MPC voted to maintain the stock of asset purchases financed by the creation of central bank reserves at £200 billion. Consequently, the Bank did not undertake any APF gilt purchases over the review period.

Purchases of high-quality private sector assets financed by the issuance of Treasury bills and the Debt Management Office's (DMO) cash management operations continued, in line with the arrangements announced on 29 January 2009. Table A summarises operations under the APF over the review period by type of asset.

Gilts

The stock of gilts held by the APF in terms of the amount paid to sellers was maintained at £198.3 billion (Chart 24).(4)

Gilt lending facility

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 March 2010 a daily average of £4.1 billion was lent in this way. Use of the facility continued to be generally concentrated in gilts in which the Bank holds a large proportion of the free float (the total amount of a gilt in issue less the amount held by the UK Government).

(1) For further details on the structure and evolution of the Bank's balance sheet, see 'The Bank's balance sheet during the crisis', in the 2010 Q1 Bank of England Quarterly Bulletin, pages 34-42.

The data cut-off for this subsection is 20 May.

The objectives and operation of the APF are described in more detail in the 2009 Q2 (3) Ouarterly Bulletin.

Chart 21 Sterling corporate bond spreads^(a)

⁽⁴⁾ Further details of individual operations are available at www.bankofengland.co.uk/markets/apf/gilts/results.htm.

,	51 ()				
Week ending ^(a) C	commercial paper	Gilts	Corporate bond		Total ^(b)
			Purchases	Sale	5
18 February 2010 ^{(c)(d)}	279	198,275		1,467	200,009
25 February 2010	25	0	3		1 27
4 March 2010	50	0	0	6	5 44
11 March 2010	25	0	2	67	-40
18 March 2010	0	0	5	43	-38
25 March 2010	70	0	15	4	4 81
1 April 2010	0	0	14	2	2 12
8 April 2010	0	0	20	(20
15 April 2010	1	0	0		-1
22 April 2010	150	0	0	17	133
29 April 2010	0	0	0		1 -1
6 May 2010	100	0	27		1 126
13 May 2010	0	0	5	() 5
20 May 2010	250	0	12	4	4 258
Total financed by Treasury bills ^{(d)(e)}	251	-		109	360
Total financed by central bank reserves	(d)(e)	198,275		1,310	199,585
Total asset purchases ^{(d)(e)}	251	198,275		1,419	199,945

Table A APF transactions by type (£ millions)

(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. Weekly values may not sum to totals due to rounding. Amount outstanding as at 18 February 2010. (Ь)

(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.



Chart 24 Cumulative gilt purchases^(a) by maturity

Commercial paper

The Bank continued to offer to purchase sterling-denominated investment-grade commercial paper (CP) issued by companies that make a material contribution to UK economic activity.

During the review period, the majority of primary spreads in the sterling CP market remained below the spreads at which the APF offers to purchase CP. Hence APF holdings of CP continued to fall from £279 million on 18 February 2010 to £251 million as of 20 May 2010. Gross purchases over the period were £671 million, compared with redemptions of

£700 million. This occurred alongside a further reduction in CP outstanding for UK corporate and non-bank financial firms, which fell from £2.9 billion to £2.4 billion (Chart 25) as issuers continued to raise longer-term issuance in the corporate bond market and issue CP in other currencies.





Corporate bonds

The Bank continued to offer to purchase and sell corporate bonds via the Corporate Bond Secondary Market Scheme during the review period. The Scheme aims to facilitate market-making by banks and dealers to help reduce illiquidity premia and so remove obstacles to corporates' access to capital markets.

Activity in the Bank's auctions continued to vary with market conditions. Periods of market stress have tended to correspond with increased activity in the Bank's purchase auctions. This was noticeable on 2 October 2009 when the Bank received £332 million offers in one operation. More recently — though outside of the review period — on 25 May, and coinciding with a period of broad-based market uncertainty, the Bank received the third highest number of offers in a single auction (£276 million). Similar, if less marked, increases in activity occurred during the review period, notably in late April.

Demand in the Bank's sale auctions tended to coincide with improvements in investor sentiment, as seen in the first three weeks of March, during which the Bank sold £114 million of its portfolio (Chart 26). But the subsequent deterioration in market conditions, including a reduction in investor risk appetite, coincided with periods of decreased activity in the Bank's sale auctions, notably in April.

Chart 26 Weekly transactions of sterling corporate bonds^(a)



⁽a) Data start on 26 March 2010

As of 20 May 2010, the Bank portfolio totalled £1,419 million, compared to £1,467 million at the end of the previous review period on 18 February 2010. This fall reflected the effect of corporate bond sales.

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.⁽¹⁾ There has been no use of the facility to date.

Credit Guarantee Scheme

The Bank did not make any purchases of bank debt issued under the Credit Guarantee Scheme (CGS) from the secondary market, but stands ready to do so should conditions in that market deteriorate. The UK Government's 2008 CGS closed for new issuance on 28 February 2010, although institutions are able to refinance existing debt guaranteed by the Scheme.

Operations within the sterling monetary framework⁽²⁾

The Bank implements monetary policy by maintaining overnight market interest rates in line with Bank Rate, so that there is a flat risk-free money market yield curve to the next MPC decision date and by conducting asset purchases as mandated by the MPC.

During the period under review, the level of reserves was determined by (i) the stock of reserves injected via asset purchases, (ii) the level of reserves supplied by long-term repo OMOs, and (iii) the net impact of other sterling ('autonomous factor') flows across the Bank's balance sheet.

Long-term repo OMOs

Over the review period, the three-month extended-collateral long-term repo OMOs in March and April were uncovered. But the operation on 18 May received cover of 1.25 in the wake of the widespread deterioration in financial market conditions (Table B). This resulted in a small increase in the stock of long-term repo OMOs outstanding over the period.

Monthly repo operations at six, nine and twelve-month maturities were offered against collateral routinely accepted in the Bank's short-term OMOs and Operational Standing Facilities. In contrast to repo operations at the three-month maturity, all of these operations were covered (**Table C**). The Bank announced the introduction of a new operational design for its long-term repo OMOs in a Market Notice published on 26 May. The box on pages 90–91 outlines the key features of the new framework, the first operation under which will take place on 15 June 2010.⁽³⁾

Operational Standing Facilities

As a result of the change to remunerate all reserves balances at Bank Rate and (given the level of Bank Rate) the reduction in the rate paid on the Operational Standing Deposit Facility to zero, average use of the deposit facility was £0 million in each of the maintenance periods under review. Average use of the lending facility was also £0 million throughout the period.

⁽b) Weekly (Friday–Thursday) amounts in terms of the proceeds paid to counterparties, on a trade-day basis.
(c) Weekly (Friday–Thursday) amounts in terms of value at time of initial purchase, on a

trade-day basis.

⁽¹⁾ The SCP facility is described in more detail in the Market Notice available at

www.bankofengland.co.uk/markets/marketnotice090730.pdf.

⁽²⁾ This and the subsection describing other market operations cover operations from 19 February to 21 May.

⁽³⁾ For further details see www.bankofengland.co.uk/markets/marketnotice100526.pdf.

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Table B Extended-collateral three-month long-term repo operations

16 March 2010		
On offer (£ millions)	5,000	
Cover	0.84	
Weighted average rate ^(a)	0.557	
Lowest accepted rate ^(a)	0.500	
Tail ^(b)	0.06	
13 April 2010		
On offer (£ millions)	5,000	
Cover	0.41	
Weighted average rate ^(a)	0.500	
Lowest accepted rate ^(a)	0.500	
Tail ^(b)	0.00	
18 May 2010		
On offer (£ millions)	5,000	
Cover	1.25	
Weighted average rate ^(a)	0.668	
Lowest accepted rate ^(a)	0.500	
Tail ^(b)	0.17	

(a) Per cent.(b) The yield tail measures, in percentage points, the difference between the weighted average accepted rate and the lowest accepted rate

Table C Long-term repo operations

	Six-month	Nine-month	Twelve-month
16 March 2010			
On offer (£ millions)	750	400	200
Cover	3.33	2.88	3.25
Weighted average rate ^(a)	0.539	0.577	0.685
Lowest accepted rate ^(a)	0.530	0.573	0.673
Tail ^(b)	0.01	0.00	0.01
13 April 2010			
On offer (£ millions)	750	400	200
Cover	2.10	2.19	2.38
Weighted average rate ^(a)	0.541	0.582	0.689
Lowest accepted rate ^(a)	0.531	0.566	0.686
Tail ^(b)	0.01	0.02	0.00
18 May 2010			
On offer (£ millions)	750	400	200
Cover	1.10	2.88	3.63
Weighted average rate ^(a)	0.518	0.591	0.640
Lowest accepted rate ^(a)	0.511	0.577	0.640
Tail ^(b)	0.01	0.01	0.00

(a) Per cent.
 (b) The yield tail measures, in percentage points, the difference between the weighted average accepted rate and the lowest accepted rate.

Discount Window Facility

The Discount Window Facility (DWF) is a permanent facility to provide liquidity insurance to the banking system and allows eligible banks and building societies to borrow gilts against a wide range of collateral. On 6 April 2010, the Bank announced that the average daily amount outstanding in the DWF between 1 October and 31 December 2009 was £0 million.

Other market operations

Special Liquidity Scheme

The drawdown period for the Special Liquidity Scheme (SLS) closed on 30 January 2009. Although the drawdown window to access the SLS has closed, the Scheme will remain in place for three years, thereby providing participating institutions with continuing liquidity support.

As at 28 February 2010, securities with a fair value of £229 billion (2009: £245 billion) were held as collateral for Treasury bills lent under the SLS with a face value of £165 billion (2009: £185 billion).

US dollar repo operations

In response to the renewed strains in the short-term funding market for raising US dollars, the Bank, in concert with other central banks, reintroduced measures to offer US dollar financing to financial institutions, funded by a swap with the Federal Reserve Bank of New York. From 11 May, the Bank offered weekly fixed-rate tenders with a seven to eight-day maturity. As of 21 May, there had been no use of the facility.

Foreign exchange reserves

In March, the Bank issued a \$2 billion three-year bond and purchased the equivalent value of principally euro and US dollar-denominated assets with the proceeds. This was the fourth bond issued by the Bank under the annual bond issuance programme.

The new bond was announced on 2 March and priced on 8 March. The transaction, which was marketed via Barclays Capital, BNP Paribas, Goldman Sachs International and IPMorgan Chase & Co., priced at a spread of zero to mid-swaps. The issue was successful, attracting a broad order book, with orders totalling \$2.9 billion. It sold to investors in Asia (43%), Africa, Europe and the Middle East (36%) and the Americas (21%). As with earlier issues in the programme, central banks and official institutions were the predominant buyers (56%), with bonds being sold to asset managers (24%), and the remainder sold principally to commercial banks, insurance and pension funds (20%).

At the end of April the Bank's foreign exchange reserves comprised £3.9 billion of assets.

Capital portfolio

The Bank regularly purchases sterling bonds in the course of investing its capital and the proceeds of cash ratio deposits. These transactions are separate from the purchases of sterling bonds conducted under the APF. Over the period from 19 February to 21 May 2010, gilt purchases were made in accordance with the quarterly announcements on 4 January and 1 April. The portfolio currently includes around £3.6 billion of gilts and £0.6 billion of other debt securities.

The Bank's new indexed long-term repo operations

In October 2008 the Bank published a wide-ranging consultation paper on recent and proposed developments in its sterling market operations.⁽¹⁾ One of the proposals was to revise its long-term repo operations; specifically, to widen permanently the range of collateral eligible in these operations and to modify the auction design so that the quantity of funds lent against different types of collateral varied depending on the rates bid by counterparties in the auction.

Following two periods of consultation with market participants, the first auction under the revised structure is due to take place on 15 June 2010. This box explains briefly the principles underpinning the new approach and how the auctions will work in practice.

Background

As part of its existing framework of operations, the Bank has provided liquidity to the banking system via regular long-term repo operations (at three, six, nine and twelve-month maturities) since January 2006.

In addition to influencing the quantity of central bank reserves as part of the Bank's implementation of monetary policy, long-term repos can provide liquidity support to the banking system in times of stress. This latter role became particularly important at the height of the financial crisis, during which the Bank increased the size and frequency of its three-month operations and extended temporarily the range of assets that were eligible to be used as collateral in the operations. This helped meet the greater need for central bank liquidity during the global crisis and helped banks to refinance certain securities that had become illiquid. The Bank has continued to conduct auctions against an extended range of collateral in its three-month operations alongside its regular long-term repos, although it gradually decreased the size of the extended-collateral operations as bidding in these auctions reduced.

From June onwards, all of the Bank's long-term repo operations will be conducted using a revised auction design. The new design will allow the proportion of lending against different types of eligible collateral to adjust automatically in each auction depending on the bids in that auction, while ensuring that the liquidity insurance provided is appropriately priced to avoid distorting banks' incentives for prudent liquidity management. The new-style auctions, and so the provision of 'liquidity insurance' via lending against a broader range of collateral, will be a permanent part of the Bank's framework for its sterling operations. Separately, the Bank is also mindful of the need to control the risks taken onto its own balance sheet. The article on pages 94–103 of this *Bulletin* sets out how the Bank undertakes collateral risk management in light of the expanded range of collateral accepted in these, and other, operations.

Auction design⁽²⁾

The new operations allow participants to borrow against two distinct 'sets' of collateral — one set that corresponds with securities eligible in the Bank's short-term repo operations ('narrow collateral') and a second set containing a broader class of high-quality third-party debt securities that, in the Bank's judgement, usually trade in liquid markets ('wider collateral').⁽³⁾ The Bank has opted for an auction design in which the total amount of lending on offer in each auction will be fixed in advance, but the split of lending against each collateral set will be determined as part of the auction.

Counterparties will be able to bid for funds against either or both collateral sets. One could think of bids against each collateral set as separate, with bids against each type of collateral ranked from the highest interest rate bid downwards. Starting with the highest bid, each can be accepted in turn until a 'clearing rate' is reached at which either all the bids are allotted or the funds allocated to lending against that collateral set are exhausted. Hence there will be a clearing rate for each collateral set.

Assuming reasonable participation in the auctions, there would be many different ways in which the funds available in the auction could be split between the two collateral sets. And each of these possible allocations would imply a pair of clearing rates. So the available allocation choices — effectively an allocation frontier or 'demand schedule' — can be defined in terms of the spread between pairs of clearing rates. This schedule will be downward sloping, as shown in **Chart A**, because increasing the share of the auction allocated to wider collateral will either reduce the clearing rate on wider collateral or increase the clearing rate on narrow collateral. Moreover, if market conditions deteriorate, the value attached to borrowing against wider collateral, relative to borrowing against narrow collateral, may rise which would increase the slope of the demand schedule, as shown in **Chart A**.

The actual allocation will depend on the Bank's preferences for allocating funds between collateral sets, as defined by the spread between the respective clearing rates. The Bank will operate on the basis that it requires a larger spread between clearing rates to increase the proportion of the auction allocated to the wider collateral set, so the Bank's 'supply schedule' is upward sloping. The Bank does not intend to publish the details of its supply schedule, which need not be linear but is shown as such for simplicity in **Chart A**.

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The intersection of the Bank's supply schedule with the revealed demand schedule from the auction will identify the collateral split and the clearing rates. Hence higher bids against wider collateral relative to narrow collateral would tend to result in a higher percentage of the auction being allocated to wider collateral.

This example shows how the new auctions will automatically react to changes in the pattern of demand for funding against the two collateral sets (and by extension, changes in market conditions). This removes the need for the Bank to make a decision before each auction on the appropriate split of funding to provide. The Bank will also be able to use the bids in successive auctions to consider changes in funding market conditions, and hence to inform the appropriate size of subsequent auctions. This was not possible in the previous extended-collateral long-term repo operations, in which the Bank imposed a restriction on bids against wider collateral being at least 50 basis points above the minimum bid rate for narrow collateral.

Operational features

A new feature of the revised auctions is that bids will be indexed to Bank Rate; ie the rate paid by counterparties will be explicitly linked to the actual level of Bank Rate over the life of the repo. Hence bids will be submitted as a spread over Bank Rate. This will allow counterparties to participate without having to take a view on the future path of Bank Rate. And unlike previous long-term repo operations, the new indexed auctions will be on a so-called uniform-price format. This means that every successful bidder on a given collateral set pays the same price, which is the lowest accepted rate (the clearing rate) for that collateral set. This should mean that participants face little incentive to alter their bids based on assumptions about other participants' likely behaviour.

Another new feature in the auctions will be the option for participants to submit 'paired bids', consisting of a single

nominal amount and two spreads at which the counterparty is willing to borrow against the delivery of narrow and wider collateral respectively. This gives participants two opportunities to raise a specific quantity of funds while avoiding the risk of being allocated more than they need (which could happen if two separate bids for the same nominal amount were successful). If both sides of a paired bid are successful, the participant will be allotted against the bid which offers them better value (ie the bid with the highest spread relative to the clearing spread for that collateral type).

The new long-term repos will be offered initially once per month, with two operations with a three-month maturity and one with a six-month maturity in each calendar quarter. The overall stock of funds available will be reviewed regularly in light of prevailing financial market conditions and the level of demand at previous auctions.

⁽¹⁾ See The Development of the Bank of England's Market Operations at

www.bankofengland.co.uk/markets/money/publications/condococt08.pdf. (2) The Bank would like to thank Professor Paul Klemperer of Nuffield College, Oxford University for his contributions and advice on design issues for the new auctions.

⁽³⁾ To ensure consistency across the Bank's sterling operations, the wider collateral set will initially be aligned closely with Collateral Level B for the Discount Window Facility.

Research and analysis

PROMISE

Collateral risk management at the Bank of England

By Sarah Breeden, Head of the Bank's Risk Management Division and Richard Whisker of the Risk Management Division.⁽¹⁾

In response to the financial crisis the Bank of England has expanded the range of collateral accepted in its market operations to include private sector assets, notably asset-backed securities and covered bonds. Such assets have different risk characteristics to the forms of collateral previously accepted, presenting new risk management challenges. This article sets out how the Bank of England undertakes collateral risk management, highlighting in particular the significant degree of protection taken by the Bank in its operations.

Introduction

In response to the financial crisis the Bank of England, along with other authorities, acted to underpin confidence in the banking system. As part of this response the Bank, in common with other central banks, expanded some of its existing operations and introduced new facilities to provide liquidity insurance to the banking system. In particular, the Bank broadened the range of collateral accepted in these facilities to include certain forms of high-quality private sector assets, notably residential mortgage-backed securities (RMBS) and covered bonds.

When the Bank lends funds in its operations, it does so against collateral in order to protect itself against counterparty credit risk: whenever funds are lent, the lender takes on the risk that the borrower may not repay. But it is not part of the Bank's objectives to take on credit risk via its operations, and the consequence of a significant loss could harm its credibility, threaten its independence and impair its ability to discharge its statutory responsibilities. Although the credit risk in lending can never be zero, by taking collateral of sufficient quantity and quality, the Bank is able to significantly reduce the risk of a material loss arising in the event of a counterparty default.

This article sets out how the Bank undertakes collateral risk management in order to demonstrate how it protects its balance sheet. The Bank does not publish the detailed risk information used as inputs in determining the valuations and haircuts applied to individual items of collateral taken, not least because of practical and legal constraints. Instead, this article sets out the high-level principles that drive how the Bank approaches risk management, outlining the policies and procedures through which it protects its balance sheet. The Bank forms its own independent view of the risks in the collateral taken. It supplements this analysis with various sources of information, including the rating agencies, but the Bank does not rely on such ratings.

As background, the next section describes the Bank's liquidity insurance operations and the principles underlying its collateral policy. The article then describes how the Bank undertakes collateral risk management through the three basic tools of eligibility, valuations and haircuts, illustrating that risks would only crystallise in very extreme stress scenarios.

Liquidity insurance and collateral policy

The Bank's provision of liquidity insurance contributes to the stability of the financial system. Commercial banks and building societies provide important services that benefit the economy, providing payment services and transforming short-maturity deposits into longer-maturity loans to households and businesses. But this exposes the banks to liquidity risks, for example if a sudden loss of confidence leads to depositors withdrawing their deposits at short notice. To help contain the costs to the wider economy of a crystallisation of these liquidity risks, the Bank provides liquidity insurance by being prepared to lend to banks against good-quality collateral.

The Bank's liquidity insurance operations have been at the heart of the Bank's response to the financial crisis.⁽²⁾ **Table A** provides an overview of the key features of these operations. Of these, the Special Liquidity Scheme (SLS) and US dollar repo operations are temporary additional facilities, introduced

The authors would like to thank Neil Shah and Rajib Alam for their help in producing this article.

⁽²⁾ For a more detailed description of these operations, as well as the Bank's implementation of monetary policy throughout the crisis, see Cross et al (2010). It should be noted that operations designed to implement monetary policy also provide some liquidity insurance — for example through the provision of reserves accounts even though that is not their primary objective.

Operation/facility	Type of operation	Cost of borrowing	Collateral accepted	Date introduced	Date facility closes	Peak value of lending outstanding
Extended-collateral long-term repos	Auctions of sterling cash at term of three months. New auction design (including auctions at six-month maturity) to be implemented in 2010, with the operations to be termed 'indexed long-term repos' — for details see the box on pages 90–91 of this <i>Bulletin</i> .	Rate paid depends on bids received, with different rates paid on borrowing against 'narrow' and 'extended' collateral.	'Narrow' (sovereign and supranational) collateral plus 'extended' collateral, including AAA-rated RMBS, covered bonds and certain asset-backed securities (ABS); widened further in September 2008 to include securitisations of commercial mortgages and corporate bonds and loans.	December 2007.	Permanent.	£180 billion, 9 January 2009.
Special Liquidity Scheme	Facility to allow counterparties to swap illiquid assets for liquid UK Treasury bills for a term of up to three years.	Three-month Libor minus the three-month general collateral gilt repo rate, subject to a floor of 20 basis points.	Extended collateral, including AAA-rated RMBS, covered bonds, and credit card ABS; assets must have been held on the counterparty's balance sheet at end-2007.	April 2008.	Drawdown period closed end-January 2009; last swaps will terminate end-January 2012.	£185 billion, 30 January 2009.
US dollar repo operations	Lending of dollar cash at terms of 7, 28 and 84 days.	Variable-rate auctions of fixed size (up until October 2008); fixed-rate tenders of unlimited size thereafter.	Same as for ELTRs.	September 2008.	Closed end-January 2010; reintroduced on 10 May 2010.	\$86 billion, 17 October 2008.
Discount Window Facility	On-demand bilateral facility to lend gilts (or, exceptionally, cash) at a term usually of 30 days.	Rate charged depends on amount borrowed and type of collateral provided.	Narrow collateral plus broader range of extended collateral than accepted in ELTRs, including ABS rated higher than A3 provided they were rated AAA at issue. The Bank has proposed to extend further	October 2008.	Permanent.	Zero usage up to 31 December 2009 (the Bank publishes DWF usage with a lag).

the range of collateral to include unsecuritised loans.

Table A Summary of liquidity insurance operations in which extended collateral is accepted

to address specific market dislocations.⁽¹⁾ Other new facilities the extended-collateral long-term repos (ELTRs) and Discount Window Facility (DWF) - will be permanent, as described in detail in the October 2008 consultation paper (Bank of England (2008)). In addition to these public facilities, the Bank also provided bilateral emergency liquidity assistance (ELA) to some institutions, as described in more detail later in the article.

Prior to the financial crisis, the Bank accepted as collateral in its operations only certain highly rated sovereign and supranational debt — which we will refer to as 'narrow' collateral. One of the biggest changes to the Bank's provision of liquidity insurance was the broadening of the collateral accepted to include private sector assets — 'extended' collateral.⁽²⁾ As shown by Chart 1, the majority of such collateral has been in the form of RMBS and covered bonds. In response to the financial crisis some other central banks, such as the Federal Reserve in the United States, also introduced new facilities in which a broader range of collateral was accepted. Others, such as the European Central Bank, entered the crisis already accepting a broad range of collateral in its routine operations, including private sector assets such as RMBS and covered bonds.(3)

At times of financial stress, central banks have traditionally been prepared to lend against a wider range of collateral. In launching its new permanent facilities the Bank took the decision that it would be prepared to accept extended



Chart 1 Extended collateral taken by the Bank^(a)

(a) Holdings by market value as at 30 January 2009 (which was when the SLS drawdown window (b) 'Other' includes various eligible asset types, such as commercial mortgage-backed securities (CMBS), bank debt guaranteed under HM Government's bank debt guarantee scheme, and

debt issued by government-guaranteed agencies. (c) ABS include securities backed by credit card receivables and other consumer debt.

collateral in its liquidity insurance operations in routine fashion. This was aimed at ensuring that the Bank's liquidity insurance framework is consistent through time, by giving the market clarity on the terms on which the Bank will lend, both in normal times and, importantly, in times of stress.

⁽¹⁾ For a discussion of the rationale for the temporary nature of SLS, see King (2010). (2) Extended collateral also includes a broader range of public sector assets than

accepted before the crisis, including for example debt issued by government-guaranteed agencies

⁽³⁾ For a comparison of the collateral frameworks of these central banks, see Cheun et al (2009).

The benefits of offering liquidity insurance must be balanced against the cost of reducing incentives for banks to manage liquidity risk prudently, and subject to the need to minimise the risk taken onto the Bank's balance sheet. The design of the Bank's permanent liquidity insurance facilities — crucially, the terms on which it will lend — aims to meet these two requirements as follows.⁽¹⁾

To balance against the cost of creating incentives for banks to take excessive liquidity risk, the prices paid for borrowing are designed to be attractive only in stressed conditions. In this way, the Bank remains lender of *last* resort rather than lender of first resort. For example, in the DWF the rate charged is set at levels that, in normal market conditions, should make banks prefer to find alternative financing arrangements. The rate charged also increases as a bank's borrowing increases and/or is made against less liquid collateral, helping to incentivise banks to manage liquidity risk prudently.

To minimise the risk taken onto its balance sheet, the Bank aims to exclude from its public facilities any bank whose solvency or viability is seriously in question. To protect its balance sheet further, the Bank accepts as collateral only instruments it can risk-manage effectively. In particular, through its collateral valuations and haircuts, the Bank aims to leave the financial risks associated with the collateral with the counterparty, so that the Bank is only providing liquidity against the collateral, and not a subsidy for its underlying credit risk.⁽²⁾

These principles are in keeping with Bagehot's dictum from over a century ago that, to avert panic, central banks should lend early and freely to solvent firms, against good collateral and at high rates (see Bagehot (1873)).

Collateral risk management at the Bank of England

The Bank has increased its capacity to manage the new types of risk associated with the broader range of collateral now accepted in its operations. In particular, it has undertaken extensive work to enhance its risk management processes governing the securities accepted as collateral. This has included an increase in the Bank's risk management staff numbers, including hires from the private sector with relevant expertise. The Bank has also drawn on external advice when necessary, for example in advising on the design of an enhanced collateral risk monitoring system.

The Bank has available to it three basic tools with which it can manage the risks associated with the collateral it takes in its operations: (i) eligibility — what collateral the Bank will lend against; (ii) valuations — how much the collateral is worth; and (iii) haircuts — how much the Bank will lend relative to the value of the collateral. The Bank risk manages collateral using the same principles across all its operations, and aims to treat its counterparties fairly and consistently. The remainder of this section addresses each of the Bank's three risk management tools in turn.

Eligibility

Eligibility is the highest level risk management tool. Securities whose risk cannot be easily assessed, or managed through valuations and haircuts, are simply made ineligible so they are not allowed to be used as collateral with the Bank.

The Bank publishes high-level collateral eligibility criteria for its operations, which set a baseline for the quality of collateral accepted.⁽³⁾ By restricting eligibility to certain asset types, the Bank accepts only securities whose structures it can understand at reasonable cost, and whose intrinsic risks it can quantify and easily manage. For example, the Bank only accepts commercial mortgage-backed securities (CMBS) that are backed by a sufficiently diversified pool of commercial properties.

The first step in the eligibility checking process is therefore to determine whether a security meets the high-level eligibility criteria. Ratings assigned by the rating agencies play a role in establishing minimum standards of credit quality for the securities accepted, but they are indicative only, giving a public statement about where the Bank's criteria are set. The Bank undertakes its own independent analysis of securities submitted for eligibility checking and may deem a security ineligible even if it has the publicly stated ratings. For example, the Bank may not wish to accept securities with certain structural features, such as where third parties may be able to exercise control of the transaction to the detriment of the Bank's interests. Conversely, in the event of a downgrade of a security below a minimum-rating criterion, the Bank may allow it to remain eligible as collateral if the Bank believes it remains of sufficient quality.

Some of the securities taken as collateral by the Bank during the crisis already existed and were traded in the market. These securities have been 'market tested' and the Bank is just one of many noteholders. Provided the Bank's review of such a security concludes that it meets the eligibility criteria and has a well-understood structure with no unusual features and no concerns over its performance, it is deemed eligible. Ongoing compliance with the eligibility criteria, including current ratings, is checked on a daily basis.

But a large proportion of the securities taken have been created specifically for use as collateral with the Bank by the

For further details of the principles underlying the Bank's collateral policy, see Bank of England (2008) and Tucker (2009).

⁽²⁾ An additional layer of protection for the Bank's balance sheet is provided in some operations, for example the SLS, by an explicit indemnity from the Treasury.
(3) For details of current eligibility criteria for the Bank's operations, see

⁽³⁾ For details of current eligibility criteria for the Bank's operations, see www.bankofengland.co.uk/markets/money/eligiblecollateral.htm.

originator of the underlying assets, and have therefore not been traded in the market. Such 'own-name' securities accounted for around 76% of the Bank's extended collateral (around the peak of usage in January 2009), and form the overwhelming majority of collateral taken in the SLS. These securities undergo a detailed evaluation, including a committee review process, to determine eligibility. This involves a thorough legal review of the transaction documentation to ensure that the structure is legally robust and at least as sound as that of similar securities that have been issued into the market. Counterparties may be asked to bear the legal costs of such reviews. A detailed assessment of the credit quality of the underlying assets is also carried out, including through the use of stress testing. The Bank only confirms eligibility of a security once it has been issued, but engages with the issuer before issuance to identify any unusual features it is not comfortable with and which may - if not addressed — result in the security being ineligible.

The performance of all eligible securities is monitored on an ongoing basis through investor reports and other sources, including the rating agencies and other data providers. Securities whose performance deteriorates are investigated further to determine if any mitigating action is required. This could include making a security ineligible, in which case any counterparty that has submitted it as collateral has to replace it with alternative eligible collateral. As well as monitoring individual securities, the Bank monitors developments in the broader market, including through market contacts, broker research and other news sources.

The information generally disclosed on asset-backed securities varies considerably, both within and across asset classes, making it difficult to assess ongoing performance. To improve the efficiency of its risk management of these assets, as well as to bring greater transparency to the market, the Bank has proposed to make it an eligibility requirement that issuers disclose more information about them (see Bank of England (2010a)). This would include granular information on the underlying assets, as well as greater transparency around the structure of the securities.

Valuations

The Bank's valuation of collateral plays a key role in protecting the Bank against loss in the event of a counterparty default. The value assigned to a security, together with the haircut applied, determines how much the Bank will lend against it. If the counterparty then fails to repay when due, the Bank would plan to sell the collateral in due course (subject to market conditions) to make good the loss. It is therefore important that the Bank's valuation of a security reflects as accurately as possible its current market price.

The Bank revalues its collateral on a daily basis to ensure it remains protected in this way. If the aggregate

haircut-adjusted value of a counterparty's collateral falls below the value of liquidity provided, a margin call is made whereby the counterparty is required to either provide more collateral or, if appropriate, return some of the lent funds.

Where available, the Bank uses market prices to value a security, since that is the price at which a market participant has bought, or has indicated that it is willing to buy, the security. The market price must be from a publicly available source that is reliable and independent of the counterparty delivering the security. The Bank uses a range of pricing data sources, which it keeps under continuous review. The Bank may use its discretion to override such prices if it believes they may no longer be accurate. For example, following the announcement that Northern Rock's RMBS programme, Granite, had hit a non-asset trigger,⁽¹⁾ the Bank adjusted its prices immediately — based on its analysis and supplemented by discussions with market participants — rather than waiting for observed quoted prices to change.

Where no market price is available or those that are available are judged to be unreliable, for example because they are dated, the Bank calculates a model price to value a security. Given the large proportion of collateral comprised of own-name securities created specifically for use in the Bank's facilities, around 84% of the Bank's extended collateral was model-priced (around the peak of usage in January 2009). To ensure valuation consistency between market and model-priced securities the Bank's internal valuation process is designed to assign a model price that replicates as closely as possible what a market price would be, had there been one.

To model-price a security the Bank uses a standard bond pricing model to discount expected future cash flows using implied market rates.

Securitisations often have uncertain cash flows which must therefore be estimated. For example, 'pass-through' securities are paid down as principal from the underlying loans is received, the timing of which cannot be predicted with certainty (for example, mortgages may be paid off early when borrowers remortgage). The Bank estimates these cash flows on the basis of historical information and performance data (such as loan prepayment rates) provided by the issuer, together with data on similar securities in the market. For securities with call options, the Bank forms its own judgement on whether to give credit to the call in its valuations.⁽²⁾ For own-name securities where the counterparty submitting the collateral is also the originator of the collateral, the Bank will

⁽¹⁾ The non-asset trigger effectively results in a wind-down of the programme, with notes issued from it paid down on an amortising basis (ie as the underlying mortgages pay down). This affects the expected maturity of the notes, and hence their prices.

⁽²⁾ To give investors greater certainty about the maturity of securities, a common feature of securitisations is a 'call option' whereby the issuer may redeem the bonds on a specified date. This 'call date' is often taken as the expected maturity of the securities, even though the maturity could be longer if the issuer does not exercise the call.

not usually give credit to the call in its model price. This is because the Bank would only have an outright holding of the collateral in the event that the counterparty had defaulted, in which case the counterparty would be unable to exercise the call.

To discount the cash flows, the Bank uses market spreads observed on comparator securities — where possible from the same issuer — that most closely align with the underlying liquidity, maturity and credit risk characteristics of the security being model-priced. If there is a risk characteristic in the model-priced security that is not present in the comparator securities, the spread may be adjusted further to reflect this.

The Bank supplements its valuation process with a number of cross-checks to ensure accuracy and consistency. First, it compares the valuations of securities with similar characteristics. This allows the identification of any securities whose price appears out of line with peers, which can then be investigated further and acted upon if required. These peer group comparisons are performed weekly by a valuations review committee. Second, it supplements its analysis with market research and intelligence gathered from market participants, and has also sought external advice on the valuations assigned to securities.

The Bank does not publish its valuations of securities, because that might risk the Bank being used as a pricing reference source, which could distort the market and hinder the price discovery process. But an indication of the level of prices assigned by the Bank to its collateral during the crisis is shown in **Chart 2**. The chart shows the weighted average price assigned by the Bank to UK RMBS collateral. Prices fell during the second half of 2008 as financial systemic stress intensified. Since mid-2009 prices have risen as the market has recovered.





 ⁽a) Average prices of UK RMBS held as collateral, weighted by the size of holding.
 (b) Data points are monthly moving averages. Data are shown up to 30 April 2010.

Haircuts

The Bank does not lend an amount equal to the full value of the collateral it takes. To take additional protection and reduce the likelihood that the Bank would incur a loss in the event of a counterparty default, the Bank applies haircuts.

Haircuts can be thought of as loan to value (LTV) ratios, analogous to those applied to mortgage lending to protect the lender against falls in house prices. For example, consider a security with a nominal (par) value of 100 — this is what the noteholders should be paid when the bond is redeemed — and a current price of 90. Assume that the haircut applied to that security is 22% (the weighted average haircut applied to the Bank's SLS collateral), which is equivalent to an LTV ratio of 78%. The Bank would then lend up to 90*(1-0.22) = 70.2against that security. But unlike mortgages, where the maximum LTV ratio of the mortgage is set at origination but is subsequently beyond the control of the lender (for example, the LTV ratio will rise if house prices fall), the Bank's daily valuation and remargining process ensures that it continuously maintains this buffer.

The Bank's haircuts are designed to protect against both market risk and fundamental credit risk. This protection is particularly important for less liquid securities that the Bank might have to hold for a period of time before being able to sell them, as there is then more time for such risks to crystallise.

Market risk would crystallise if a counterparty defaulted and the value of collateral then fell as a result of market movements before it could be sold. The haircut is designed to absorb this potential reduction in value, so that the sale of the collateral at the lower price would still be sufficient for the Bank to recover the amount it is owed.

Fundamental credit risk is the risk that the value of a security may fall because of a deterioration in the credit quality of the underlying assets. For an RMBS security for example, there is the risk that a large number of the borrowers default on the underlying mortgages, which could result in the security incurring a credit loss and noteholders not getting paid back in full. Haircuts are therefore also designed to absorb the potential impact of such underlying credit losses.⁽¹⁾

The total haircut applied to a security is comprised of 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 be idiosyncratic to that security. The Bank may vary haircuts at its discretion, including those applied to collateral it has already taken.

⁽¹⁾ The valuations of securities reflect fundamental credit risk to some extent, but based more on the *expected* performance of the underlying assets, whereas haircuts are designed to protect against fundamental credit risk in *stressed* scenarios.

Base haircuts

The Bank publishes base haircuts that it applies to different asset types, reflecting their different risk characteristics.⁽¹⁾ For narrow collateral, haircuts start at 0.5 percentage points for floating-rate or short-maturity fixed-rate securities. For extended collateral the base haircuts range from 12 percentage points for floating-rate RMBS or covered bonds to 25 percentage points for floating-rate CMBS. For fixed-rate securities the haircuts also increase with maturity to mitigate interest rate risk, which is the risk that market interest rates rise, resulting in price falls for securities that pay a fixed rate of interest.

For narrow sovereign and supranational collateral, the Bank sets its haircuts on the basis of historic price volatility in stressed periods, so that price falls should rarely exceed the size of the haircut. It does this by estimating potential price falls using a Value-at-Risk (VaR) approach, assuming a five-day holding period with a 99% confidence interval. This means that — based on historic price volatility in stressed periods the fall in value of a security would only be expected to exceed the haircut once in a hundred five-day periods. The Bank uses a five-day holding period as it expects it would be able to sell such collateral within this time frame given its liquidity. The Bank uses at least ten years of price-volatility data and determines the 99% confidence interval based on the most volatile two-year period within that, in order to minimise both the risk of its haircuts proving inadequate, and the likelihood of needing to increase haircuts at a time of market stress.

For extended collateral such as RMBS, the Bank uses stressed-scenario analyses, rather than a stressed VaR approach, to set its haircuts. This is because in the wake of a counterparty bank defaulting, the value of such private sector securities — particularly those associated with banks — is likely to fall by more than historic price volatility might suggest. To estimate market risk in extended collateral the Bank considers the following indicators (illustrated for the case of RMBS):

- observed historical price falls following particular events to capture the impact of actual events on RMBS prices;
- the difference in price between various eligible RMBS to measure the range of prices and so estimate how far prices could conceivably fall; and
- changes in the bid-offer spreads on eligible RMBS securities
 to measure the illiquidity in the RMBS market.

As noted above, haircuts are also set to protect against price falls resulting from a deterioration of the fundamental credit quality of the collateral. One way the Bank does this is to look at the difference in price between AAA and lower-rated securities of the same issuers, in order to estimate the impact of a material change in the credit risk of a security. A second way the Bank assesses the adequacy of the protection haircuts provide against fundamental credit risk is through the use of stress tests, as discussed further below.

Haircut add-ons

The Bank applies additional haircuts to address risks that are not accounted for by the base haircut. These include standard haircut add-ons for:

- non-sterling securities 6 percentage point add-on to address the exchange rate risk inherent in taking collateral denominated in a different currency to that of the loan;⁽²⁾
- model-priced securities 5 percentage point add-on to account for both the risk that the model price may be an overestimate of the true price and the lower liquidity that is implied by the lack of a market price; and
- own-name securities 5 percentage point add-on to address the correlation risk inherent in accepting securities where the counterparty submitting them as collateral is also the originator of the underlying assets.⁽³⁾

In addition to these standard haircut add-ons, the Bank may apply further idiosyncratic add-ons to cover additional risks. One example of this would be to account for any additional correlation risks if the counterparty plays other roles in connection with the security, not just that of the originator. For example, the counterparty may provide bank accounts or swaps to the special purpose vehicle issuer of the securities. In the event that the counterparty defaults suddenly, the noteholders could therefore have an exposure to the counterparty, which could result in a loss. The Bank may apply an additional haircut to reflect this risk.

The Bank may also apply idiosyncratic haircut add-ons to mitigate any concerns regarding the credit quality of the assets underlying a security, based on the outcome of stress testing.

Stress testing

Stress testing plays a key role in assessing the adequacy of the protection taken by the Bank and in determining haircuts. Stress tests are applied to individual securities to determine potential idiosyncratic haircut add-ons that may be required. They are also used to size the base haircuts, which are designed to provide sufficient protection against fundamental credit risk for the majority of securities, with only a few higher-risk securities requiring additional idiosyncratic add-ons. Stress tests are applied on an ongoing basis, for example for securities which are flagged through the Bank's monitoring process as having potential performance issues.

For details of current haircuts applied in the Bank's operations, see www.bankofengland.co.uk/markets/money/notices.htm.

⁽²⁾ In the US dollar repo operations, this haircut add-on is applied for non-dollar denominated collateral. The add-on for yen-denominated collateral is 8 percentage points (in all operations).

⁽³⁾ In future, own-name securities will not be eligible for use as collateral in the Bank's long-term repo operations, but will remain eligible for use in the DWF.

The Bank has developed stress tests for different asset classes. These follow the general approach of considering the impact of stressed assumptions for default rates and losses given default on the assets underlying a security. For example, one stress test for RMBS would be to assume stressed house price falls together with additional costs associated with foreclosure. Together with the LTV profile of the pool of mortgages, these assumptions give an estimate of the stressed loss on the pool for a given level of defaults. For different securities, the Bank might seek protection against different levels of defaults, depending on the characteristics of the underlying mortgages and borrowers.

Protection taken by the Bank

The article so far has discussed the principles that underpin the Bank's collateral risk management procedures. Chart 3 brings all of these together to show the actual protection taken by the Bank through the aggregate valuations and haircuts applied to collateral in the ELTRs and SLS. By taking a greater degree of protection against riskier, less liquid collateral, the Bank seeks to take no more risk overall in accepting one form of collateral over another.

Chart 3 Protection taken in the ELTRs and SLS at their peak usage(a)(b)(c)(d)



- (a) Data are for the respective peaks of usage: 9 January 2009 for the ELTRs, 30 January 2009
- (b) Note that the figures for the Spectre peaks of usage. Splandar 2005 for the ELTRS, of January 2005 for the SLS. Actual amounts are shown above the bar.
 (b) Note that the figures for the total haircut-adjusted value of collateral (£185 billion for the ELTRS, £190 billion for the SLS) are slightly higher than the figures for the amount lent in Table A. This reflects the fact that counterparties tend to submit slightly more collateral than the minimum required.
- The majority of the narrow collateral (84%) was sterling-denominated UK government debt. (d) Haircuts for narrow collateral have subsequently been increased (see www.bankofengland.co.uk/markets/marketnotice090925.pdf). Haircuts currently applied to narrow collateral range from 0.5% for floating-rate or short-maturity fixed-rate sterling securities to 13.5% for fixed-rate non-sterling securities with greater than 30 years to maturity.

The largest aggregate haircuts are applied to the collateral taken in the SLS: the weighted average haircut is 22%, reflecting the fact that the majority of the collateral is in the form of floating-rate RMBS and covered bonds (12 percentage point base haircut) which are own-name (5 percentage point haircut add-on) and model-priced (5 percentage point add-on). For a practical example of how the various layers of

protection combine to protect the Bank against loss at an individual security level, see the box on page 101.

Emergency liquidity assistance and the risk management of loans as collateral

In addition to providing liquidity insurance through the public facilities described in Table A, in exceptional circumstances the Bank can act directly as lender of last resort to commercial banks through bilateral arrangements, in order to prevent a loss of confidence spreading through the financial system. The Bank extended such emergency liquidity assistance (ELA) to two institutions, Royal Bank of Scotland (RBS) and Halifax Bank of Scotland (HBOS), in the autumn of 2008.

ELA was provided to HBOS between 1 October 2008 and 16 January 2009, with use of the facility peaking at £25.4 billion on 13 November 2008. ELA was provided to RBS between 7 October 2008 and 16 December 2008, with usage peaking at £36.6 billion on 17 October 2008. The banks were charged fees for the use of the facilities.⁽¹⁾

The collateral taken by the Bank in respect of this facility included various forms of raw (ie non-securitised) loans, including pools of mortgages, personal loans and loans to small and medium-sized enterprises (SMEs), as shown in Chart 4.



(a) Data are for the respective peaks of usage: 17 October 2008 for RBS, 13 November 2008 for HBOS

The Bank risk-managed the collateral using the same principles of eligibility, valuations and haircuts applied to the collateral accepted in its public facilities so as to ensure it took an equivalent level of protection. To this end, the Bank accepted as collateral only equivalent types of loan to those accepted in

⁽¹⁾ For further details of the ELAs, including the fees charged, see Bank of England (2010b)

A practical example of how the Bank is protected against loss

This box uses a hypothetical mortgage-backed security to demonstrate how the various layers of protection combine to protect the Bank against loss. Consider an RMBS transaction backed by a pool of 1,000 mortgages, each of £100,000. In this example, the £100 million pool of mortgages might support the issuance of, say, £90 million of 'senior' notes and £10 million of 'subordinated' notes. This means that the senior notes benefit from credit enhancement of 10% (a typical figure for actual RMBS), so that the first 10% of losses on the mortgages are not absorbed by the senior noteholders, but are absorbed by the subordinated noteholders. It is only the senior notes that would potentially be eligible for use as collateral with the Bank, provided they met the Bank's eligibility criteria, including having been rated AAA at issue.

In addition to this credit enhancement, further protection is provided by the fact that the mortgages are themselves secured loans, backed by properties worth more, in general, than the value of loans. So to suffer 10% of actual losses on the mortgage pool would require more than 10% of the borrowers to default on their mortgages.

Chart A illustrates the various layers of protection for this example, assuming that the weighted average LTV ratio for the mortgages is 75% (a typical figure for an RMBS mortgage pool), the price assigned to the security is 90, and the haircut applied is 12%.⁽¹⁾ The final three bars are equivalent to the bars shown for the ELTRs and the SLS in **Chart 3** and reflect the protection taken by the Bank through its valuation and haircut. The differences between the first three bars reflect the protection built in to the security itself.

In this case, the Bank would be prepared to lend up to £71 million against the collateral with a nominal value of £90 million and ultimately backed by properties worth £133 million. This means the Bank would be protected against a significant deterioration in the fundamental credit quality of the collateral, so that it would only be at risk of suffering a credit loss under very extreme stress scenarios. For example, consider a simplified stress test with the severely stressed assumptions of a 50% house price fall, and foreclosure costs (including repossession costs and foregone interest) of 40% of the outstanding loan amount. Assume also that every mortgage has an LTV ratio of 75% (in reality, the pool would have a distribution of LTV ratios). Under these assumptions the senior notes would only incur a loss if more than 14% of the underlying borrowers defaulted (Table 1). Further, with the additional protection taken by the Bank through its valuation and haircut, the Bank would only suffer a loss if more than 39% of the borrowers defaulted.

Chart A Lending against RMBS — an example



Table 1 Stressed loss analysis(a)

	Property value:	£133,333
	Size of mortgage loan:	£100,000
	Value of property after 50% price fall:	£66,667
	Recovery from repossession and sale of property, net of 40% foreclosure costs:	£66,667 – £40,000 = £26,667
	Loss given default:	(£100,000 – £26,667)/ £100,000 = 73%
Senior note protection	Protection against loss:	10%
	Proportion of borrowers that can default given the protection against loss:	10%/0.73 = 14%
Bank's protection	Protection against loss:	29%
	Proportion of borrowers that can default given the protection against loss:	29%/0.73 = 39%

(a) Some calculations affected by rounding.

The Bank's haircuts are also intended to protect against market risk, not just fundamental credit risk. Indeed, following a counterparty default the Bank would plan to sell the collateral in due course (subject to market conditions) rather than hold it to maturity, not least because it is not the Bank's role to provide long-term funding to the economy by holding private sector collateral on its balance sheet. The degree of protection against fundamental credit risk highlighted above implies that the collateral would make an attractive investment to investors. This should help to ensure that the Bank would indeed be able to sell the collateral — at a price at which it would not suffer a loss even if there had been some deterioration in the performance of the underlying assets — so that the Bank would only need to hold the collateral until any period of severe market illiquidity had passed.

^{(1) 12%} is the base haircut applied to RMBS. With haircut add-ons, the total haircut applied to an RMBS security could be much higher. For example, if the security was own-name, model-priced and non-sterling, the haircut would be 28%. But those additional haircut components are designed to protect against specific incremental risks that are not considered in this simple example, which instead just illustrates the protection against fundamental credit risk provided by the base haircut.

securitised format in its public facilities such as the ELTRs. The Bank applied a haircut to each pool of loans comprised of the following three elements, which can be viewed as the equivalent of the steps between the final four bars in **Chart A** in the box on page 101:

- 'AAA haircut' to replicate the credit enhancement inherent in a typical AAA securitisation of that loan type, to bring the credit protection up to broadly the AAA level;
- 'valuation haircut' based on the valuations of securitisations backed by similar loans, to replicate the effect of a market price (given that the loans were not tradable instruments they did not have market prices); and
- 'conventional haircuts' applied based on the haircuts applied to equivalent securitisations in the ELTRs. For example, pools of mortgages attracted the same 12 percentage point base haircut applied to RMBS. Additional haircuts were applied for own-name risk and model-price risk, with further add-ons applied to account for any idiosyncratic risks in the loan pools, such as limited availability of data on the loans. The Bank also used stress tests to ensure the adequacy of the protection provided by the haircuts.

This resulted in total effective haircuts (relative to the nominal value of the loans) across their loan collateral portfolios of 49% for RBS and 48% for HBOS. The total haircut provided a significant degree of protection in both cases, broadly comparable to the total protection taken in the Bank's other operations. In the SLS for example (**Chart 3**), the amount that the Bank would lend (£190 billion) was around 34% less than the nominal value of the collateral (£287 billion). Assuming additional credit enhancement built in to the collateral (ie a 'AAA haircut') of, say, 10%, the nominal value of the loans underlying the collateral securities would have been around £319 billion, so that the equivalent total 'effective haircut' relative to this amount, under that assumption, would have been around 40%.

Future developments

For liquidity insurance to be effective it is important that the range of collateral accepted is wide enough that the commercial banks have sufficient collateral to borrow against in stressed circumstances. To this end, the Bank has proposed to extend the range of collateral accepted in the DWF to include loans in addition to securities, so that a significant proportion of banks' assets would in principle be eligible as collateral with the Bank (see Bank of England (2010a)). Even with large haircuts to protect itself against risk, this should help ensure that the Bank can provide the liquidity necessary to support financial stability, including in stressed circumstances.

As described above in the context of the ELA, loans accepted as collateral in the DWF would be risk-managed using the same principles as for securities: the aim would be for the Bank's risk tolerance to be broadly the same for loans as for a securitisation of those same loans, so as not to provide incentives to submit one form of collateral over the other. Indicative haircuts that would be applied to loans accepted as collateral range from 25%–60% depending on the type of loan (see Bank of England (2010a)).

Conclusion

At times of financial stress, the Bank's provision of liquidity insurance plays a crucial role in containing the impact of stress on the broader economy. But — in keeping with Bagehot central banks should only provide that liquidity insurance against good collateral and at a penalty rate. That is also consistent with the need to minimise the risk taken onto the Bank's balance sheet.

The Bank's conservative approach to risk management means that it takes a significant degree of protection in its operations. In particular, given its approach to collateral valuations and haircuts, the Bank should be at risk of suffering a loss only under very extreme stress scenarios. Together with the rates paid for borrowing in its facilities (designed to ensure that the Bank remains lender of last resort) they ensure that the Bank does not provide liquidity on generous terms. In particular, given the higher haircuts and rates paid for borrowing against less liquid collateral, the Bank seeks not to provide liquidity against extended collateral on more generous terms than against narrow collateral.

Collateral risk management plays a central role in ensuring the effectiveness of the Bank's liquidity insurance operations. The Bank keeps its collateral policy under continuous review to ensure risks continue to be managed and mitigated, and the Bank's balance sheet protected.

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The impact of the financial crisis on supply

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Output fell sharply in the United Kingdom during the recent global financial crisis, some of which is likely to have reflected a contraction in the economy's supply capacity. This article considers the impact of financial crises on supply and the potential channels through which supply may have been affected during the recent recession. It is likely that the downturn has resulted in a fall in companies' effective supply capacity although the magnitude of that impairment is difficult to gauge.

The financial crisis that began in 2007 precipitated a fierce recession that led, as in many other countries, to a dramatic reduction in UK output. According to the latest Monetary Policy Committee projections in the May 2010 *Inflation Report*, output is likely to remain substantially below the level implied by a continuation of its pre-crisis trend over the next three years (Chart 1). Much of that shortfall is likely to reflect a persistent reduction in the supply capacity of the economy.⁽²⁾ This article considers the impact of financial crises on supply and the potential channels through which supply may have been affected during the recent recession.

Chart 1 Projection of the level of GDP based on market interest rate expectations and £200 billion asset purchases — May 2010 *Inflation Report*^(a)



⁽a) Chained-volume measure. This chart is derived from the corresponding projection for GDP growth. For a description of the Bank of England's fan chart for GDP growth, and for details of the assumptions underlying it, see the footnote to Chart 1 on page 7 of the Bank's May 2010 Inflation Report. The width of this fan over the past has been calibrated to be consistent with the four-quarter growth fan chart, under the assumption that revisions to quarterly growth are independent of the revisions to previous quarters. Over the forecast, the mean and modal paths for the level of GDP are consistent with the fan chart for GDP growth. So the skews for the level fan chart have been constructed from the skews in the four-quarter growth fan chart at the one, two and three-year horizons. This calibration also takes account of the likely path dependency of the economy, where, for example, it is judged that shocks to GDP growth in one quarter will continue to have some effect on GDP growth in successive quarters. This assumption of path dependency serves to widen the fan chart.

Understanding the impact of the recession on supply is important for monetary policy. In the medium term, inflation is determined by the balance between nominal demand and the effective potential supply capacity of the economy. Potential supply cannot be observed directly. But its evolution will shape both the degree of spare capacity available to companies and the slack in the labour market, which in turn influence companies' pricing and wage-setting decisions and, hence, future inflation.

A number of recent studies have examined how medium-term output and, perhaps, potential supply may have been affected by past financial crises. These are reviewed in the first section of the article. The second section explains in more detail the approach to model supply developments which is adopted in this article before the subsequent section explores the channels through which supply might have been affected. The final section concludes by briefly discussing the implications for future developments in potential supply.

Learning from the past: studies of how output responds to financial crises

The latest downturn has been triggered by an unprecedented, globally synchronised financial crisis, and many industrialised countries have experienced large falls in output. But the response of inflation depends in part on how supply capacity reacts. Consequently, several policy and research institutions around the world have published recent studies on the behaviour of potential supply.

⁽¹⁾ The authors would like to thank Alex Haberis, Rachana Shanbhogue and

Kenny Turnbull for their help in producing this article (2) See Section 5 in the May 2010 *Inflation Report*.

Most of these studies infer the likely response of potential supply by examining past financial crises and recessions. Potential supply is unobservable but, over time, movements in actual supply may provide a useful proxy for movements in supply capacity. Some studies draw on data sets that cover a range of countries and periods (IMF (2009a), Furceri and Mourougane (2009) and Cerra and Saxena (2008)). Others use more of a case-study approach, focusing on individual cases in greater detail (European Commission (2009) and OECD (2009)). In summarising this literature, three broad findings emerge.

First, financial crises are associated with a persistent loss of output relative to its level had the crises not occurred (**Table A**). Estimates of the size of output loss differ, reflecting differences in both methodology and coverage. For example, the IMF (2009a) estimates an average output loss of 10% relative to a trend level, while research from the OECD suggests the impact is much smaller on average, at around 2% (Furceri and Mourougane (2009)).

Table A Output losses following financial crises

Study	Change in output	Description
IMF (2009a)	-10%	Average output loss seven years after a financial crisis.
Cerra and Saxena (2008)	-7.5%	Average output loss ten years after a financial crisis.
Furceri and Mourougane (2009)	-1.5% to -2.4%	Average loss in potential output five years after a financial crisis.

Sources: Cerra and Saxena (2008), Furceri and Mourougane (2009) and IMF (2009a)

Second, experiences differ widely across countries. For example, even setting to one side the more extreme responses in the IMF (2009a) study, the range of impacts for the central half of cases was no less than -26% to +6%. The response of different economies appears to depend on certain characteristics, such as the demographic and industrial structures of the country and its political system, as well as on the fiscal and monetary policy response to the crisis. In some cases, the impact on supply has been more persistent than in others. For example, there appeared to be a persistent impact on growth in Japan following the financial crisis in the early 1990s so that the size of the output loss grew over time.⁽¹⁾ But there appeared to be only a temporary impact on output growth in Finland and Sweden following their financial crises (European Commission (2009) and Haugh *et al* (2009)).

Third, output losses tend to be bigger and longer lasting when recessions are accompanied by financial crises, as compared with normal recessions. For example, research from the OECD found that output losses after severe financial crises are typically around two times greater than after less severe crises (Furceri and Mourougane (2009)). The IMF (2009b) also found that recessions associated with financial crises are longer and generally more costly than others. Reinhart and Rogoff (2009) also highlight the persistent weakness in output following financial crises. With all these studies, however, differentiating between the impact of a financial crisis and a 'normal' recession is difficult given that financial crises can frequently be accompanied by recessions.

While these explorations of past crises can provide a useful benchmark for the most recent episode, the results should be treated with some caution. Actual output is a useful proxy for potential supply only once inflation has stabilised and the economy has regained the balance between demand and potential supply. And the size of output loss is typically measured relative to an estimated pre-crisis trend path, which is difficult to pin down. For example, estimates that extrapolated the pace of growth immediately prior to the crisis may inadvertently include periods of unsustainably high growth, which can lead to overestimates of the size of output loss.

Despite these difficulties, most of the available evidence suggests that financial crises and associated recessions have a negative and long-lasting effect on the supply capacity of the economy. In particular, among estimates for the United Kingdom in the context of the current crisis, in their *Green Budget*, the Institute for Fiscal Studies (2010) estimated a persistent output loss of around 71/2%. This is greater than HM Treasury's (2010) estimates, which pointed to a deterioration in supply of around 5%. The remainder of the article goes on to examine the channels through which supply in the United Kingdom may have deteriorated during the recent financial crisis and associated recession.

Medium-term potential supply from the growth accounting approach

Although potential supply is unobservable, there are a number of approaches that can be used to estimate it. Some of these imply measures that respond more quickly to changes in the economic environment than others (see the box on page 106). This article focuses on a concept of potential supply built up from the component parts — labour supply, capital services and productivity — and so is consistent with a 'growth accounting' approach.⁽²⁾ This approach acknowledges that movements in supply — like output itself — may be influenced by the business cycle, and so it is well suited for analysing the effects of the crisis and the recession on supply.

An example of this framework can be seen by decomposing changes in *actual* GDP. But it is important to recognise that this only provides a decomposition of *actual* supply and not

⁽¹⁾ Extrapolating high growth rates in Japan prior to the crisis may, however, lead to an overestimate of the effects of the crisis.

⁽²⁾ For an example of this approach, see the box entitled 'The impact of the dislocation in financial markets on potential supply' on page 28 of the May 2008 *Inflation Report*.

Concepts of supply

Conceptually, it is relatively straightforward to measure how much companies are producing and, hence, their actual output or supply. But it is much harder to gauge the quantity companies would ideally like to produce given the economic environment, and how that may evolve over time. This is unobservable and hence must be inferred. This box explores a number of different ways to estimate potential supply.

Three broad approaches to measuring potential supply have been identified in the economics literature. They can be classified according to the speed with which potential supply responds to changes in the economic environment. At one end of the spectrum are trend-fitting approaches, which treat potential output as relatively slow moving. At the other end of the spectrum are those approaches in which short-term factors are allowed to affect potential supply, resulting in volatile estimates. In between is the 'growth accounting' approach.

Trend-fitting approaches use a variety of statistical techniques to estimate potential supply. These techniques typically smooth through variations in output, resulting in estimates of potential output growth that are close to some historical average and relatively slow moving. Examples include linear trend estimates, first differencing, fitted polynomials in time, peak-to-peak interpolation, and Hodrick-Prescott and band-pass filters.⁽¹⁾ While these methods provide useful practical estimates, they usually have little basis in economic theory. They are also sensitive to the choice of sample period over which they are estimated, with more recent estimates which are of greater relevance for policymakers — particularly susceptible to subsequent revision.

An alternative approach is a 'bottom-up' analysis. The amount that a business can produce depends on the number of people it employs, along with its capital or technical infrastructure. But its output will also depend on the efficiency with which its workforce can use the technology available - the company's total factor productivity. The 'growth accounting' approach

uses this framework to analyse how these components, and hence aggregate supply, evolve over time.

Under the third approach, short-term factors are allowed to affect businesses' potential supply. For example, models (such as those in the 'New Keynesian' literature) can be used to measure potential supply as the 'flexible price level of output' that is, the level of output that would exist if prices were able to change immediately. In this case, sudden changes to the real economy can result in sharp movements in estimates of potential supply. And since these changes are unlikely to be smooth, neither will be the path of potential output. As a result, variations in potential output account for a greater degree of the variation in actual output.⁽²⁾

An alternative concept in which short-term factors can influence supply is based on the notion that companies may be constrained by difficulties in accessing finance. Businesses typically use working capital to fund their day-to-day business activities. But if credit lines dry up and businesses are unable to access working capital, they may be constrained in the amount they can 'effectively' supply.⁽³⁾ Working capital can, in theory, be analysed within the growth accounting framework as another factor that companies need to produce output. And quantitative theoretical models can also be constructed that shed light on the impact of the working capital channel.⁽⁴⁾

Finally, during periods of rapid restructuring, the supply capacity of the economy may be reduced if it is costly and takes time to shift production to newer, faster-growing sectors. This is another way in which potential supply may be affected in the near term and is sometimes referred to as 'speed limit effects' (Walsh (2003)). Seminal work in this area is attributable to Gordon (1980), who argued that US inflation is better explained when considering the rate of change of a measure of potential supply.

(4) See, for example, Kiyotaki and Moore (2008).

potential supply. It reflects what inputs go into meeting the current level of demand with domestic output.

Much of the variation in output over the economic cycle reflects movements in total factor productivity (TFP) (Chart 2), which, in theory, captures the efficiency with which businesses can combine labour and capital to produce output. But TFP is unobservable and so, in practice, is estimated as a residual. The strongly procyclical pattern to TFP may reflect a range of factors. For example, companies may be reluctant to lay employees off during economic downturns due to the

costs associated with changing headcount.⁽¹⁾ This will be reflected in lower productivity and hence weaker TFP. In contrast, during periods of economic expansion, employees generally raise levels of effort and capital is used more intensively. These variations in the intensity with which companies use their labour and capital may not be captured in the headline capital and labour input data, and will show up instead as higher TFP.

⁽¹⁾ See, for example, Hodrick and Prescott (1997), Canova (1998), Stock and Watson (1999) and Christiano and Fitzgerald (2003). See, for example, Neiss and Nelson (2005).

⁽³⁾ See Blinder (1987) for a discussion of 'effective' supply.

⁽¹⁾ For a comparison of the response of the labour market in this recession relative to previous downturns, see Faccini and Hackworth (2010)


 (a) Chained-volume measure of gross domestic product at market prices. The decomposition is only available to 2009 Q4.
 (b) Population data are non seasonally adjusted.

* This chart differs from the version originally published, for which the participation and total factor productivity bars were slightly different.

Much of the remainder of the variation in output reflects changes in unemployment. In particular, the fall in actual output during the early 1990s recession was accompanied by higher unemployment. Faced with lower demand for their products, some businesses may lay off employees during economic downturns. Alongside this, the average number of hours worked typically falls back in recessions as companies look for ways to adjust the amount of labour input. And the share of the population willing to work also tends to fall back in recessions as people become discouraged about their chances of finding a job.

Translating this framework into an estimate of *potential* supply is, unfortunately, much more difficult. In any economy, the level of potential output is a moving target, partly because the economy grows over time, but also because changing circumstances have effects in the medium term. So the level of potential supply can be thought of as an equilibrium path towards which actual output will tend to gravitate in the medium term. Medium-run values of different supply components can be estimated, but they are not directly observable. Therefore, an assessment of how these medium-run values are likely to change will be based on economic theory and how the current values of the inputs evolve. The next section will use this growth accounting approach to explore the channels through which *potential* supply may have been affected in the recent recession.

The impact of the financial crisis and recession on potential supply

Overall, it is likely that the effective supply capacity of the economy has been impaired since the start of the financial

crisis. Inflation has been resilient. And surveys of capacity utilisation do not appear to have fallen by as much as the fall in output might suggest (**Chart 3**). This section uses the growth accounting framework to examine the channels through which each component of supply — labour, capital and the TFP residual — might have been affected in the recession.





Sources: Bank of England, British Chambers of Commerce (BCC), Confederation of British Industry (CBI), CBI/PricewaterhouseCoopers and ONS.

 (a) Three measures are produced by weighting together surveys from the Bank's Agents (manufacturing and services), the BCC (manufacturing and services) and the CBI (manufacturing, financial services, business/consumer services, distributive trades) using shares in nominal value added. The BCC data are non seasonally adjusted.
 (b) Chained-volume measure at market prices.

Labour supply

The amount of labour used to produce goods and services can be measured by the total number of hours worked in the economy. This can be decomposed into: (i) the size of the population; (ii) the share of that population willing and able to work; (iii) the share of those people actually in work; and (iv) the average number of hours worked by those employed.⁽¹⁾ But for *potential* supply, it is the medium-term equilibrium levels of these components that are most relevant.

Size of the population

Population growth has been relatively strong in recent years, and is likely to have made a significant contribution to the growth of potential labour supply in the United Kingdom. Rising population can reflect either natural change or increases in net inward migration, both of which have picked up over the past decade (Chart 4). In 2008, natural change exceeded net inward migration for the first time in nine years, as net inward migration edged down and births continued to rise.

Natural change in the population, influenced by changes in fertility, life expectancy and age composition, typically occurs quite slowly.⁽²⁾ And these changes are unlikely to be very

As the arguments for how 'potential hours' might respond in a recession can work in either direction, we do not explicitly discuss this component.
 See Barwell *et al* (2007).





sensitive to the economic cycle. But the degree of net inward migration is likely to have stronger links with the state of the economy.

Inward migration increases the population directly. And it may have a further impact on labour supply if immigrants differ from the typical UK resident (and those leaving the United Kingdom) in terms of how likely they are to participate in the labour market.⁽¹⁾ The incentive to migrate may partly reflect cyclical differences in wages and the probability of finding work in different countries. During periods of relative cyclical weakness, net inward migration may therefore be lower than otherwise.

The financial crisis has been a global phenomenon. So while the cyclical position of the UK economy has been affected, it is less clear to what extent it has changed relative to other



Chart 5 Estimates of net inward migration by

Source: ONS International Passenger Survey.

- adjusted. 2009 data are provisional, and are available up to 2009 Q3.
 (b) The A8 countries are the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia. Prior to 2004, net inward migration from the A8 is included in the 'Other' bar, because the split between net inward migration from the A8 and from other countries is not available.
- (c) Rolling four-quarter sum.

countries. If the attractiveness of the United Kingdom as a destination for migrants had declined, then that would be consistent with the slowdown in net inward migration indicated by ONS data up to 2009 (Chart 5). In addition, sterling's depreciation — of around 25% since the start of 2007 — will have made nominal pay in the United Kingdom worth less in terms of foreign currencies, which may also serve to discourage net inward migration.

Participation

The proportion of people that are willing and able to work is an important element of labour supply. The participation rate — the number of people working or seeking work, as a percentage of the adult population — tends to fall during an economic downturn (**Chart 6**) for a number of reasons.⁽²⁾ For example, individuals may be discouraged from looking for work during a recession when the likelihood of finding a job is lower. Reduced job opportunities may imply a stronger motive to do 'non-market' work, such as caring for relatives or investing in education as an alternative. And weaker real wage growth may mean people are less willing to supply labour.

Chart 6 Participation rates



Source: ONS (including the Labour Force Survey)

(a) Recessions are defined as at least two consecutive quarters of falling output (at constant market prices) estimated using the latest data. The recessions are assumed to end once output began to rise.

- (b) Percentage of the 16+ population. Rolling three-month measure.
- (c) Percentage of the population aged 50–64 for men and 50–59 for women. Rolling three-month measure. The observations before 1992 are based on non seasonally adjusted, annual LFS microdata. The annual observations correspond to the March-May quarter.

Recessions may, however, have other effects that actually encourage participation in the labour market. The reduction in equity prices and financial wealth that marked the early stages of the current recession would make financing retirement, or leisure more generally, more difficult for instance. That may have pushed up on the participation rate of older workers in particular (Chart 6).⁽³⁾

⁽a) Estimates of net long-term international migration by citizenship. Data are non seasonally

⁽¹⁾ See Saleheen and Shadforth (2006) and Barwell (2007)

⁽²⁾ See Gomes (2009) for evidence of the cyclicality of UK labour market flows.

⁽³⁾ For a further discussion of recent trends in participation, see Faccini and Hackworth (2010).

These changes in actual participation can in turn affect medium-term participation. For example, some people who leave (or choose not to enter) the labour force may be less able to retain or acquire the skills sought by employers. And decisions to enter education, retire, or look after the family or home may not be easily reversed.

The impact of the crisis and the recession on medium-term participation may, however, be smaller now than in the past. In the early 1990s, institutional features — such as the availability of early retirement packages and access to disability benefits — are thought to have encouraged declining participation of older age groups (Chart 6). But the availability of these features has been scaled back significantly. That too could account for the most recent data in which the impact on participation appears, so far at least, to have been relatively muted. Furthermore, the fall in participation since early 2008 has been more than accounted for by those under 25 years old, many of whom may have re-entered education. To the extent that these people eventually return to the workforce, with improved skills, that may serve to attenuate some of the fall in supply potential.

Unemployment

A defining feature of an economic downturn is a pronounced rise in unemployment. This can give rise to a risk of increased labour market 'mismatch', whereby people who are out of work for longer spells see their skills deteriorate, meaning they may no longer have the appropriate expertise looked for by businesses. Alternatively, the unemployed may simply be living too far away from companies that would like to hire them and regional mobility may be limited. Mismatch could be further exacerbated by large-scale restructuring of economic activity away from some industries (such as property-related sectors) and towards others (such as the export sector), meaning that the unemployed do not possess the skills, training or experience to quickly take up positions in faster-growing industries.

Economic studies have used labour market mismatch to help explain the rise and persistence of unemployment across Europe in the 1980s. This raised the possibility that the labour market was subject to 'hysteresis', whereby temporary events have long-lasting effects.⁽¹⁾ These effects, triggered by a cyclical rise in unemployment, could manifest themselves in people remaining unemployed for longer, which may in turn lead to higher equilibrium unemployment.

In the United Kingdom, the long-term unemployment rate is currently lower than in the mid-1980s and early 1990s (Chart 7), although it has continued to rise in recent months. The lower level of long-term unemployment indicates that any hysteresis-type effect may be smaller than suggested by previous experiences. But there remains considerable uncertainty about how the labour market will evolve and,

Chart 7 Unemployment rate by duration^(a)



(a) Annual data. Data prior to 1992 are based on LFS microdata. These annual observations correspond to the March-May quarter.

given the rise in the unemployment rate to 8%, there remains a risk that long-term unemployment might rise further.

Capital

The supply capacity of the economy depends in part on the amount of capital available to companies. Theoretically, capital includes a range of inputs, including both tangible assets — such as plant and machinery, buildings, vehicles and information technology — and intangible assets — such as copyrights, patents, trademarks and alike. In practice, the official data may not properly capture the importance of all of the assets.⁽²⁾ In the very long run, there is an equilibrium level of capital services, the size of which depends on fundamental influences such as the level of technology, the size of the population and the level of global interest rates. Over long time periods, businesses may adjust their actual capital holdings towards this desired level. But a more relevant measure for how much could be produced by businesses now — and, hence, potential supply — is the current level of capital available to them. Capital may be affected through gross investment, scrapping and asset-life lengthening, each of which will now be examined.

The obvious channel through which capital can be affected in a recession is through lower business investment. This tends to fall sharply during downturns (**Chart 8**) as companies revise down their expectations of future demand and become unwilling to invest in an uncertain economic climate. Investment has been particularly weak during the recent recession, perhaps reflecting an additional impact from the financial crisis. Companies may have found it more expensive

See Blanchard and Summers (1986), Jackman and Roper (1987) and Layard, Nickell and Jackman (1991).

⁽²⁾ See Marrano and Haskel (2006). The composition and quality of capital assets which are not properly captured in capital data are likely to affect aggregate TFP measurement.

to access the external funding they need to finance investment projects and, in some cases, they may not have been able to access external finance at all. Although business investment flows are small relative to the size of capital services, the unprecedented decline in business investment during the recession will have materially weakened capital services growth.

Chart 8 Business investment and recessions Recessions^(a) Business investment^(b) £ billions 40 30 20 10 ١₹ 0 1977 80 83 86 89 92 95 98 2001 04 07 10 (a) Recessions are defined as in Chart 6

(b) Chained-volume measure.

The implications of weak investment spending depend primarily on the extent to which investment projects have been deferred into the future rather than abandoned altogether. If companies decide to go back to projects that were previously postponed, strong investment in the recovery may partly compensate for the weakness in the recession. But past experiences show that investment is often slow to recover, perhaps reflecting some build-up of excess capacity, meaning that the impact on the level of capital services may persist.

A second channel through which capital can be affected is changes in its lifespan. Recessionary periods tend to lead to a rise in company liquidations (**Chart 9**). Some of the capital held by such distressed companies may be scrapped, rather than sold in a secondary market. Such capital scrapping appeared to occur in the early 1980s when assets, particularly plant and machinery in manufacturing, were scrapped before their normal service lives were reached.⁽¹⁾

The rise in liquidations during the recent recession, however, appears more moderate than might have been expected given the fall in output and the depth of the financial crisis (Chart 9). That may be a result of a relatively healthy position of the corporate sector prior to the crisis, or increased forbearance on the part of the banks and tax authorities. Or it may reflect the policy response of both the monetary and fiscal authorities to the crisis. Lower-than-expected corporate liquidations may indicate that premature scrapping has had less of an impact on





(a) Recessions are defined as in Chart 6.

(a) Netzasions are connected on the connected of the c

capital than has been typical in the past. Official capital stock data do try to capture capital scrapping (drawing on information on corporate default rates) but this is a difficult process. So there remains considerable uncertainty surrounding capital measures in the presence of premature scrapping.⁽²⁾

Set against the capital scrapping effect during a downturn is the possibility that, for those businesses that remain active, the effective lifetime of the installed capital may increase. For example, companies may choose to hold on to their machines for longer as reduced utilisation leads to less wear and tear. For any given level of investment, such asset-life lengthening would thus raise the level of available capital services.

The net effect on supply through changes in the lifespan of capital is ambiguous given that these capital scrapping and life-lengthening channels point in different directions. But given that insolvencies have remained relatively low, this suggests that this channel through to potential supply is weaker than in the past.

Productivity (TFP)

Much of the variation in actual output over the cycle appears to reflect changes in the efficiency with which companies combine their labour and capital inputs: their total factor productivity (TFP). So movements in potential output might also be expected to reflect movements in equilibrium TFP. Some of the channels fit neatly into the typical description of TFP. But others reflect factors that are not properly accounted

See Oulton and Srinivasan (2003) for a general discussion of scrapping.
 See ONS (2009).

for when measuring other inputs and so, by default, are captured in the TFP component. In broad terms, TFP is a residual that may reflect not only trend productivity growth, but other factors, such as the quality of capital and labour and influences from working capital. Below we discuss the main channels through which TFP may be affected.

First, TFP may have been adversely affected by a reduction in the number of new businesses. For example, prospective businesses may have found it harder to access the funding they need to start trading. This effect may have been exacerbated in the recent period given the financial nature of the shock. These businesses may be particularly important as a source of productivity growth, through the implementation of new technologies for instance. And they may also increase competition, forcing existing businesses to improve their operating efficiency. However, after falling around the start of 2008, company incorporations have started to rise again (Chart 10), perhaps indicating that the effect on TFP through lower start-ups was relatively small during the recent recession.

Chart 10 Company incorporations^(a)



(a) Data are for Great Britain and are non seasonally adjusted.

Second, certain features of the recession may exacerbate the impact on productivity, particularly if it is more productive sectors that are exposed. For example, productivity in the financial sector may have fallen back in the recent recession as lower demand for financial products stymied innovation. As measured by the ONS, financial sector output grew rapidly from the mid-1990s onwards (Chart 11). To the extent that the pace of growth of this sector may be lower following the crisis, overall output growth may be weaker. More generally, sterling's depreciation may have reduced the threat from foreign competitors, lowering the incentive for businesses operating in the most open UK markets to increase efficiency.

A third channel through which measured TFP might be affected is through changes in inputs that are unobservable, or difficult to measure. These could be intangible investment

Chart 11 Financial intermediation output and GDP



⁽a) Chained-volume measure at market prices(b) Data prior to 1987 Q4 are annual.

assets, such as copyrights or patents, which would perhaps be more appropriately reflected in measures of capital or labour. Indeed, research suggests that intangible assets would, in reality, probably form a large part of investment (Marrano and Haskel (2006)). But they can be difficult to measure, meaning that their effects frequently show up in measured TFP. Businesses may cut back on these intangible investments during recessions, mechanically lowering measured TFP growth. And there may also be channels through to structural TFP, for example if lower spending on training reduces individuals' productivity growth.

A fourth channel through which *measured* TFP might be affected is the working capital channel. Businesses require working capital to fund their day-to-day activities. This can come from a combination of internal cash flow, including liquidating inventories (Benito (2005)), bank borrowing or trade credit.⁽¹⁾ The tightening of corporate credit conditions that resulted from the financial crisis may have made it harder and more expensive for businesses to obtain working capital. In a growth accounting framework, this impairment to 'effective' supply would show up in a weak TFP residual.

In turn, there are three main routes through which a reduction in working capital might affect potential supply. First, businesses' production processes may be disrupted without access to sufficient working capital, meaning that the quantity that they can *effectively* supply shrinks. Survey evidence certainly indicates that tight credit conditions may have made it hard for some businesses to meet orders: the proportion of businesses in the CBI surveys reporting that external finance was limiting output remained elevated throughout 2009 and into 2010 (Chart 12).

⁽¹⁾ See the box on page 15 of the February 2009 *Inflation Report* for further details on trade credit.





Sources: CBI and ONS.

Second, the higher cost of working capital will naturally lead to a rise in businesses' production costs. With more expensive credit, some businesses will need to pay a higher cost when they borrow to cover wages and intermediate inputs. As a result, the effective price of these inputs will increase and businesses may use fewer of them, thus lowering production levels. In this way, potential supply might be adversely affected via the cost channel.

In addition, businesses' need for working capital may lead them to divert funds from other activities, indirectly affecting potential supply. For example, if businesses finance their short-term operations with funds previously intended for capital expenditure, business investment will be weaker than otherwise. While this lowers demand, it would also reduce supply through weaker capital services growth. Businesses whose activities or financial structure are considered more risky may find it particularly difficult to access working capital. To the extent that these businesses are a more significant source of dynamism and technical progress, reductions in working capital would reallocate resources from more to less productive companies, thus lowering the average level of productivity.

There is considerable evidence to support this picture of businesses facing working capital constraints. Both the British Chambers of Commerce (BCC) survey and the *Deloitte CFO Survey* pointed to businesses having to deal with severely constrained cash flow. The BCC cash-flow scores fell to record low levels (**Chart 13**). And chief financial officers in the *Deloitte CFO Survey* reported that increasing cash flow would be a top priority in 2010 (**Chart 14**).

A shortage of working capital is likely therefore to have played a significant role in constraining the output of some

Chart 13 Survey indicators of businesses' cash-flow positions^(a)

- Manufacturing

— Services

Manufacturing sector average^(b)
 Services sector average^(b)



Sources: BCC and Bank calculations.

 (a) Companies are asked: 'During the last three months how has your cash flow changed: improved/same/worsened?'.
 (b) Averages since 1992.





Source: The Deloitte CFO Survey 2009 Q4.

(a) Deloitte asked CFOs to select their top three priorities for 2010 from a list of ten. The score for each factor above is the percentage of CFOs that have included the factor in their top three priorities. The chart shows the top seven factors selected by CFOs.

companies. But this effect is unlikely to persist as working capital constraints ease.

Implications for the evolution of potential supply

The path of potential supply is a key concern for monetary policy makers. But potential output is difficult to measure as it is both unobservable and can be defined in a number of different ways. As such, it is easy to see why competing studies provide such a wide range of estimated effects. This article has applied a growth accounting 'bottom-up' approach to understand the channels through which supply may have been affected during the recent UK recession.

⁽a) This measure is produced by weighting together balances for the manufacturing sector and the consumer/business service sector using shares in nominal value added. Manufacturing companies are asked: 'What factors are likely to limit output over the next three months?'. Service sector companies are asked: 'What factors are likely to limit your ability to increase the level of business over the next twelve months?'.

It is likely that the downturn has resulted in a fall in companies' effective supply capacity through a number of the channels described above. That is consistent with both the resilience in inflation and survey estimates of spare capacity within companies. In particular, both capital and labour inputs are likely to be negatively affected, and the efficiency with which these inputs are combined may have also deteriorated somewhat.

The developments observed in the data can shed some light on the relative impact these channels have on supply. In particular, relative to the decline in output, employment has fallen by less than in previous recessions. That suggests the deterioration in equilibrium employment may be less acute relative to past experiences. Similarly, although the number of insolvencies has risen, it has so far done so by less than might be expected given the fall in output, pointing to less capital scrapping than may have been expected. Other evidence, however, points to larger effects on supply. Investment has fallen substantially in the recession, pushing down on the level of capital services available to businesses. And the available evidence indicates that companies' working capital is likely to have restricted their effective supply. But significant uncertainty remains around the extent to which supply capacity has been impaired through all of these channels.

Future developments in supply also remain uncertain. If credit conditions ease, working capital effects on supply are likely to dissipate quickly. Also, if the economic recovery proves robust, some of the negative supply effects may be more muted than expected, while others may be partly reversed. Indeed, according to a recent survey by the Bank's Agents, most companies appear not to have permanently reduced their supply capacity.⁽¹⁾ For example, a majority of businesses reported that they could increase output by more than 5% without a material increase in recruitment or capital expenditure. However, if demand growth proves anaemic, the effects of higher unemployment and lower participation on labour supply, together with increased capital scrapping and cancelled investment projects, would bear down more persistently on the economy's supply potential.

Given this uncertainty, monitoring the supply side of the economy will, as ever, be vital in assessing the balance between aggregate demand and aggregate supply. Such an assessment, and associated monetary policy actions, is necessary to ensure that the inflation target is met in the medium term.

⁽¹⁾ For further discussion, see page 31 of the May 2010 Inflation Report.

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Public attitudes to inflation and monetary policy

By Alina Barnett, Clare Macallan and Silvia Pezzini of the Bank's Monetary Assessment and Strategy Division.⁽¹⁾

Inflation has been volatile in the past three years. This article examines how that has affected households' attitudes to inflation and to monetary policy more generally. Some of the volatility in inflation has fed through to households' perceptions of inflation, as measured by the Bank/GfK NOP survey. But inflation expectations have responded less than changes in perceptions: households may have placed weight on the weak economic environment and the inflation target rather than simply extrapolating past trends in prices. Public satisfaction with the Bank, which deteriorated between 2007 and 2009, has improved in recent quarters.

Introduction

Inflation has been volatile in the past three years. Annual inflation, as measured by the consumer prices index (CPI), rose to 5.2% in September 2008, fell back sharply over the following twelve months to 1.1% and then rose again to 3.7% in April 2010. That volatility in part reflected the temporary effects from a number of factors, including movements in food and energy prices and the temporary reduction in the standard rate of VAT (between 1 December 2008 and 1 January 2010). But prices have also been affected by two more fundamental economic forces: sterling's depreciation since mid-2007 is likely to have pushed up inflation while the financial crisis and the associated deterioration in demand have acted in the opposite direction.⁽²⁾

The Bank of England's monetary policy objective is to maintain price stability. Stable prices are defined by the Government's inflation target, which is currently 2% as measured by the annual change in the CPI. Subject to that, the Bank is also tasked with supporting the Government's economic objectives, including those for growth and employment. The Monetary Policy Committee (MPC) seeks to achieve those objectives by setting the level of Bank Rate and, since March 2009, by purchasing assets financed through the issuance of central bank reserves, a programme sometimes referred to as quantitative easing.⁽³⁾

The Bank's success in meeting its monetary policy objectives depends in part on the credibility of the monetary policy framework itself: if people expect inflation to return to target in the medium term then they may behave in such a way that deviations of inflation from target are more short-lived. There are various channels through which inflation expectations can influence inflation. If households expect high inflation in the future, for example, they are likely to demand higher nominal wages and push up on companies' costs. And if companies expect to bear higher production costs, then they will raise their own prices for the goods and services they produce. The prices that households and businesses expect in the future will also affect their spending and investment decisions today.

Inflation expectations cannot be directly observed. But surveys of households, businesses and economists, together with measures derived from the prices of financial market instruments, can act as a guide. Since 1999, the Bank has commissioned a survey of households' attitudes to inflation and interest rates, conducted on its behalf by GfK NOP. The survey was extended in May 2009 to include questions relating to the MPC's policy of asset purchases, or 'quantitative easing'. The box on page 116 describes the Bank/GfK NOP survey in more detail.

This article examines whether the increase in the volatility of inflation in the past three years has affected households' attitudes to inflation and to monetary policy more generally. The first section examines how households' perceptions of inflation have changed relative to measured inflation in that period. The following section considers how households' expectations for inflation, both in the near term and in the longer term, have behaved. The final section examines how public attitudes to monetary policy more broadly have evolved in recent years.

⁽¹⁾ The authors would like to thank Philip Barrett, Sally Hills, Tom O'Grady and

Bryony Willmott for their help in producing this article. (2) For more detail on the recent path of inflation, see Section 4.1 of the May 2010 Inflation Report.

⁽³⁾ For further discussion of the Bank's asset purchases, see Benford et al (2009).

The Bank/GfK NOP survey

Since 1999, the Bank has commissioned GfK NOP to survey the general public's attitudes to inflation and monetary policy. These surveys are conducted in February, May, August and November of each year. They cover around 2,000 individuals, with an additional 2,000 interviewed in an extended survey each February.

Rather than focusing on a specific measure of inflation, such as the consumer prices index or the retail prices index, the survey is phrased in terms of the prices of goods and services in general. Respondents are asked how they perceive prices to have changed over the past twelve months and how they expect them to change over the year ahead. Additional questions asking individuals about their expectations for inflation in two and in five years' time were introduced in February 2009. In addition to the questions on prices, individuals are also asked a range of questions to assess how well they understand the Bank's monetary policy framework and the tools by which the inflation target can be achieved. In March 2009, the Monetary Policy Committee announced that, in addition to setting Bank Rate, in order to meet the inflation target it would start to inject money directly into the economy — a policy that has come to be known as 'quantitative easing'. Since May 2009, the survey has included additional questions designed to assess the public's awareness of quantitative easing and their beliefs about how this policy would help to ensure that inflation remains close to the target in the medium term.

As with all surveys, the Bank/GfK NOP survey is subject to sampling error. The sample is designed and weighted to ensure that it is representative of known population data on age, gender, social class and region.

Perceptions of inflation

CPI inflation has been more volatile since 2007 compared with the previous ten years. Much of that volatility reflected short-term movements in food and energy prices (**Chart 1**) and the temporary reduction in the standard rate of VAT. But prices have also been affected by two more fundamental economic forces: the depreciation of sterling since mid-2007 is likely to have pushed up both import and consumer prices while the financial crisis and the associated deterioration in demand have acted in the opposite direction. In the past three years, inflation has deviated from target more than in the first ten years of the MPC's existence (**Table A**).

The increased volatility of inflation has, in part, been reflected in movements in households' perceptions of inflation

Chart 1 Contributions to annual CPI inflation from food and energy^(a)



Sources: ONS and Bank calculations.

(a) Food prices include non-alcoholic beverages. Energy comprises utilities (electricity, gas and other fuels) and fuels and lubricants.

Table A Volatility in annual inflation

Percentage points

	St	Standard deviations			Mean deviations from target ^(a)		
	1997– 2003	2004–07	2008– present	1997– 2003	2004–07	2008– present	
CPI	0.4	0.5	1.0	n.a.	0.0	1.0	
RPIX	0.4	0.6	1.4	-0.1	n.a.	n.a.	

Sources: ONS and Bank calculations

(a) The inflation target was changed on 10 December 2003 to 2% as measured by the CPI from 2.5% as measured by the RPIX.

(Chart 2). Perceptions rose in tandem with official estimates of inflation between late 2007 and early 2009. But they were slower to respond to the subsequent fall. This section considers what factors might influence households' perceptions of inflation.





Sources: Bank/GfK NOP survey and ONS.

(a) The inflation target was changed on 10 December 2003 to 2% as measured by the CPI from 2.5% as measured by the RPIX. Three oft-cited influences on households' inflation perceptions are food and energy prices and media coverage of the economy.⁽¹⁾ Around 80% of respondents to the February 2010 Bank/GfK NOP survey cited at least one of household energy, transport and petrol, and food and drink as being 'very important' when forming their perceptions of inflation. And over half cited media reports about inflation as being either 'very important' or 'fairly important' when forming their perceptions (**Table B**).

 Table B
 Percentages of respondents citing influences on inflation

 perceptions as either 'very' or 'fairly' important(a)

,	Very important	Fairly important	Total ^(b)
Household energy	62	25	87
Transport and petrol	59	24	82
Food and drink	54	34	88
Cost of housing ^(c)	31	23	53
Clothing and footwear	29	36	65
Media reports about inflatio	in 21	38	59
Media reports about VAT	18	39	58
Other	10	24	34

Source: Bank/GfK NOP survey

(a) Respondents could select more than one option. This question is asked only in the extended February

survey. (b) Components may not sum to totals due to rounding.

(c) For example, mortgage payments and rent.

Individuals' perceptions of inflation may be sensitive to movements in food and energy prices because it is relatively easy for them to assess how the prices of these items have changed. People tend to buy a broadly comparable basket of food from week to week, and have similar energy requirements each year. The prices of food and energy items also tend to be highly visible: the price of fuel, for example, can be observed easily at petrol stations and supermarkets.

Similarly, media reports provide a ready source of information on inflation that can be obtained without requiring much time or effort. More frequent mentions of inflation in the media may lead to an increase in the number of people who take notice of inflation. And it may cause people to update their views on inflation on a more regular basis (Carroll (2003)).

The rise in inflation perceptions in 2008 is consistent with the increase in food and energy price inflation and with the pickup in media coverage that occurred at that time. Annual food price inflation rose from 3% in August 2007 to 13% in August 2008 (Chart 3) — its highest rate in the period since 1997. Energy price inflation rose from around zero in August 2007 to 30% in September 2008, again its highest rate in the period since the Bank was granted operational independence for monetary policy. The 2007/08 rise in inflation also received greater coverage in the media than did previous rises in inflation (Chart 4). But food and energy price inflation. So it is less clear that these factors can explain why

Chart 3 Inflation perceptions and food and energy price inflation $\ensuremath{^{(a)}}$



(a) Food prices include non-alcoholic beverages. Energy comprises utilities (electricity, gas and other fuels) and fuels and lubricants.

Chart 4 Inflation perceptions and media discussions of rising prices



Sources: Bank/GfK NOP survey and © 2007 Factiva, Inc. All rights reserved

perceptions were slow to respond to the subsequent fall in inflation.

In summary, the recent rise in the volatility of inflation appears to have been partially reflected in households' perceptions of inflation. Rising food and energy prices, along with greater media coverage, can help to explain why perceptions rose in tandem with measured inflation in early 2008. Those factors may also have contributed to the more recent rise in perceptions in 2010.

The next section considers changes in the behaviour of households' inflation expectations.

⁽a) Six-month moving average. Based on searches designed to count the number of headlines referring to increases in inflation, wages, and food and energy prices but, where possible, excluding headlines referring to non-UK inflation and house prices. Newspapers included in the search are the Daily Express, the Daily Mail, the Daily Mirror, the Daily Star, The Daily Telegraph, The Cuardian, The Independent, The Independent on Sunday, The Mail on Sunday, the News of the World, The Observer, The People, The Sun, the Sunday Mirror, The Sunday Telegraph, The Sunday Times and The Times.

For further discussion of how food/energy prices and media coverage influence inflation perceptions, see Barnett et al (2009) and Benford and Driver (2008).

Inflation expectations

Households' expectations for inflation in the year ahead have diverged from their perceptions of current inflation for much of the past three years (Chart 5). Prior to 2008, there tended to be a close relationship in the Bank/GfK NOP survey between the median household's inflation perception and the median near-term inflation expectation. But expectations rose by less than perceptions following the increase in inflation between August 2007 and September 2008 and fell more quickly than perceptions in the final months of 2008 and early 2009.⁽¹⁾

Chart 5 Median inflation perception and expectation for inflation one year ahead



Source: Bank/GfK NOP survey.

More recently, in the May 2010 Bank/GfK NOP survey, households' expectations for inflation in the near term picked up sharply, rising back towards their perceptions of current inflation. Expectations for inflation in the next two years also rose, albeit to a lesser extent (**Chart 6**). In contrast, longer-term expectations were little changed.

Indeed, households' expectations for inflation in the longer term have generally been more stable than their near-term expectations during the recent period of inflation volatility. Since February 2009 (when questions on longer-term expectations were first asked in the Bank/GfK NOP survey), the five year ahead measure has picked up by less than the one year ahead measure. That relative stability of longer-term inflation expectations is also a feature of the YouGov/Citigroup survey. Having fallen back in 2008, expectations for inflation five to ten years ahead have drifted up a little since then. But they have been much less volatile than the corresponding one year ahead measure.

This section considers what factors might have driven households' near-term inflation expectations during the past two years. It then examines changes in longer-term expectations, exploring what factors might have accounted for their stability relative to shorter-term measures.

Chart 6 Median household's longer-term inflation expectations

Bank/GfK NOP five years ahead — YouGov/Citigroup five to ten years ahead

Per cent

Bank/GfK NOP two years ahead — YouGov/Citigroup one year ahead Bank/GfK NOP one year ahead



Sources: Bank/GfK NOP survey, Citigroup and YouGov.

Near-term inflation expectations

Households' perceptions of inflation are likely to be an important influence on their expectations for inflation in the year ahead. For example, some individuals may use a simple rule of thumb to forecast inflation, expecting inflation over the next year to be similar to that over the past year. Around eight in every ten respondents to the Bank/GfK NOP survey in February 2010 cited past changes in prices as being either 'very important' or 'fairly important' when forming their near-term inflation expectations, as in previous years. In past Bank/GfK NOP surveys, around half of the respondents reported that they expected inflation in the coming year to remain unchanged from its current perceived rate. That proportion fell back significantly in the second half of 2008 and has been around one third since then (**Chart 7**).





(a) Ignores those who answer 'don't know' to either question

 The box on page 37 of the May 2010 Inflation Report compares expectations in the Bank/GfK NOP survey with other available measures. The increased volatility of inflation has also been accompanied by an increase in the dispersion of near-term expectations across individuals (**Chart 8**). For example, a greater proportion of respondents to the February 2010 Bank/GfK NOP survey thought that prices over the year ahead would either be unchanged or fall than did in mid-2006, when the median inflation expectation was at a similar level.

Chart 8 Distribution of households' inflation expectations one year ahead



Source: Bank/GfK NOP survey.

The following subsections consider two factors that could help to explain the pattern of expectations in the past two years. First, the financial crisis, and the associated decrease in demand, may have led some people to lower their near-term inflation expectations relative to their perceptions of inflation. Second, observation of past episodes of high inflation, after which inflation has typically reverted to target, may have led some individuals to place more weight on the 2% inflation target when forming their expectations.

Developments in demand

The fall in demand for UK goods and services over the past two years is likely to have put downward pressure on prices and thus on some individuals' near-term inflation expectations. Real final domestic demand was around 5% lower in 2009 Q2 than it was in 2008 Q2. Almost 80% of respondents to the February 2010 Bank/GfK NOP survey said that the state of the British economy was either a 'very' or 'fairly' important factor in forming their near-term inflation expectations. Consistent with that, the proportion of respondents who expected inflation in the next year to be no more than 1% rose in 2008, at the same time that GDP growth fell sharply (Chart 9).

For some people the effect of falling demand on their inflation expectations may have been balanced by the elevated level of inflation. Of those respondents who said that the state of the economy had an important bearing on their near-term inflation expectations, around 90% also said that their Chart 9 Percentage of households who expected inflation in the year ahead to be no more than 1% and real GDP



perception of current inflation was a very or a fairly important influence. In recent quarters, the level of real final domestic demand has recovered somewhat while perceptions of inflation have remained high. Some of the rise in near-term inflation expectations since February 2009 could therefore reflect a waning influence from demand.

The role of the inflation target

Some households may use the inflation target as a guide to near-term inflation. Indeed, over half of the respondents to the Bank/GfK NOP survey in February 2010 reported that the inflation target was an important factor in forming their expectations for inflation in the year ahead. The proportion of respondents who expected inflation in the year ahead to be within 1 percentage point of the target has gradually risen to around one quarter in May 2010 from around one sixth in August 2008.

The greater weight being placed on the inflation target may reflect households learning from past observation that deviations of inflation from target tend to be short-lived. There have been three episodes in the history of the MPC in which inflation rose more than 1 percentage point above the target, starting in: March 2007, May 2008 and January 2010. In the first two instances, the deviation of inflation from target proved to be temporary and inflation subsequently fell below 2%. The MPC also expects inflation to return to target from its currently elevated level, as set out in the May 2010 *Inflation Report*. The experience of the previous episodes could have caused households to now place more weight on the inflation target when forming their expectations for near-term inflation.

Households with a greater awareness of the monetary policy framework appear to be more likely to have a view about the prospects for inflation. In the May 2010 Bank/GfK NOP

survey, households who had heard of quantitative easing were less likely to answer 'don't know' when asked what they expected inflation would be in the year ahead than those who had not (**Chart 10**). But, aside from that difference, the distribution of inflation was broadly similar across the two groups.

Chart 10 The distribution of one year ahead inflation expectations for those who have and have not heard of quantitative easing



Source: Bank/GfK NOP survey.

The two hypotheses discussed here have different implications for monetary policy. The MPC's remit recognises that inflation will, on occasion, depart from the 2% target as a result of shocks and disturbances. The MPC would be concerned, however, if temporary increases in inflation led to a persistent increase in households' inflation expectations because that could make it harder to return inflation to target. If the stability of inflation expectations relative to perceptions reflected the fall in demand offsetting elevated perceptions, then there is a risk that near-term inflation expectations might increase if demand continued to recover. That could be consistent with the rise in near-term inflation expectations in the most recent Bank/GfK NOP survey. In contrast, if people placed more weight on the MPC's ability to return inflation to target, then near-term inflation expectations might be less responsive to economic news.

Longer-term inflation expectations

As noted above, households' longer-term inflation expectations appear to have been less volatile than their near-term counterparts, despite falling in early 2008 (Chart 6). This section explores what factors might explain the relative stability of longer-term inflation expectations and what might have driven their fall in 2008, which occurred against a background of rising inflation.

The relative stability of longer-term inflation expectations could reflect a well-functioning inflation-targeting regime. If

households believe that movements in inflation away from target will be transitory then an increase in the volatility of inflation should not feed through into their expectations for inflation in the longer term.

But other factors appear necessary to explain the fall in longer-term inflation expectations in 2008. For example, the deterioration in the economic environment may have led some households to revise down their longer-term inflation expectations (Chart 11). Perhaps reflecting that, the percentage of households who reported that they expected prices to fall or remain unchanged on average over the next five to ten years reached a record high in late 2008 (Chart 12). The fall in longer-term inflation expectations also coincided with a near fourfold increase in the number of media headlines on deflation, suggesting that media coverage may have influenced expectations about inflation in the longer term as well as in the short term.





(a) Rolling three-month averages.(b) Chained-volume measure at market prices.

Overall, measures of households' longer-term inflation expectations appear to be well-anchored. But a more prolonged period of above-target inflation could increase the risk that inflation expectations rise. The MPC continues to monitor data on longer-term inflation expectations closely.

Attitudes to monetary policy and satisfaction with the Bank

The public's attitude to monetary policy may have been affected by the recent volatility of inflation, together with wider changes in the UK economy such as the financial crisis and associated recession. This section discusses how both public awareness of and satisfaction with monetary policy have changed in the past three years. It also examines

Chart 12 Households' expectations for inflation over the next five to ten years and media discussion of falling prices



(a) Rolling three-month averages.

(b) Six-month moving average. Based on searches designed to count the number of headlines referring to deflation and decreases in inflation, wages, and food and energy prices but, where possible, excluding headlines referring to non-UK deflation and house prices. Newspapers included in the search are as in **Chart 4**.

individuals' perceptions of past changes in interest rates and their expectations for future developments.

Awareness of the monetary policy framework

Households' awareness of the monetary policy framework appears to have been little affected by recent economic events. The proportion of respondents to the Bank/GfK NOP survey who knew, without guidance, that 'Britain's basic interest rate level' is set by either the Bank or the MPC has remained around 40% since the survey began in 1999. And when options were offered, around 70% of respondents identified the Bank of England as the group responsible for setting interest rates. Broadly the same proportion of respondents to the May 2010 survey — one half — had heard about quantitative easing as had when the question was first asked in May 2009. Those who had heard of quantitative easing were more likely to know who sets monetary policy than those who had not.

Satisfaction with the Bank

On balance, the public have been satisfied with the performance of the Bank in the past three years (Chart 13). But the degree of satisfaction deteriorated between 2005 and 2009, before improving more recently.

Some of the deterioration in satisfaction since late 2005 is likely to have reflected concerns about the severity of the financial crisis and the depth of the recession (Chart 13). Consistent with that, satisfaction has been more resilient among individuals who are more aware of the actions that the Bank has taken in response to those events. Having cut Bank Rate sharply, from 5.75% in late 2007 to 0.5% in March 2009, the MPC injected £200 billion of money into the economy by

Chart 13 Satisfaction with the Bank and real GDP



Sources: Bank/GfK NOP survey and ONS.

 (a) Chained-volume measure at market prices.
 (b) Net satisfied is the percentage of respondents who were fairly or very satisfied with the Bank less the percentage who were fairly or very dissatisfied.

purchasing assets financed through the issuance of central bank reserves (a programme sometimes referred to as quantitative easing). In the May 2010 Bank/GfK NOP survey, the net proportion of respondents who were satisfied with the Bank was around 50% among those who had heard of quantitative easing but only about 15% among those who had not (Chart 14).

Chart 14 Satisfaction with the Bank and awareness of quantitative easing^(a)



Source: Bank/GfK NOP survey.

(a) Of those who answered the question in May 2010, 45% had heard of quantitative easing and

55% had not. (b) Net balance satisfied is the percentage of respondents who were fairly or very satisfied with the Bank less the percentage who were fairly or very dissatisfied.

Monetary policy

Households have, on balance, perceived a fall in interest rates on deposits, mortgages and bank loans in the past two years (Chart 15). But those perceived changes in interest rates appear smaller than the fall in average interest rates on the stocks of outstanding savings and debt, which in turn have fallen by less than Bank Rate since late 2007. Tighter credit



Chart 15 Interest rate perceptions and effective household interest rates

(a) Perceived interest rates are the percentage of respondents who thought that interest rates had risen over the past year less the percentage who thought that rates had fallen. Data are quarterly observations

(b) Effective deposit rate is the three-month average of household time and sight deposit

effective stock rates weighted by the outstanding balances.

(c) Effective loan rate is the three-month average of household secured and unsecured borrowing effective stock rates weighted by the outstanding balances.
 (d) Bank Rate is the three-month average.

conditions have driven a wedge between movements in Bank Rate and in retail rates. Changes in credit conditions may also explain why households do not appear to have recognised the full extent of the measured reduction in interest rates. For example, an individual looking to borrow money may choose not to take out a loan because the interest rate is too high. In that instance, his perception of interest rates might rise but there would be no effect on the average interest rate on the stock of loans outstanding.

Households' expectations for future monetary policy have varied considerably in recent years. On balance, households have only once expected interest rates to fall, in November 2008 (Chart 16). That survey followed the co-ordinated action taken by central banks around the globe on 8 October 2008, which included the MPC cutting Bank Rate by 50 basis points on that day, and the MPC's decision to cut Bank Rate by a further 150 basis points on 6 November. The size of those cuts may have led people to expect further significant reductions in interest rates and thus pushed the net balance below zero. But fewer individuals may have expected interest rates to fall further as the MPC continued to reduce Bank Rate and the scope for additional reductions became correspondingly smaller.

Conclusion

This article has examined whether the increased volatility of inflation in the past three years has affected households' attitudes to inflation and to monetary policy more generally. Over that period, households' perceptions of inflation, as measured by the Bank/GfK NOP survey, appear to have reflected some of that volatility. But their near-term inflation





Source: Bank/GfK NOP survey

(a) Percentage of respondents who thought that interest rates would rise less the percentage who thought that rates would fall

expectations have responded less to changes in perceptions. And their expectations for inflation in the longer term by less still.

Households' perceptions of inflation rose in tandem with official estimates of inflation between late 2007 and early 2009. But perceptions were slower to respond to the subsequent fall in inflation.

Households' expectations for inflation in the year ahead have diverged from their perceptions of current inflation for much of the past three years. It is likely that some individuals lowered their near-term inflation expectations in response to the financial crisis and the associated decrease in demand. But observation of past episodes of high inflation, after which inflation has typically reverted to target, may also have led people to place more weight on the 2% inflation target when forming their expectations.

More recently, households' near-term inflation expectations have risen back towards perceptions of current inflation. But their expectations for inflation in the longer term remain little changed, likely reflecting the credibility of the inflation-targeting regime. A more prolonged period of above-target inflation could, however, increase the risk that inflation expectations rise.

Public awareness of the UK monetary policy framework does not appear to have been affected by recent economic events. But it is likely that concerns about the severity of the financial crisis and the depth of the recession weighed on the public's satisfaction with the Bank. Over the past year, however, public satisfaction with the Bank has started to recover.

Sources: Bank of England and Bank/GfK NOP survey.

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Contagion in financial networks

Summary of Working Paper no. 383 Prasanna Gai and Sujit Kapadia

In modern financial systems, an intricate web of claims and obligations links the balance sheets of a wide variety of intermediaries, such as banks and hedge funds, into a network structure. The advent of sophisticated financial products, such as credit default swaps and collateralised debt obligations, has heightened the complexity of these balance sheet connections still further. As demonstrated by the financial crisis, especially in relation to the failure of Lehman Brothers and the rescue of American International Group (AIG), these interdependencies have created an environment for feedback elements to generate amplified responses to shocks to the financial system. They have also made it difficult to assess the potential for contagion arising from the behaviour of financial institutions under distress or from outright default.

This paper models two key channels of contagion in financial systems. The primary focus is on how losses may potentially spread via the complex network of direct counterparty exposures following an initial default. But the knock-on effects of distress at some financial institutions on asset prices can force other financial entities to write down the value of their assets, and we also model the potential for this effect to trigger further rounds of default. Contagion due to the direct interlinkages of interbank claims and obligations may thus be reinforced by indirect contagion on the asset side of the balance sheet — particularly when the market for key financial system assets is illiquid.

Our modelling approach applies statistical techniques from complex network theory. In contrast to most existing theoretical work on interbank contagion, which considers small, stylised networks, we demonstrate that analytical results on the relationship between financial system connectivity and contagion can be obtained for structures which reflect the complexities of observed financial networks. And we provide a framework for isolating the probability and spread of contagion when claims and obligations are interlinked.

The model we develop explicitly accounts for the nature and scale of macroeconomic and bank-specific shocks, and the complexity of network structure, while allowing asset prices to interact with balance sheets. The interactions between financial intermediaries following shocks make for non-linear system dynamics, whereby contagion risk can be highly sensitive to small changes in parameters.

Our results suggest that financial systems may exhibit a robust-yet-fragile tendency: while the probability of contagion may be low, the effects can be extremely widespread when problems occur. The model also highlights how seemingly indistinguishable shocks can have very different consequences for the financial system depending on whether or not the shock hits at a particular pressure point in the network structure. This helps explain why the evidence of the resilience of the system to fairly large shocks prior to 2007 was not a reliable guide to its future robustness.

The intuition underpinning these results is as follows. In a highly connected system, the counterparty losses of a failing institution can be more widely dispersed to, and absorbed by, other entities. So increased connectivity and risk sharing may lower the probability of contagious default. But, conditional on the failure of one institution triggering contagious defaults, a high number of financial linkages also increases the potential for contagion to spread more widely. In particular, high connectivity increases the chances that institutions which survive the effects of the initial default will be exposed to more than one defaulting counterparty after the first round of contagion, thus making them vulnerable to a second-round default. The effects of any crises that do occur can, therefore, be extremely widespread.

The geographical composition of national external balance sheets: 1980–2005

Summary of Working Paper no. 384 Chris Kubelec and Filipa Sá

Financial globalisation has been one of the most striking phenomena happening in the world economy in the past two decades. Until recently, very little was known about the size and composition of countries' external financial assets and liabilities. This gap was partly narrowed by the work of Lane and Milesi-Ferretti, which provides estimates of the total external financial assets and liabilities of 145 countries, from 1970 to 2004. These data show that there has been a marked increase in the ratio of foreign assets and liabilities to GDP, particularly since the mid-1990s. This increase has been especially pronounced among industrial countries, where financial integration has exceeded trade integration. However, very little is known about the geographical composition of assets and liabilities. This paper contributes to a better understanding of the geographical composition of countries' external positions by constructing a data set of stocks of bilateral assets and liabilities for a group of 18 countries, covering the period from 1980 to 2005.

The data distinguish between four asset classes: foreign direct investment, portfolio equity, debt, and foreign exchange reserves. For the first three asset classes, missing data are constructed using gravity models, which have been extensively applied to explain cross-border trade and have been increasingly used to explain financial stocks and flows. These models explain bilateral assets by the geographical and historical proximity between the source and host countries, including variables such as distance, time difference, whether the source and host countries share a common border, a common language, or have colonial links. These models tend to have a large explanatory power, suggesting that financial markets are not frictionless, but are segmented by information asymmetries and familiarity effects. For reserves, a two-step procedure is adopted. First, data on the currency composition are collected and then are translated into geographical composition.

To give a flavour of the data set and identify the key stylised facts that emerge from it, a number of tools from network

analysis are applied. The international financial system is represented as a network, where nodes represent countries and links represent bilateral financial assets. The evolution of the global financial network over time shows that there has been a remarkable increase in interconnectivity over the past two decades. Financial links have become larger and countries have become more open. Financial links are centred around a small number of nodes, which have many and large links. In addition, the average path length of the global financial network has decreased over time and the clustering coefficient has increased. These are properties of 'small-world' networks which, from a stability perspective, are robust yet fragile. Because these networks are highly interconnected and some nodes have multiple and large links, they are susceptible to targeted attacks affecting the key financial hubs. Disturbances to the key hubs would be transmitted rapidly and widely throughout the network.

For comparison, the same type of analysis is applied to the global trade network. There are some common features with the financial network. In particular, the trade network also shows an increase in interconnectivity over time and is centred around some key hubs. However, there are important differences between the trade and financial networks. While the financial network is centred around the United States and the United Kingdom, which have large links and are connected to most other countries, the trade network shows strong intracontinental links and is arranged in three clusters: a European cluster (centred on Germany), an Asian cluster (centred on the United States).

This data set can be used for a number of applications. For example, it can be used to examine how financial links affect the international transmission of shocks. Other possible applications include an analysis of whether emerging markets have decoupled from advanced economies and whether business cycles in the G7 have become more synchronised.

Imperfect credit markets: implications for monetary policy

Summary of Working Paper no. 385 Gertjan W Vlieghe

This paper aims to address the following questions. If credit markets do not work perfectly, how does that affect the overall economy? Furthermore, if monetary policy can influence the level of economic activity in the short run, how should monetary policy be set optimally in the presence of credit market imperfections? This is a timeless issue, but of course the global financial crisis that started in 2007 has renewed interest in the topic of credit frictions and monetary policy.

It is thought that credit markets may not operate perfectly because of limitations on how much information a lender has about the quality of the borrower, or limitations on how well contracts between lenders and borrowers can be enforced. One consequence of such credit market imperfections might be that borrowing can only take place (or take place more cheaply) against collateral, such as land, buildings and machines. If that is the case, then changes in the value of collateral will affect the ability of firms and households to borrow. This could have important consequences for aggregate economic activity.

I consider in particular a case where there are two types of firms, those with high productivity and those with low productivity. Ideally, those with low productivity would lend all their resources to high productivity firms, so that high productivity firms can carry out all production. But when there are collateral constraints, some production is also carried out by low productivity firms. The total level of output is therefore determined by how much of the economy's productive resources are held by the high productivity firms. High productivity firms still end up borrowing from low productivity firms, but not as much as would be desirable in the absence of borrowing constraints.

Following a shock that reduces current output or the price of capital (which is used as collateral), the net worth of high productivity firms falls by more than the net worth of low productivity firms, because high productivity firms are highly leveraged. This means that high productivity firms can afford less capital for production in the following period. Because capital shifts to those with lower productivity, this reduces expected future returns on capital, which depresses the value of capital today, and exacerbates the initial redistribution of net worth. Output falls further in the subsequent period, as the economy's resources are now used much less efficiently. It takes time for the high productivity firms to rebuild their share of the capital stock, and output is therefore depressed for many periods, even if the initial disturbance only lasted a single period.

How does this mechanism interact with monetary policy? First, the transmission mechanism of interest rates in this model works through sticky goods prices as well as a reallocation of resources to less efficient producers. So the output response to monetary shocks is larger than in a model without borrowing constraints. Second, when responding to productivity shocks, the monetary policy maker faces a trade-off. It is efficient for output to fall immediately following an adverse productivity shock. So, considered in isolation, there is no reason for a monetary policy maker to offset the initial output fall by letting inflation rise temporarily. But the presence of borrowing constraints means that there is a trade-off between short-term inflation and output fluctuations because of their effect on future output. The larger the immediate fall in output, the larger the reallocation of resources away from the most productive firms, which will lead to future output being inefficiently low. By allowing inflation to rise temporarily and thereby dampening the initial output fall, monetary policy can mitigate inefficiently large future output fluctuations in subsequent periods.

But monetary policy cannot accommodate inflation too far, as inflation expectations must remain anchored, and inflation variability itself is costly too. So this begs the question of how much inflation variability it is optimal to tolerate. I answer this question formally by assuming that the monetary policy maker maximises the welfare of the private sector. There are two frictions in the economy: credit market frictions and sticky prices. The policymaker has a single instrument available, the nominal interest rate, to offset the inefficiencies generated by these frictions. I find that the cost of responding to inflation too aggressively can be large, by creating excessive variability in output. By allowing only a small amount of inflation variability, policy can achieve a large reduction in output variability. This trade-off between inflation variability and output variability is consistent with the remit of the Monetary Policy Committee, which aims for price stability partly as a precondition for the wider economic goal of economic stability. Thus in this paper we are able to provide a new aspect of the transmission mechanism that supports that remit.

Evolving UK macroeconomic dynamics: a time-varying factor augmented VAR

Summary of Working Paper no. 386 Haroon Mumtaz

After the introduction of inflation targeting in 1992, the United Kingdom experienced a period of low inflation and stable output growth often referred to as the 'great stability'. Recent research into this phenomenon has suggested that this stability had been unmatched since the gold standard. A growing empirical literature has examined this apparent change in the dynamics of the UK economy, perhaps due to shifts in the monetary policy regime. These papers usually employ empirical models that contain a limited amount of macroeconomic variables - typically using systems of equations known as vector autoregressions (VARs): a set of equations where the explanatory variables in each equation are the complete set of lagged variables in the system. GDP growth, inflation and the nominal interest rate are the typical variables included in VARs that describe the transmission mechanism of monetary policy. If, in reality, the central bank examines a wider set of variables when setting policy, estimates of the monetary policy shock derived from these small empirical models may be biased — ie not completely disentangled from non-policy shocks. As a consequence an accurate assessment of structural shifts may be hampered.

This paper therefore explores the dynamics of the United Kingdom's macroeconomy using a VAR model that incorporates a larger amount of economic information than a typical tri-variate model. In particular, we use an extended version of the 'factor augmented VAR' (FAVAR) model recently proposed in the literature. The idea behind the FAVAR model is that the bias created by the difference in the information set of the researcher and the agents described in the model can be alleviated by augmenting the standard VAR with common factors that are extracted from a large set of macroeconomic indicators. These common factors summarise the relevant information in the macroeconomic indicators and therefore provide a proxy for the information set of agents in the model.

Our FAVAR model for the United Kingdom contains common factors extracted from data on real activity, inflation, money and credit and asset prices in addition to a short-term nominal interest rate. We allow the coefficients of the model and the variances of the shocks to vary over time. The model is estimated over the period 1970 Q1 to 2004 Q2, thus restricting attention to the period before and during the great stability.

In accordance with previous studies, our estimates show a decline in the volatility of shocks to inflation and real activity. In addition, the results suggest that this stability extends to money, credit and asset prices. The average response of the variables in the FAVAR to monetary policy shocks is similar before and after the introduction of inflation targeting. The response of inflation to a (contractionary) monetary policy shock appears to be more plausible than previous studies — in particular not displaying an anomalous (initial) positive response (ie the 'price puzzle'). This may point to the fact that the extra information included in this model improves the identification of the monetary policy shock. Shocks to monetary policy contribute little to inflation and the interest rate during the inflation-targeting period.

Shocks to bank capital: evidence from UK banks at home and away

Summary of Working Paper no. 387 Nada Mora and Andrew Logan

Does bank capital matter for lending? Benjamin Friedman has pointed out that a view among some economists was that holding capital was a 'macroeconomic irrelevance'. But others counter that a shortage of bank capital leads to a fall in lending, hurting overall economic activity. For this to occur two informational failures need to exist. First, banks must have a problem raising fresh capital because potential financiers cannot tell apart a bad bank with poor lending opportunities from a good bank needing capital to fund profitable new projects. Second, borrowers must depend on bank loans in order to fund their investment because they too face problems convincing uninformed markets that they are a risk worth funding. It is easier for banks to overcome this information problem because they are better at screening potential borrowers, establishing relationships and monitoring those that they choose to finance. This means that when banks cannot lend, borrowers will in turn be unable to invest, so lowering economic growth.

In this paper, we explore what the first failure means for bank lending, that is how do banks behave when they cannot offset capital losses by raising more capital or cutting dividends? This is clearly a relevant question in the context of the banking crisis and current recession. Our empirical analysis provides a historic perspective insofar as it relates to a period preceding the current crisis. One concrete problem with much empirical work is that finding an association between bank capital and loans is not the same thing as saying that a hit to bank capital causes a drop in lending. Non-performing loans and write-offs, which can cause banks to lose capital, tend to be negatively correlated with the economic cycle. This may mean that capital limits begin to influence the supply of bank loans when economic growth falters. But at the same time, a slowdown in growth is likely to impact individual and corporate borrowers' incomes and net worth, their expectations about the future path of the economy and the prices of the goods and assets they want to purchase. A deterioration in economic conditions is likely to translate into lower demand for loans meaning that the supply of loans could be adjusting passively.

How is it then possible to identify and attribute lending changes to bank capital? We draw on three methods. First we take advantage of historic data on banks' balance sheets from 1990 to 2004 to investigate shocks to different portfolio components. Along with the time dimension, we use cross-bank differences in a panel of UK banks to extract the important comovements among capital, loans, securities and liabilities. This approach is known as a panel vector autoregression specification. We find that innovations in a bank's capital in the sample period, other things equal, were coupled with a loan response that lasted up to three years and the effect was especially strong among small banks.

Our second method uses indicators of regulatory capital pressure from confidential supervisory returns. We use this information to test whether banks responded differently to capital innovations depending on how close they were to their minimum capital requirements set by the regulator during the sample period. Banks approaching their regulatory minimum were found to cut lending. But they also responded to an increase in capital by lending more. A further result is that banks were less compelled to raise their deposit interest rate to attract funds when they received positive capital shocks starting from a constrained position.

Our third method is the least vulnerable to the problem that the lending response may be contaminated by demand conditions or by factors driving both demand and supply. We identify a possible exogenous shock to bank capital, in the form of a shock originating in a different geographical region. Because many UK banks take deposits from and lend to non-residents, we take advantage of data on write-offs on loans to non-residents. These write-offs will tend to reduce bank's capital (relative to the counterfactual), and are independent of a bank's lending to UK residents. For example, the East Asian crisis led to an increase in non-resident write-offs but was not associated with a rise in write-offs on resident loans. We find some evidence that a shock to non-resident write-offs caused a significant and sustained fall in UK lending. We also isolate the movements in bank capital coming from non-resident write-offs and find a significant positively correlated effect on UK resident lending (controlling for resident write-offs, liquidity and other measures). The effect was strongest on private non-financial corporation (PNFC) loans, and in contrast, lower bank capital had a positive effect on household loans. This indicates that — in this pre-crisis period — banks substituted away from risky PNFC loans into potentially less risky loans when capital was short.

The results show that the external transmission of capital shocks may be present under a more general environment than previous work, which has demonstrated a specific transmission from Japanese parent banks to their external branches in the 1990s. Second, the importance of bank capital for lending also means that the distribution of bank capital matters because information problems impede an optimal transfer of capital from capital-rich lenders to capital-poor banks. This will in turn exclude some firms from bank loans and they will also be unable to substitute to the public debt and equity markets.

An economic capital model integrating credit and interest rate risk in the banking book

Summary of Working Paper no. 388 Piergiorgio Alessandri and Mathias Drehmann

Banking activities are subject to various types of risk, including credit, market and liquidity risk. As part of their risk management, banks need to monitor and quantify these risks on a continuous basis, maintaining capital and liquidity buffers that are sufficient to protect them against large, negative shocks. Various analytical tools have been developed to look at these risks in isolation, especially for credit and market risk. However, no unified economic capital model exists which integrates risks in a consistent fashion. Therefore, banks generally analyse risks in isolation, deriving total economic capital by some rule of thumb. Indeed, a common rule consists of calculating risk-specific buffers and then simply adding them up (possibly subject to a correlation adjustment) to calculate a bank's total capital. The conventional wisdom is that, since risks are only imperfectly correlated, adding up always delivers a conservative capital buffer. However, recent research and experience in the financial sector has shown that this is a fallacy; under some circumstances, risks actually amplify one another and additive rules of thumb do become dangerous. This is an important result for both practitioners and regulators, and it represents a crucial motivation for this work: the main aim of the paper is to investigate to what extent standard, traditional banking (in a sense to be defined below) is subject to this risk amplification problem.

The conceptual contribution of this paper is the derivation of an economic capital model which consistently integrates credit and interest rate risk in the banking book. The paper does not address the issue of what the appropriate level of capital for a bank is; we focus instead on the narrower question of how this level of economic capital is influenced by interactions between risks. According to industry reports, credit and interest rate risk represent the most important sources of risk for a standard 'banking book'. Furthermore, there are good reasons to believe that these risks interact in a non-trivial way. Interest rates and default frequencies are linked to the state of the business cycle; hence, they are implicitly driven by a common set of macroeconomic factors. Interest rates are themselves an important determinant of credit risk: borrowers are more likely to default when interest rates are high. Finally, a bank's interest income depends on its credit risk profile in that credit losses reduce the stock of assets that generate interest payments.

Credit and interest rate risk are modelled in line with standard practices. The credit risk component is based on the same conceptual framework as Basel II and the main commercially available credit risk models. Interest rate risk, on the other hand, is captured by earnings at risk, a well-established metric among practitioners. The key innovation of the paper is in the way risks are integrated. The model explicitly links the systematic component of these risks to a common set of macroeconomic factors. Furthermore, net interest income is modelled dynamically, taking into account the fact that interest rates adjust in response to shifts in the risk-free yield curve and/or changes in the riskiness of the underlying credit exposures. This makes it possible to capture any income compression due to the repricing mismatch between long-term assets and short-term liabilities. The model is applied to a stylised bank whose portfolio is designed to broadly replicate a standard UK banking book in terms of types of exposures (including corporate, mortgage and credit cards loans), size of the loans and pricing maturities. All loans are assumed to be held to maturity and subject to book value accounting. By running numerical simulations, we derive distributions of profits and losses under a range of possible macroeconomic scenarios. We then compare 'simple' (ie additive) economic capital to an 'integrated' capital that takes into account interactions across risks.

The main result of the analysis is that in the narrow set of circumstances tested here the conventional wisdom holds up: simple capital exceeds integrated capital. In other words, in this particular exercise, a simple approach to aggregating credit risk and interest risk in the retail loan book does not lead to an underestimation of risk, compared to an approach that takes into account the interactions between the two sources of risk. The difference between the two depends on various features of the bank, such as granularity of the portfolio, funding structure and pricing behaviour, but it is positive under a broad range of circumstances. Various factors contribute to generating this result. A relatively large portion of credit risk is idiosyncratic, and thus independent of the macroeconomic environment, and the correlation between systematic credit risk factors and interest rates is itself not perfect. Furthermore, as long as the bank's portfolio can be repriced relatively frequently, any increase in credit risk can be partly passed on to borrowers.

Some caution is warranted on the generality of the exercise. The results cannot be used to argue that *in general* an economic capital model that fully integrates all risks would result in lower capital than that implied by simple aggregation rules. Neither does the paper address the issue of what is the appropriate level of capital for a bank. Since the paper focuses only on traditional banking book risks, it does not deal with insights relating to the recent crisis. Securitisation, derivatives and liquidity management, which were at the core of the turmoil, remain outside the scope of this work, and mark-to-market accounting is not taken into consideration. We also assume that banks recover a fixed fraction of any defaulted loan, thus abstracting from the impact of asset prices on recovery rates. Finally, we demonstrate that 'traditional' banking book risks do not generate perverse interactions. However, many banks manage large, complex portfolios that expose them to a wider range of risks than the ones we analyse here: our conclusions cannot be generalised to those cases. Furthermore, complexity might imply a stronger non-linearity in banks' returns than the ones we examine here. As a consequence, banks should generally work on the assumption that additive rules are not reliable and could in some circumstances lead to underestimating economic capital. Developing integrated economic capital models is arguably a key priority for the industry going forward.

Liquidity-saving mechanisms in collateral-based RTGS payment systems

Summary of Working Paper no. 389 Marius Jurgilas and Antoine Martin

There is a growing recognition of the key role played by interbank payments systems in modern economies. Research on these payment systems has been motivated by the important design changes that have occurred in the past 30 years, and has shown that the incentives embedded in a payment system are sensitive to its design, highlighting the importance of a better understanding of these incentives.

There are two main types of real-time settlement payment systems that differ in the way banks can obtain access to intraday liquidity from the central bank. In a collateral-based system, such as TARGET 2 (European Union), CHAPS (United Kingdom), or SIC (Switzerland), banks can obtain intraday liquidity at no fee against collateral. In contrast, in a fee-based system such as Fedwire (United States) banks can obtain intraday liquidity without collateral but at a fee.

Recently, central banks and other public authorities of some countries have started implementing enhancements to the real-time settlement systems that would allow their banks to reduce liquidity needs without introducing new risks. Among the modifications is the introduction of a variant of an offsetting algorithm. In a nutshell, an offsetting algorithm, usually popularly referred to as a 'liquidity-saving mechanism' (LSM), settles offsetting payments with finality in real-time without any, or very minimal, funds. Several real-time settlement systems, ie TARGET 2 (European Union), SIC (Switzerland), RITS (Australia), and BoJNet (Japan), have already adapted offsetting algorithms.

There is a trade-off. Introducing LSMs does not inevitably improve outcomes in all types of payment systems since particular design features affect the way banks respond to the LSM. In all payment systems there are potential benefits, but previous work has shown that in real-time settlement systems that provide unsecured intraday overdrafts for a fee, for example Fedwire (United States), introduction of an LSM may be undesirable. The intuition is that the presence of an offsetting facility provides incentives for banks to delay some payments intraday which, in the absence of an LSM, would have settled earlier. The undesirable effect of an offsetting facility is that it provides an insurance mechanism against having to borrow funds intraday from the central bank. The key contribution of this paper is in showing that such a trade-off does not arise in payment systems that have a collateralised intraday overdraft facility, like CHAPS.

The key difference of a collateralised intraday liquidity payment system, like CHAPS, compared to a fee-based intraday liquidity system, like Fedwire, is that in the collateralised system payment behaviour during the day does not affect the cost of the intraday overdraft once the collateral is pledged with the central bank. While it is technically feasible to adjust the amount of collateral pledged during the day, this happens rarely. In the absence of an LSM banks with sufficient funds therefore settle their payment obligations sooner, while banks with insufficient funds delay their payment outflows. Introducing an LSM in such an environment would provide incentives for banks with insufficient intraday liquidity to submit their payments to an offsetting facility. Thus the presence of an offsetting facility makes settlement earlier in the day more likely.

If the cost of obtaining collateral intraday is sufficiently high then an offsetting algorithm would provide large liquidity savings, while if collateral can be obtained at a low cost during the day the benefits of LSMs are smaller. In our model a payment system with an LSM always performs better than a payment system without the facility to offset payments.

Unlike some possible LSMs, a central queue of the type described here does not create the possibility of reintroducing credit risk into a real-time gross settlement (RTGS) system. Indeed, there is evidence that already RTGS settlement banks queue their payments in internal schedulers. Replacing internal queues with a central queue that allows for offsetting of payments would not reintroduce settlement risk.

Technology shocks, employment and labour market frictions

Summary of Working Paper no. 390 Federico S Mandelman and Francesco Zanetti

A key question in macroeconomics is what driving forces generate aggregate fluctuations? An understanding of this is obviously vital to macroeconomic policy makers. According to Nobel recipients Finn Kydland and Edward Prescott, this question can be addressed by modelling the decision processes of the agents who populate the economy, and then examining to what extent the simulated model is able to replicate the 'stylised' facts in the data that help to summarise the dynamics of key variables. The general aim is to derive the economic model from optimal individual behaviour (a process described as providing 'microfoundations'), and then to calibrate the structural parameters which represent preferences and technology to simulate the model. Proponents of this 'real business cycle' (RBC) view argue that persistent shocks to technology are able to replicate the main empirical regularities of the business cycle in models with optimising representative agents, perfectly competitive markets, flexible prices and the unexplained (and therefore outside the model, or 'exogenous') technology shocks. 'Real' here refers to the fact that behaviour is largely unconnected from changes in quantities measured in money (or 'nominal') terms. The reason for this is that the framework assumes flexible prices. So nominal shocks, such as monetary policy shocks or cost-push shocks, are either absent or have a

minimal role in explaining aggregate fluctuations. A key result that follows from this theoretical framework is the positive response of employment to technology shocks. Recent empirical evidence, however, conflicts with this prediction, thereby calling the validity of the RBC framework into question.

This paper investigates whether the presence of labour market frictions, in the form of imperfections that prevent firms from costlessly hiring workers, could reconcile the functioning of the RBC model with the empirical evidence. To this end, the paper sets up an otherwise standard model that allows, but does not require, labour market frictions to affect the functioning of a prototype RBC model. It then takes the model to the data and estimates its structural parameters to investigate whether the model based on labour market frictions makes the RBC model consistent with the negative response of employment to technology shocks. We use a method of estimation known as Bayesian, which is particularly useful for estimating models such as this where the theory has a lot to say about the dynamics of the data. The findings of this exercise show that the evidence does support the version of the model in which labour market frictions generate a negative response of employment to technology shocks.

Deep habits and the cyclical behaviour of equilibrium unemployment and vacancies

Summary of Working Paper no. 391 Federico di Pace and Renato Faccini

Understanding the determinants of unemployment fluctuations along the business cycle is an important topic for policymakers, since the degree of slack in the labour market affects both wage and price inflation. However, there is no agreement as yet on the sources of fluctuations in unemployment and vacancies. The standard model which attempts to explain these quantities allows for 'matching' of vacant jobs to unemployed workers. In the US data, a standard test bed for labour market models, employment and vacancies are about ten times more volatile than productivity, and the standard textbook matching model of the labour market fails to replicate this fact.

The most successful extension of the standard model that manages to replicate the high degree of volatility in labour market variables is based on the assumption that wages of all workers are sticky. However, recent studies show that what matters for the decision of job creation is only the volatility of the wages of newly hired workers. Intuitively, the decision on whether to create a marginal job only depends on the profitability of the marginal worker, which is only a function of his or her productivity and wage. Empirical evidence shows that the wages of newly hired workers do not exhibit sticky behaviour. Hence, the assumption of sticky wages cannot explain the volatility of unemployment and vacancies over the business cycle.

This paper provides a new mechanism of fluctuation in labour market variables, which does not rely on the assumption that wages for the newly hired workers are sticky. It is based on the notion of 'habits' in consumption, where households' utility from consumption depends partly on past levels of aggregate ('external') consumption, sometimes described as 'catching up with the Joneses' behaviour. This has proved to be very helpful in explaining many features of the economy. The new variant that we apply to the labour market is that workers form habits in consumption on particular varieties of goods, rather than on the average consumption basket in the economy. So some households will form habits on the consumption of cars, others on the consumption of clothes, food, or various amenities, and so on. If this is the case, each firm should internalise the impact of their pricing policy on habit formation. In other words, when setting prices firms anticipate that higher consumption in the current period implies higher habits and higher future consumption. In a model with deep habits, firms exploit the upturns of the business cycle to increase the stock of habits. In order to do so, they need to increase employment. The assumption of deep habits therefore helps making the behaviour of vacancies and employment more strongly procyclical.

We show that a model with deep habits is able to replicate successfully the qualitative and quantitative behaviour of labour market variables along several dimensions. Our paper therefore reinforces the idea that deep habits have a wide range of macroeconomic implications. Previous work in the literature has shown that deep habits can account for the countercyclicality of mark-ups, the positive response of consumption to a government expenditure shock, the price puzzle and the incomplete pass-through. Our work uncovers an important implication of deep habits for the labour market.

Time-varying inflation expectations and economic fluctuations in the United Kingdom: a structural VAR analysis

Summary of Working Paper no. 392 Alina Barnett, Jan J J Groen and Haroon Mumtaz

Since World War II, the United Kingdom has experienced a broad range of economic dynamics. The economy was faced with relatively low inflation and economic growth volatility in the period preceding the 1970s, an unprecedented period of high inflation and depressed economic growth during the 1970s, and with more stable inflation and growth prospects from the 1980s up to the end of our sample in 2007, in particular after the introduction of inflation targeting in 1992. Subsequently, the United Kingdom, in common with most of the world, has suffered a severe recession following the onset of the financial crisis in 2008, but our analysis is not intended to shed light on these very recent events.

These economic changes were associated with shifts in the behaviour of monetary authorities. For example, Bank of England work in 2004 suggested that the response of the Bank to expected inflation was stronger after the introduction of inflation targeting in 1992. Similar results are thought to hold for the United States, with the decrease in inflation and output volatility in the post-1979 period coinciding with an increase in the weight placed by the Federal Reserve on stabilising inflation.

Other commentators argue that the credibility of monetary policy might have had an impact on inflation dynamics by changing the manner in which inflation expectations are formed. According to this literature when the economy is hit by large, inflationary shocks (an 'Inflation Scare') and the central bank hesitates to respond promptly, this may result in a persistent increase in longer-term inflation expectations. This in turn presents the central bank with a choice; either substantially contracting policy to deflate this rise in expectations (and hence cause an economic slowdown); or to accommodate it and let these higher inflation expectations become entrenched in the economy (resulting in persistently higher actual inflation).

There have not been many studies that have looked at the observed time-varying economic dynamics of the UK economy by explicitly using measures of inflation expectations. The work which has been done on this topic is generally focused on the US economy. Some used surveys on inflation expectations from the *Survey of Professional Forecasters* while others

used surveys such as the *Livingston Survey*. They typically find that monetary policy accommodated temporary shocks to inflation expectations in the pre-1979 sample, a period with high inflation persistence, but not in the post-1979 Volcker-Greenspan period (a period with low inflation persistence).

Our study contributes to this debate by employing a complementary approach to analyse UK macroeconomic dynamics by using explicit measures of inflation expectations. We use a system of equations (a vector autoregression) where we use theory to identify the underlying structure. We then apply a time-varying structural methodology to generalise the analysis done for the US economy, allowing for shifts in the coefficients of our system that are caused by changing behaviour (are 'endogenous'). We also explicitly consider the role of demand and supply shocks.

Using this structure, we investigate two main questions relating to the UK economy between 1965 and 2007 (and therefore excluding the effects of the financial crisis and its aftermath). First, how has the impact of the mix of real and nominal shocks on the UK economy evolved over time and did this have a specific impact on UK inflation expectations? Second, has there been an autonomous impact of inflation expectations on the UK economy and has this changed over time?

Our results suggest that shocks to inflation expectations had important effects on actual inflation in the United Kingdom in the 1970s, but that this impact declined significantly towards the end of our sample in 2007. This seems to be mainly due to a relatively stronger response of monetary policy to these shocks during the inflation-targeting years. Similarly, oil price shocks and real demand shocks led to important changes in macroeconomic variables in the 1970s. Beyond that period oil price shocks become less significant for the dynamics of actual inflation and output growth, but real demand shocks, on the other hand, have in the latter part of our sample become a more important determinant for fluctuations in those series. The changing response of monetary policy to the real demand shock appears to be crucial for this result.

PROMISE

Report

A review of the work of the London Foreign Exchange Joint Standing Committee in 2009

This article reviews the work undertaken by the London Foreign Exchange Joint Standing Committee during 2009.

Introduction

The London Foreign Exchange Joint Standing Committee (FXJSC — 'the Committee') was established in 1973, under the auspices of the Bank of England, as a forum for banks and brokers to discuss broad market issues. The Committee comprises senior staff from many of the major banks operating in the wholesale foreign exchange market in London, representatives from brokers, trade associations including the Wholesale Market Brokers' Association (WMBA), the Association of Corporate Treasurers (ACT) — representing corporate users of the foreign exchange market, the British Bankers' Association (BBA) and the Financial Services Authority (FSA). A list of the members of the Committee as at end-2009, and a high-level organogram, can be found at the end of this article. The Committee held six meetings during 2009, as well as an *ad hoc* liaison teleconference during the market-wide business continuity exercise in November.

In the first half of the year, the Committee agreed to undertake a review of the UK foreign exchange (FX) market and its operation during the recent financial crisis. A working group was set up to conduct this review comprising representatives from the membership of the Committee and its subgroups. The working group produced a paper that was endorsed by the Committee and was published on the FXJSC website in September 2009.⁽¹⁾ The paper provides a brief overview of the UK foreign exchange market, its size, structure and the regulatory regime under which it operates, and discusses how the FX market performed during the period of financial turbulence. The paper also sets out a range of current market initiatives under discussion by the Committee, and its subgroups, to mitigate risks further.

One of the key findings of the FXJSC paper was that, in contrast to some other asset classes, the FX market remained fully operational throughout the crisis. However, FX liquidity was impaired during the second half of 2008, and this was most pronounced for FX forwards and swaps. Among the potential explanations, it seems that market participants were primarily concerned about their counterparty exposures. Market confidence started to improve in early 2009 and FX liquidity subsequently gradually picked up.

Overall, the paper concludes that the deep and liquid nature of the FX market and high level of transparency, together with the risk-mitigating structures already in place, such as the use of Credit Support Annexes (CSAs)⁽²⁾ and the settlement services provided by CLS Bank,⁽³⁾ and a well-established code of best practice between market participants, each played a vital role in ensuring that the FX market remained operational during times of high volatility and increasing uncertainty. However, as part of the review, the FXJSC identified a number of key initiatives, many of them of a global nature, to reduce risks further including: encouraging the use of payment-versus-payment mechanisms, such as CLS, across more participants, currencies and products; improving back-office capacity and operational capabilities; strengthening existing CSAs and considering the possible costs and benefits of introducing central counterparty clearing for certain FX products.

As part of these initiatives, a number of infrastructure providers, including LCH.Clearnet, CLS and ICAP, gave presentations to the FXJSC on their services and outlook for the foreign exchange market.⁽⁴⁾ The operations subgroup has also taken forward its work programme on behalf of the FXJSC, to increase market efficiency and mitigate risks further. Moreover, members of the Committee also met with asset managers and members of the hedge fund community during 2009 to discuss market developments.

⁽¹⁾ See www.bankofengland.co.uk/markets/forex/fxjsc/fxpaper090923.pdf.

⁽²⁾ The ISDA Credit Support Annex deals with bilateral security and other credit support arrangements between counterparties for transactions governed by an ISDA Master Agreement.

⁽³⁾ CLS (Continuous Linked Settlement) Bank is a special-purpose bank that provides a continuous linked settlement service for FX transactions by simultaneously settling the two payments relating to the transaction ('payment-versus-payment'), and thereby eliminating the risk that one payment could be made and the corresponding payment not received. More information on CLS is available at www.cls-group.com/About/Pages/default.aspx.

⁽⁴⁾ Guest speakers at the January and March 2010 meetings were the CME Group and the ICE.

Work of the FXJSC operations subgroup

The operations subgroup was established in 2002. Its members are operational managers from many major banks active in the London wholesale foreign exchange market as well as representatives from service providers and trade associations.

During 2009, the 'Option Confirmations Automation' working group of the operations subgroup finished its work on establishing best-practice standards for 'vanilla' FX option confirmations. Work has now begun on standardised confirmations for more 'exotic' FX options such as single barrier and double barrier options. A working group was established to work with members of the operations subgroup to consider ways of increasing CLS usage and participation among a wider cross-section of market participants; also to consider possible new products and currencies. Moreover, the operations subgroup established a dialogue with corporates, funds and asset managers, relating to FX market operations and to promote best practices across the market. The subgroup has also continued to strengthen its co-operation with other international committees by joint membership of some of its working groups and by regular liaison conference calls to discuss the workstreams of the individual groups and establish global best practices for operational issues where possible.

Non-Investment Products Code

The Non-Investment Products (NIPs) Code is a voluntary code of good market practice drawn up by market practitioners covering the foreign exchange market in the United Kingdom as well as the markets for wholesale bullion and wholesale deposits. The Code is published by the FXJSC, with contributions from the FXJSC operations and legal subgroups, the Sterling Money Markets Liaison Group and the Management Committee of the London Bullion Market Association (LBMA) for the relevant sections. The current version of the Code was published in April 2009.⁽¹⁾

Market-wide business continuity exercise

In November 2009, the London FXJSC took part in a market-wide business continuity exercise which was based on a scenario of significant flooding of various financial centres including Canary Wharf and Manhattan in the United States. The exercise was organised by the tripartite authorities (FSA, HM Treasury and Bank of England) and was designed to assess and improve the UK financial sector's resilience in the event of major operational disruption. The FXJSC was asked to take part representing the UK foreign exchange market. Following initial briefing of the scenario, members of the FXJSC main Committee and the operations subgroup organised a conference call during the first day of the exercise to discuss their response to the scenario and outline their business continuity arrangements in such an event. In most cases, businesses were able to revert to their contingency arrangements and continue business as usual for the FX market. The views of the FXJSC were collated and a response was submitted to the exercise organisers. A report on the market-wide exercise and lessons learned was published in February 2010.⁽²⁾

Work of the FXJSC legal subgroup

The legal subgroup was established in 2004 with some 19 professional members providing in-house legal counsel for many of the major institutions involved in the wholesale foreign exchange market in London. The group met three times in 2009. It continued to make an invaluable contribution through its provision of legal support to the work of the FXJSC main Committee and its operations subgroup; in particular reviewing and preparing the updated NIPs Code for publication and contributing to the FXJSC review of the UK foreign exchange market that was published in September. During 2009, the legal subgroup welcomed guest speakers on topical issues from the Financial Markets Lawyers Group (FMLG), the International Swaps and Derivatives Association (ISDA), the FSA as well as member firms, and kept updated on developments in the global FX market.

In addition, the legal subgroup participated in the FXJSC Operations working group that continued to work on standardising the master documentation on non-deliverable forward (NDF)⁽³⁾ confirmations. The group continued to liaise with a range of other domestic and foreign legal committees to keep abreast of developments in foreign exchange markets.

Work of the FXJSC Chief Dealers' subgroup

The Chief Dealers' subgroup was established in July 2005. Its membership in 2009 comprised twelve chief dealers active in the London foreign exchange market.

The subgroup met three times during 2009 to discuss conjectural and structural developments in the foreign exchange market, including the performance of various parts of the FX market during the crisis and the impact of potential regulatory changes on market liquidity and risk management behaviour. The group also discussed e-commerce and

⁽¹⁾ See www.bankofengland.co.uk/markets/forex/fxjsc/nipscode.pdf.

⁽²⁾ See www.fsa.gov.uk/pages/Library/Other_publications/Miscellaneous/2010/ mwe2009.shtml.

⁽³⁾ NDFs are forward contracts in foreign exchange where one currency is not easily traded. The contract is priced by reference to a particular source for the bilateral exchange rate but is settled entirely in the more freely available currency, usually dollars.

developments in FX market infrastructure, in particular focusing on system outages, contingency arrangements and market transparency.

International co-operation

Liaison between the eight foreign exchange committees based in different international financial centres (London, Frankfurt for the euro area, Hong Kong, New York, Singapore, Sydney, Tokyo and Toronto) continued during the year. In December 2009 the Singapore Committee hosted the third global meeting of the FX committees. Topics discussed included the FXJSC and New York Foreign Exchange Committee papers on the functioning of the FX market, international regulatory reform initiatives, operational lessons learned from the Lehman bankruptcy and its impact on the market.

International survey results overview

Thirty one banks, representing the most active participants in the London foreign exchange market, including members of the FXJSC, contributed to the tenth and eleventh semi-annual surveys of foreign exchange turnover in London conducted by the FXJSC in April and October 2009. In April 2009, London foreign exchange turnover⁽¹⁾ fell 20% from six months earlier, returning to similar levels to the October 2007 survey. However, the October 2009 results showed that turnover has since recovered somewhat. Average daily turnover recorded in the October 2009 survey was \$1,549 billion, 14% higher than the April survey, but still some 9% lower than in October 2008 (**Chart 1**). This was in line with FX activity in other global centres; turnover growth recorded by the New York Foreign Exchange Committee fell by 11% on the year to October 2009, while activity in the Singapore and Australia FX markets fell



Sources: Australian Foreign Exchange Committee, Canadian Foreign Exchange Committee, London Foreign Exchange Joint Standing Committee, New York Foreign Exchange Committee, Singapore Foreign Exchange Committee and Tokyo Foreign Exchange Market Committee.

(a) This includes spot, outright forwards, non-deliverable forwards, FX swaps, currency swaps and FX options.

10% and 2%, respectively. Turnover in the Canadian market was down 10% on the year. Japan does not conduct a survey in October.⁽²⁾

The increased turnover in the London FX market in October, compared to April, was driven by a 17% rise in spot foreign exchange turnover (**Chart 2**). Foreign exchange swap turnover also saw a marked recovery, with a rise of 7%. All other products posted increases in turnover from April, although turnover in almost all products remained below October 2008 levels.



Chart 2 UK daily average turnover by product

Source: London Foreign Exchange Joint Standing Committee.

Turnover of all major currencies increased since April 2009, although there was little change in the relative levels of activity by currency (Chart 3). Turnover in sterling rose 10% in October from April, while turnover in US dollars rose 16%. Australian dollar (+29%) and Canadian dollar (+28%) turnover



Source: London Foreign Exchange Joint Standing Committee.

(a) Data on turnover for the Australian dollar and Canadian dollar are only available since the survey was extended in April 2008.

 Based on spot, outright forwards, non-deliverable forwards, FX swaps and other OTC foreign exchange instruments.

(2) The Tokyo Foreign Exchange Market Committee publishes annual turnover results.

rose most sharply of all the currencies and the level of turnover for October 2009 was the highest recorded in the survey.⁽¹⁾ Turnover concentration rose, particularly for over-the-counter (OTC) derivatives. Overall, the top five banks participating in the survey accounted for 54% of overall turnover, from a level of 52% in April 2009, while 20 banks continued to account for 95% of turnover as in previous surveys.

The forthcoming FXJSC survey results for April 2010 will be published in Summer 2010.

Figure 1 Foreign Exchange Joint Standing Committee: structure



Members of the London Foreign Exchange Joint Standing Committee as at December 2009

Members of the London Foreign Exchange Joint Standing Committee operations subgroup as at December 2009

Name	Firm/Organisation	Name	Firm/Organisation
Brian Welch	Association of Corporate Treasurers	Dennis Sweeney	Association of Foreign Banks
Rob Loewy	Bank of China	Simon Bruce	Bank of America
Richard Gill	The Bank of New York Mellon	Richard Gray	Bank of England
Sean Comer	Barclays	Duncan Lord	Barclays Capital
Cassandra Kenny	British Bankers' Association	Cassandra Kenny	British Bankers' Association
Vincent Leclercq	Calyon	Leigh Meyer	Citigroup
James Bindler	Citigroup	Phil Kenworthy	CLS Services
Rob Close	CLS	Andreas Gaus	Credit Suisse
Zar Amrolia	Deutsche Bank	Tony Beels	Deutsche Bank
Heather Pilley	Financial Services Authority	Graham Warby	Goldman Sachs
Phil Weisberg	FXAll	Mike Neale	HSBC
Nick Burgin	Goldman Sachs	Colin Perry	ICAP
Frederic Boillereau	HSBC	Anna Box	ISDA
Troy Rohrbaugh	JPMorgan Chase	Derrick Pearson	Lloyds
Sarah Edgington	Morgan Stanley	Andrew Harvey	Morgan Stanley
Richard Gladwin	Nomura	Matthew Norris	Nomura
Roger Hawes	Royal Bank of Scotland	John Moorhouse	Reuters
Richard Leighton	Standard Chartered	Jeremy Hill	Royal Bank of Scotland
James Potter	Tullet Prebon	Ian Cowell	State Street
Darren Coote	UBS	Alan Spalding	SWIFT
Alex McDonald	Wholesale Market Brokers' Association	Daniel Haid	UBS
Graeme Munro	JPMorgan Chase, Chair, operations	Graeme Munro (Chair)	JPMorgan Chase
	subgroup	Grigoria Christodoulou/Sumita Ghosh	
Susan Revell	Morgan Stanley, Chair, legal subgroup	(Secretariat)	Bank of England
Michael Cross (Chair)	Bank of England		
Grigoria Christodoulou/Sumita Ghosh (Secretariat)	Bank of England		

⁽¹⁾ Since April 2008 when the new survey format was introduced capturing an extended range of currency pairs.

Members of the London Foreign Exchange Joint Standing Committee Chief Dealers' subgroup as at December 2009

Members of the London Foreign Exchange Joint Standing Committee legal subgroup as at December 2009

Name	Firm/Organisation
Ichei Kuki	Bank of Tokyo-Mitsubishi UFJ
Danny Wise	Barclays Capital
Patrick Mauberque	BNP Paribas
Robert de Groot	Citigroup
Bernie Kipping	Commonwealth Bank of Australia
Angus Grieg	Deutsche Bank
Jon Pierce	Goldman Sachs
Gary Nettleingham	HSBC
Roger Hawes	Royal Bank of Scotland
Chris Freeman	State Street
Niall O'Riordan	UBS
Martin Mallett (Chair)	Bank of England
James O'Connor	Bank of England

Name	Firm/Organisation
Gaynor Wood	Bank of America
Chris Allen	Barclays Capital
Richard Haynes	Citigroup
Sharon Blackman	Citigroup
Carl Husselmann	Deutsche Bank
Anne Moore-Williams	FSA
Dan Parker	Goldman Sachs
Felicity White	HSBC
Patrick Palmer	JPMorgan Chase
Stephen Potts	Lloyds TSB
Ed Bracken	Morgan Stanley
Martin Oakley	Reuters
Alex Bouchier	Royal Bank of Scotland
Alistair Clevely	Standard Chartered
Kate Binions	Standard Chartered
Simone Paul	State Street
Kurt Crommelin	UBS
Susan Revell (Chair)	Morgan Stanley
Jacqueline Joyston-Bechal (Secretary)	Bank of England

Speeches

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Bank of England speeches

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

The realities and relevance of Japan's Great Recession — neither *Ran* nor *Rashomon*

Adam Posen, Monetary Policy Committee member, May 2010.

www.bankofengland.co.uk/publications/speeches/2010/ speech434.pdf

In this speech, Dr Adam Posen assessed the relevance of Japan's Great Recession in offering parallels to today's economic challenges. He noted that Japanese growth was far from flat following the bursting of Japanese bubbles in 1992, but policy mistakes prevented sustainable recoveries taking hold until policies were reversed in the early 2000s. More puzzling is the persistent experience of non-accelerating price deflation. While the United Kingdom is at low risk of suffering such policy-induced recurrent recessions, Dr Posen suggested that deflation could not be ruled out. The United Kingdom combines financial parallels to Japan with far less room for fiscal action to compensate for them than Japan had. Further, Japan had an advantage in its recovery that the United Kingdom and other economies do not share at present, in the availability of growing export markets. Another parallel is the existence of corporate sector surpluses; but, while Japanese corporates sat on their cash, greater openness of the UK corporate sector could allow corporates to invest abroad with returns feeding consumption and productivity growth.

The \$100 billion question

Andrew Haldane, Executive Director for Financial Stability, March 2010.

www.bankofengland.co.uk/publications/speeches/2010/ speech433.pdf

In this speech, Andrew Haldane discussed the costs and benefits of structural reform to the banking system. In order to regulate banks to reflect the costs of the crisis, a measure of banks' contribution to systemic risk is needed. Estimates based on output foregone or implicit subsidies are large and mainly accounted for by institutions perceived as being 'too big to fail'. The public policy response to date has focused on the role of prudential regulation. As an alternative, Andrew considered the benefits of prohibition for financial system resilience (in terms of modularity, robustness and incentives) and the costs of prohibition (in terms of economies of scale and scope that might be lost as a result of restricting bank functions). The costs appear to be exhausted at fairly modest ranges of banking assets and activities. Uncertainty in macroeconomic policy making: art or science? Mervyn King, Governor, March 2010.

www.bankofengland.co.uk/publications/speeches/2010/ speech432.pdf

In this speech, the Governor compared and contrasted the treatment of uncertainty and forecasting in economic policy making and in the physical sciences.

In both areas, unpredictability comes from the difficulty of assigning probabilities to infrequent, high-impact events; differences in starting points, even small ones; and sudden transitions in the state of the world. But the Governor noted that it is often possible to identify vulnerabilities and that a system can be made more robust to shocks.

However, one key difference between economics and physical sciences is the presence, in economics, of active decision-makers that affect outcomes. This substantially complicates the dynamics of an economic system. An understanding of decision-making behaviour, and its interaction with policy, is vital. The Governor drew out several influences on individuals' decisions under uncertainty: people are influenced by experience, decisions may be affected by the way information is presented, people tend to follow the actions of others and they often have excessive faith in their own judgements.

Behaviour under uncertainty has implications for policy. In particular, it emphasises the importance of communication. Much of the value of forecasts is in their being understood. An optimal policy balances how much information to communicate and in what form. Communication is an important part of establishing credibility. The Governor went on to explain that it is the whole distribution of outcomes that matters for both understanding and policymaking. He noted that, with this in mind, the MPC's methods of communicating about an uncertain future had evolved and would continue to do so. And he concluded the speech by illustrating some of the practical devices the MPC had used, and were considering using, in communicating about the outlook.

Resolution of large and complex financial institutions: the big issues

Paul Tucker, Deputy Governor, March 2010.

www.bankofengland.co.uk/publications/speeches/2010/ speech431.pdf

In this speech, Paul Tucker — Deputy Governor for Financial Stability and chair of the Financial Stability Board's Working
Drawing on the international debate, he considered the two biggest issues that effective resolution regimes will have to address. First, whether there should be the ability to make adjustments to unsecured creditors' claims in the form of haircuts and/or equity conversions in a going concern, rather than incurring large losses as creditors in a gone concern bank insolvency process. Such an approach would in effect combine features of standard regimes for resolving commercial banks (rapidity, public policy objectives) with some features of the US Chapter 11 for non-financial companies (haircuts for creditors in a continuing business).

And second, how to address the obstacles to handling the resolution of internationally active institutions and the associated big issues about how insolvency and resolution laws are applied to internationally active financial companies. In particular, the differences between 'territorial' and 'universal' principles governing resolution and a possible intermediate course that could be described as 'modified universalism'. That would be based on a principle of equitable treatment of worldwide creditors which would be consistent with the imposition of losses on unsecured creditors. It might be agreed on a firm-by-firm basis.

In terms of the international debate around Too Big To Fail, this would involve changing our sense of what 'Fail' involves. Perhaps it would not have to involve liquidation or administration. Perhaps it would not have to involve a binary shift from 'going concern' to 'gone concern'. But it would have to involve loss for equity holders and uninsured creditors. It would have to rekindle market discipline. It would have to preserve the flow of financial services. Individual countries or economic areas such as the EU can get only so far on their own. To cope with distress in global banking, the highest reaches of the authorities need to decide whether or not they want international collaboration in the resolution of cross-border banking groups.

Prospects for global economic recovery

Andrew Sentance, Monetary Policy Committee member, March 2010.

www.bankofengland.co.uk/publications/speeches/2010/ speech430.pdf

In this speech, Andrew Sentance discussed the prospects for continued global economic recovery. He argued that a bounceback in confidence, strong growth in Asia and other emerging markets and the impact of economic policy stimulus had aided the global recovery so far and this had also supported the recovery in the United Kingdom. But there were several uncertainties affecting the outlook. New shocks, both at home and abroad, could not be ruled out. And major financial and fiscal adjustments were needed in Europe and the United States. But he argued that there were good grounds for expecting the global economic recovery to continue and provide a healthy support to the UK economy in the years ahead. He concluded by explaining that the appropriate degree of policy stimulus would be continually reassessed in light of the progress of the recovery at home and abroad and its impact on inflationary pressure.

The UK economy after the crisis: monetary policy when it is not so NICE

Charles Bean, Deputy Governor, March 2010.

www.bankofengland.co.uk/publications/speeches/2010/ speech429.pdf

In this speech, Charles Bean noted a gradual economic recovery had begun but the pace of future growth was uncertain. Downside risks came from the weak banking system, high household indebtedness, the need for fiscal contraction, and growth prospects overseas. But the substantial stimulus from monetary policy, including the MPC's asset purchases, and the depreciation of sterling were working in the other direction. There was uncertainty about the amount of spare capacity and its impact on prices, but he concluded that inflation was likely to return to target in the medium term.

He then noted some criticisms of the monetary policy framework. Policy was unlikely to be different under a 'dual mandate'; raising the inflation target would be unhelpful; and regulatory policies were better suited to preventing financial imbalances. And if monetary policy were used to restrain credit growth, it could be explained within the current mandate.

QE — one year on

Spencer Dale, Executive Director and Chief Economist, March 2010.

www.bankofengland.co.uk/publications/speeches/2010/ speech428.pdf

In this speech, Spencer Dale looked back at an extraordinary year for the economy, focusing on the policy of buying assets using the Asset Purchase Facility, known as quantitative easing (QE). Drawing on insights from the academic literature, the MPC placed weight on three key channels through which asset purchases operate: imperfect substitutability and portfolio rebalancing; improvements in financial market liquidity; and expectations. Judging the impact of QE to date was difficult, but event studies suggested that gilt yields may have been reduced by around 100 basis points. Equity and corporate bond prices had increased substantially and the growth of broad money was stronger than it otherwise would have been. Much of the impact of asset purchases to date was still to come through, so it was too early to judge their ultimate impact on nominal spending and inflation. Looking forward, policy decisions would continue to be guided by the outlook for inflation.

Fair value in foul weather

Andrew Haldane, Executive Director for Financial Stability, March 2010.

www.bankofengland.co.uk/publications/speeches/2010/ speech427.pdf

In this paper, Andrew Haldane discussed the history of accountancy and valuation and how the recent crisis has renewed the debate around the use of fair value. At the heart of this is the question of whether the Efficient Markets Hypothesis holds and whether market prices are a full and fair reflection of the present value of future cash flows on an asset. In practice, particularly during times of crisis, evidence suggests they may not be. Against this background, Andrew discussed the main arguments for and against the use of marking to market and proposed some broad principles which could help frame accounting standards: (1) the importance of a common measuring rod; (2) a failure of efficient markets is not of itself a failure of fair value; (3) better accounting for expected losses; and (4) business models matter, especially for banks.

Monetary policy — from stability to financial crisis and back? Kate Barker, Monetary Policy Committee member, March 2010.

www.bankofengland.co.uk/publications/speeches/2010/ speech426.pdf

In her final speech as an MPC member, Kate Barker sought to draw lessons from her experience, and suggested some changes in the approach to policy.

She noted that there was much uncertainty about the present size of the output gap, partly as it was not easy to reconcile a large negative output gap with recent upward surprises on inflation. One proposal for the future might be that the MPC could consider using a range of different plausible estimates of the output gap and its effect on inflation as part of the methodology for constructing the growth and inflation fan charts.

She also considered whether it might be useful to reconsider the merits of looking to inflation prospects beyond the normal forecast horizon, to ensure any future risks to economic stability are taken into account. With the benefit of hindsight, this might have been helpful in the period before the financial crisis.

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/quarterlybulletin/ index.htm.

Articles and speeches

Speeches are indicated by (S)

2006 Q4

- The economic characteristics of immigrants and their impact on supply
- Recent developments in sterling inflation-linked markets
- The state of British household finances: results from the 2006 NMG Research survey
- Measuring market sector activity in the United Kingdom
- The Governor's speech at the Great Hall, Winchester (S)
- Trusting in money: from Kirkcaldy to the MPC (S)
- The Governor's speech to the Black Country business awards dinner (S)
- International monetary stability can the IMF make a difference? (S)
- The puzzle of UK business investment (S)
- Hedge funds and financial stability (S)
- Practical issues in preparing for cross-border financial crises
 (S)
- Reflections on my first four votes on the MPC (S)
- Prudential regulation, risk management and systemic stability (S)
- Globalisation and inflation (S)

2007 Q1

- The Monetary Policy Committee of the Bank of England: ten years on
- The macroeconomic impact of globalisation: theory and evidence
- The macroeconomic impact of international migration
- Potential employment in the UK economy
- The role of household debt and balance sheets in the monetary transmission mechanism
- Gauging capacity pressures within businesses
- Through the looking glass: reform of the international institutions (S)
- The Governor's speech to the Birmingham Chamber of Commerce Annual Banquet (S)
- Perspectives on current monetary policy (S)
- The MPC comes of age (S)
- Pricing for perfection (S)
- Risks to the commercial property market and financial stability (S)

- Macro, asset price, and financial system uncertainties (S)
- The impact of the recent migration from Eastern Europe on the UK economy (S)
- Inflation and the supply side of the UK economy (S)
- Inflation and the service sector (S)
- Recent developments in the UK labour market (S)

2007 Q2

- Public attitudes to inflation and interest rates
- National saving
- Understanding investment better: insights from recent research
- Financial globalisation, external balance sheets and economic adjustment
- A review of the work of the London Foreign Exchange Joint Standing Committee in 2006
- The MPC ten years on (S)
- The City's growth: the crest of a wave or swimming with the stream? (S)
- The changing pattern of savings: implications for growth and inflation (S)
- Interest rate changes too many or too few? (S)
- A perspective on recent monetary and financial system developments (S)
- Recent developments in the UK economy: the economics of walking about (S)

2007 Q3

- Extracting a better signal from uncertain data
- Interpreting movements in broad money
- The Bank of England Credit Conditions Survey
- Proposals to modify the measurement of broad money in the United Kingdom: a user consultation
- The Governor's speech to CBI Wales/CBI Cymru, Cardiff (S)
- The Governor's speech at the Mansion House (S)
- London, money and the UK economy (S)
- Uncertainty, policy and financial markets (S)
- Central banking and political economy: the example of the United Kingdom's Monetary Policy Committee (S)
- Promoting financial system resilience in modern global capital markets: some issues (S)
- UK monetary policy: good for business? (S)
- Consumption and interest rates (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

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/index.htm.

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/workingpapers/ index.htm

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

No. 379 Household debt, house prices and consumption in the United Kingdom: a quantitative theoretical analysis (March 2010) *Matt Waldron and Fabrizio Zampolli*

No. 380 Evaluating and estimating a DSGE model for the United Kingdom (March 2010) *Richard Harrison and Özlem Oomen*

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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/externalmpcpapers/ index.htm.

The following papers have been published recently:

No. 28 International comovements, business cycle and inflation: a historical perspective (July 2009) *Haroon Mumtaz, Saverio Simonelli and Paolo Surico*

No. 29 Risk heterogeneity and credit supply: evidence from the mortgage market (February 2010) *Timothy Besley, Neil Meads and Paolo Surico*

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/ms/current/index.htm.

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/ms/articles.htm.

Financial Stability Report

The *Financial Stability Report* is published twice a year. Its purpose is to encourage informed debate on financial stability; survey potential risks to financial stability; and analyse ways to promote and maintain a stable financial system. 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/fsr/index.htm.

Payment Systems Oversight Report

The Payment Systems Oversight Report provides an account of how the Bank is discharging its responsibility for oversight of UK payment systems. Published annually, the Oversight Report sets out the Bank's assessment of key systems against the benchmark standards for payment system risk management provided by the internationally adopted Core Principles for Systemically Important Payment Systems, as well as current issues and priorities in reducing systemic risk in payment systems. Copies are available on the Bank's website at:

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 *Handbook* 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/ccbs/handbooks/ index.htm.

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/money/publications/ redbookjan08.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/other/beqm/ index.htm.

www.bankofengland.co.uk/publications/psor/index.htm.

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/about/cba.htm.

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/other/monetary/ creditconditions.htm.

Trends in Lending

This monthly 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 are supplemented by the results of a new data set, 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/other/monetary/ trendsinlending.htm.

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/quarterlybulletin/ index.htm.

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/inflationreport/ index.htm.

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 2010 are as follows:

Quarterly Bulletin		Inflation Rep	Inflation Report			
Q1	15 March	February	10 February			
Q2	14 June	May	12 May			
Q3	20 September	August	11 August			
Q4	13 December	November	10 November			

Financial Stability Report June December

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	2010						
	<i>QB, IR</i> and <i>FSR</i> package	QB and IR package	IR and FSR package	QB only	<i>IR</i> only	<i>FSR</i> 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	
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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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